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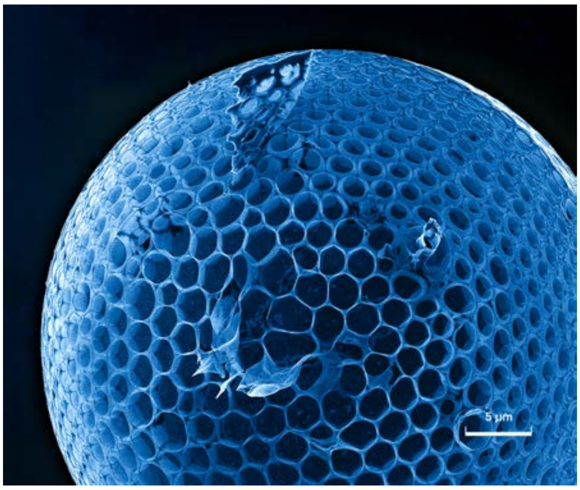

Inhalt

Imprint

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Scientific Highlights

- Dresden researchers offer insights into static mixers' flow patterns
- Combination of different methods reveals new information about uranyl compounds
- New form of cancer treatment starts in Dresden
- A simple method for measuring particle ranges improves precision of proton therapy
- Magnetic fields and lasers help unveil graphene's secret
- Cosmic jets of young stars formed by magnetic fields

Dresden Researchers Offer Insights into Static Mixers' Flow Patterns

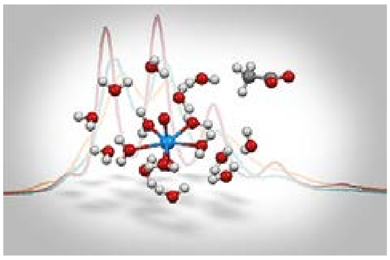
One of the chemical industry's most common processes is the dispersion and dissolution of gases in liquids. Therefore, so-called static mixers are increasingly used. The method involves elaborate arrangements of mixing elements like helical blades or cross-bars for mixing of various fluids like gases and liquids directly inside the tubing. The details of these mixing processes are still not unveiled. Computer simulations that are frequently used here are not powerful enough since flows are far too dynamic.

For this reason, researchers at the HZDR Institute of Fluid Dynamics have started using a new method called ultrafast X-ray tomography, a method that involves a rapidly moving X-ray source to irradiate the flow from many different angles. From individual projections, the scientists are afterwards able to reconstruct cross-sectional images. This means that 1,000 images per second are not even an issue. Even individual gas bubbles dispersed in the liquid and their pathways through the mixing segments can be visualized. Researchers are particularly interested in the bubble size distribution patterns since the mass transfer occurs across the bubbles' surfaces. The desired gas bubbles are small and highly dispersed as they act to intensify it.

With this research, the Rossendorf scientists were able to show that flow turbulence and centrifugal forces compete in the presence of helical elements. This in turn affects the mixture and the bubbles' dispersion. On the one hand, the turbulence acts to break the bubbles. On the other, the bubbles coalesce as the centrifugal forces separate the lighter gaseous phase from the liquid, the heavier material. From these findings, the scientists are able to draw conclusion about the components' ideal arrangements and about the required mixing segment length. This way, the facilities' energy efficiency can be optimized.

- **Publication:** S. Rabha, M. Schubert, F. Grugel, M. Banowski, U. Hampel, „Visualization and quantitative analysis of dispersive mixing by a helical static mixer in upward co-current gas-liquid flow", Chemical Engineering Journal, 262, 527-540 (2015, DOI: 10.1016/j.cej.2014.09.019)
- **Contact:** Dr. Markus Schubert, Institute of Fluid Dynamics

Combination of Different Methods Reveals New Information about Uranyl Compounds



Through a combination of mathematical and experimental methods, researchers at the Helmholtz-Zentrum Dresden-Rossendorf were able to glean surprising insights into the uranyl(VI) hydrolysis, the basic model for examining uranium chemistry in aqueous systems. For the secure storage of highly radioactive waste in permanent repositories, knowledge of how the toxic materials interact with their environment is critical and scientists are drawing on a range of different spectroscopy-based methods to figure out the specifics of these interactions. As such, the chemical structure, the binding, and thus the dispersal behavior of actinides can be decoded.

Because of their high sensitivity, methods involving luminescence spectroscopy are particularly well-suited to studying uranyl(VI) systems. However, an analysis of the collected data has proved challenging, which is why researchers at the Institute of Resource Ecology are using parallel factor analysis (PARAFAC), which they adapted for uranyl hydrolysis. The Dresden scientists collected data like pH measurements using time-resolved laser-induced fluorescence spectroscopy and assembled it into a three-dimensional data cube. This allowed them to be the first to actually show a consistent image of the uranyl(VI) system they had analyzed, identifying five important uranyl(VI) hydrolysis compounds and characterizing them using spectroscopy.

The results refute the long-held belief that distinguishing between uranyl(VI) compounds by way of excitation spectroscopy at wavelengths of less than 370 nanometers is impossible. Not only were the researchers able to confirm their findings with the help of quantum chemical calculations, but for the first time ever, they were actually able to show an existing relationship between the luminescence signal and the chemical structure. This work is helping lay the foundation for the study of more complex uranyl(VI) systems. In addition, the combination of cutting-edge luminescence spectroscopy and theoretical methods could potentially be applied to a number of systems involving additional actinides and rare earths.

- **Publication:** B. Drobot, R. Steudtner, J. Raff, G. Geipel, V. Brendler, S. Tsushima, „Combining luminescence spectroscopy, parallel factor analysis and quantum chemistry to reveal metal speciation – a case study of uranyl(VI) hydrolysis", Chemical Science, 2015, 6, 964-972 (2014, DOI: 10.1039/C4SC02022G)
- **Contact:** Björn Drobot, Institute of Resource Ecology

New Form of Cancer Treatment Starts in Dresden

Dresden's Carl Gustav Carus University Hospital is the very first site in East Germany to be banking on proton-based radiotherapy in the fight against cancer. By mid-December 2014, the first set of cancer patients were treated with radiotherapy. This form of cancer treatment involves shooting the body with protons at two-thirds the speed of light. Unlike is the case with conventional X-ray radiotherapy, these tiny particles don't actually unfold their maximum potential until they have reached the tumor, so that the surrounding tissue remains less damaged. The facility is a joint project by the University Hospital Carl Gustav Carus, the TU Dresden's Faculty of Medicine, and the HZDR.

The scientists have taken the approach of uniting research and treatment under one roof. Scientific findings are extrapolated and applied directly to the treatment - and, vice versa, the practical insights gleaned during treatment also make their way back into the research lab. This cycle is supposed to help speed up the transfer of research knowledge to clinical application. The scientists are hoping to continue to refine the use of protons in cancer therapy over the next several years with a clear focus on the patient and far from commercial dictates.

The National Center for Radiation Research in Oncology - OncoRay provides them with a cutting-edge infrastructure. In addition to its proton therapy facility, the Center also houses an experimental hall on an area of 250 square meters. Here, HZDR researchers are working closely with their partners on a brand new method for accelerating particles. Highly intense laser light is supposed to replace the need for electromagnetic fields that are traditionally used. The hope is that this will help reduce the overall size of the facilities while reducing their price tag, which in turn would help make them more ubiquitously available in the everyday hospital setting.

- **Press release (German):** Protonentherapie: erste Patienten im Bestrahlungszyklus
- **Contact:** Prof. Dr. Michael Baumann, Director Institute of Radiooncology

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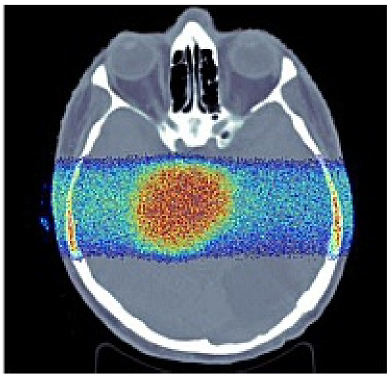
A Simple Method for Measuring Particle Ranges Improves Precision of Proton Therapy



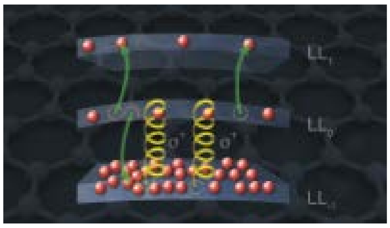
Proton beams might improve the fight against cancer as their highest destructive potential can be focused on a specific target within the body. Just like bullets a proton beam has a specific range. As long as the initial speed of particles entering the patient's body is set correctly, they unfold their greatest destructive potential precisely within the tumor following their deceleration inside the body – just at the point, at which they stop. However, this is at the same time a challenge. Even a congested nose at the time of the preliminary assessment can distort the data on whose basis the radiation treatment is planned, which could potentially mean the beam may end up missing its target. This is why scientists search for methods for obtaining precise measurements of the protons' actual range.

A team of Dresden researchers has developed a surprisingly simple technology. The high speed of the protons triggers nuclear reactions, which causes gamma radiation. The previous concepts try measuring this radiation using complex and costly detector systems in order to trace the beam's path. By contrast, the new method relies on time measurements that merely need a single detector. Researchers at the HZDR and at the OncoRay Center use an effect which so far has been viewed as a potential source of error: protons require a very short but finite period of time to reach their target inside the body.

Their deceleration time depends on the braking distance - that is, on the range. The gamma radiation generated in the process is emitted within a timespan that grows longer with increasing range. This is easy to record. If the measured time spectra deviate from the modeled ones, the beam does not reach its target with high enough precision. After only a few seconds, the beam can be shut off. The researchers were able to experimentally confirm their hypotheses. The technology could potentially help decrease the safety margin around the tumor down to a few millimeters, which increases the efficacy of the treatment.

- **Publication:** C. Golnik, F. Hueso-González, A. Müller, P. Dendooven, W. Enghardt, F. Fiedler, T. Kormoll, K. Roemer, J. Petzoldt, A. Wagner, G. Pausch, „Range assessment in particle therapy based on prompt γ-ray timing measurements", Physics in Medicine and Biology, 59, 5399-5422 (2014, DOI: 10.1088/0031-9155/59/18/5399)
- **Contacts:** Dr. Guntram Pausch, OncoRay**;** Dr. Fine Fiedler, Institute of Radiation Physics

Magnetic Fields and Lasers Help Unveil Graphene's Secret



With its tensile strength greater than steel and its conductance of electricity and heat better than copper, graphene is being hailed as a "miracle material." A two-dimensional material consisting of only a single layer of carbon atoms, it is both flexible and nearly transparent, and several million times thinner than a sheet of paper. Following its discovery ten years ago, scientists realized early on that graphene's energy states within a magnetic field - called its Landau levels - behave differently from semiconductors. But the electron dynamics of graphene in the presence of magnetic fields had not before been studied.

In order to uncover the dynamics of graphene-based charge carriers, HZDR researchers have exposed the "miracle material" to a magnetic field, examining it using light pulses from their free-electron laser. In the process, they discovered a seemingly paradoxical phenomenon: Of all things, it was the energy level, into which a laser continued to pump new electrons, that, little by little, began to empty out. The culprits behind this unusual redistribution behavior were collisions between electrons. Although scientists are familiar with this effect, which is known as Auger scattering, nobody was expecting it to be quite this powerful, capable of emptying out an entire energy level.

Looking ahead, this discovery may prove useful for the development of a new kind of laser capable of producing light at a desired set wavelength in the infrared and terahertz ranges. For the longest time, this kind of Landau level laser was considered unfeasible, but now, thanks to graphene, this semiconductor physicists' dream could become a reality.

- **Publication:** M. Mittendorff, F. Wendler, E. Malic, A. Knorr, M. Orlita, M. Potemski, C. Berger, W.A. de Heer, H. Schneider, M. Helm, S. Winnerl: „Carrier dynamics in Landau quantized graphene featuring strong Auger scattering“, Nature Physics 11, 75-81 (2015, DOI: 10.1038/nphys3164)
- **Contact:** Dr. Stephan Winnerl, Institute of Ion Beam Physics and Materials Research

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Cosmic Jets of Young Stars Formed by Magnetic Fields

Astrophysical jets are counted among the most spectacular of our universe's phenomena: from the center of black holes, quasars, or protostars, these rays of matter project far out into space, at times at a distance of several light years. What we're talking about here is a thin, straight emission of matter emanating from the center of a disc-shaped cluster made up of cosmic gas and dust. Together with colleagues from Europe, America, and Asia, HZDR researchers have realized an experiment that allowed to generate these types of jets from magnetic fields and as a result they can be modeled.

For their experiments, the researchers simulated the origination process of a jet in the lab: To this end, they targeted intense laser light on a plastic sample. This transformed the previously solid plastic object into a conductive plasma - a sort of rapidly spreading "hot cloud" made up of electrons and ions, which represented a young star's cluster of matter - on a much smaller scale, of course. This way, the scientists were able to extrapolate the results they had obtained in the lab to real-life conditions as they exist in the universe.

At the same time, the plasma was exposed to a very strong pulsed magnetic field, which was produced using a specially designed pulse generator by the Dresden High Magnetic Field Laboratory. This, then, turned out to be the experiment's deciding trick as - according to the physicists' hypothesis - the normally widely scattered plasma was supposed to focus in the magnetic field, and form a hollow interior. As predicted, this in turn generated a shockwave, from which an ultrathin beam - a jet - began to project. The experimental data corresponded nicely to previously made astronomical observations of actual jets in the universe.

- **Publication:** B. Albertazzi, A. Ciardi, M. Nakatsutsumi, T. Vinci, J. Béard, R. Bonito, J. Billette, M. Borghesi, Z. Burkley, S. N. Chen, T. E. Cowan, T. Herrmannsdörfer, D. P. Higginson, F. Kroll, S. A. Pikuz, K. Naughton, L. Romagnani, C. Riconda, G. Revet, R. Riquier, H.-P. Schlenvoigt, I. Skobelev, A. Faenov, A. Soloviev, M. Huarte-Espinosa, A. Frank, O. Portugall, H. Pépin, J. Fuchs, “Laboratory formation of a scaled protostellar jet by coaligned poloidal magnetic field”, Science, 346, 325-328 (2014, DOI: 10.1126/science.1259694)
- **Contact:** Prof. Dr. Thomas E. Cowan, Director Institute of Radiation Physics

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Calendar of Events

January: Analyzing pressure container aging in nuclear plants

At an international workshop, scientists presented findings from the EU project LONGLIFE. The project, which was coordinated by the HZDR, was taking a look at the aging processes of nuclear plant pressure containers. Using irradiated steel samples obtained from European nuclear facilities and research reactors, the researchers determined the influence the neutron flow - in other words, the radiation intensity - has on the materials at an equal neutron dose. As it turned out, the predicted aging effects had been overestimated compared with the actually occurring effects, since in the case of the radiation experiments inside the research reactor, the neutron flow is higher than is true of the reactor pressure container under normal operating conditions.

February: Collaboration between ESRF and HZDR is extended

In mid-February 2014, the HZDR's Administrative Director, Prof. Peter Joehnk, and Prof. Francesco Sette, General Director of the European Synchrotron Radiation Facility (ESRF), co-signed an agreement in Grenoble, France, to extend the collaboration between the two research facilities by another five years. Prior to the signing, then Saxon Research Minister Prof. Sabine von Schorlemer and a delegation of scientists and representatives from "Silicon Saxony" paid a visit to the Rossendorf Beamline (ROBL), which the HZDR has now been operating at the ESRF for several years.

March: Air-borne research on raw materials

Together with the Federal Institute for Geosciences and Natural Resources and the TU Freiberg, the Helmholtz Institute Freiberg for Resource Technology (HIF) continued its air-borne investigation of metallic raw material reserves. With the help of a helicopter probe, which can be used to examine the soil up to a depth of 300 meters, the researchers are planning to collect geophysical data. Taking measurements at the surface allows the researchers to extend their investigation to a depth of 500 meters. On this basis, scientists are hoping to create a three-dimensional model of the substratum.

April: Gönnsdorfer Observatory and HZDR inaugurate new telescope

In an effort to get students excited about exploring our universe, the Helmholtz-Zentrum Dresden-Rossendorf permanently loans the Gönnsdorf Observatory a new telescope. On April 5, which is National Astronomy Day in Germany, Renate Franz, Head of the Observatory, and Prof. Roland Sauerbrey, Scientific Director of the HZDR, together inaugurated the telescope. The event also served as the starting signal for a more close-knit partnership between the two institutes. The loan is an exciting new addition to the HZDR's DeltaX Student Lab's range of experimental offerings for their "Light and Color" program.

May: Lab open house attracts masses to make a pilgrimage for Rossendorf

On Saturday, May 24, some 3,500 guests decided to brave the dreary weather and spend the day at the lab open house of the Dresden-Rossendorf research and technology site. Electron accelerator ELBE, Saxony's largest research instrument, attracted the most attention that day. Visitors were able to catch hands-on glimpses of the open house motto "Digital Research Worlds" at one of some 100 stations. Together with their colleagues from ROTOP Pharmaka AG and VKTA – Radiation Protection, Analytic and Disposal, all of whom had helped co-organize the open house, HZDR scientists presented their work in the different labs by performing exciting experiments for their visitors. The insights gleaned into the world of cutting-edge research left a positive impression on young and old alike.

June: World conference for accelerator experts in Dresden

From June 15-20, some 1,500 scientists visited the Saxon capital to swap ideas about the latest accelerator projects in research, medicine, and industry as part of the IPAC14. One topic was the use of particle accelerators in cancer therapy. During an evening lecture, Prof. Wolfgang Enghardt talked about the development of a compact laser accelerator at the Helmholtz-Zentrum Dresden-Rossendorf and about proton therapy at the National Center for Radiation Research in Oncology - OncoRay. The HZDR was on site in charge of organizing the IPAC.

July: HZDR recognizes the work of Saxony's top junior physicists

The 2014 VON ARDENNE Physics Awards went to three German high school students from Dresden and Freiberg. Klara Knupfer impressed the jury with her work on organic photovoltaics. A student at Dresden's Martin-Andersen-Nexö-Gymnasium, Klara secured the coveted top award in the amount of 1,000 Euros for herself. Other awards in the amount of 750 Euros each went to Michael Jaster of the Geschwister-Scholl-Gymnasium in Freiberg and to Rowina Caspary of the Marie-Curie-Gymnasium in Dresden. The competition seeks to honor outstanding achievements in the field of physics to motivate students to pursue their passion through university study in the natural sciences.

August: Research Minister opens UniversitätsProtonenTherapie Dresden

Late August 2014 saw the German Federal Minister of Research, Prof. Johanna Wanka, and Saxony's Minister President, Stanislaw Tillich, together inaugurating the Carl Gustav Carus University Hospital's new proton therapy unit. At the inaugural event, both politicians announced that a consortium made up of TU Dresden's Faculty of Medicine, the University Hospital Carl Gustav Carus, and the HZDR, will receive additional top-level annual funding in the amount of several million Euros with the goal of setting up a Dresden partner site for the National Center for Tumor Diseases (NCT) Heidelberg.

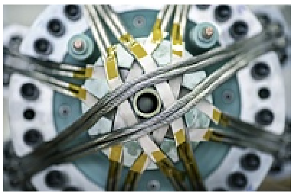
September: HZDR supports Iraqi engineers

In September, a delegation of the Iraqi Zakho University visited the Helmholtz-Zentrum Dresden-Rossendorf. The Saxon research facility has vowed to support engineers at the University, assisting them with setting up and operating a multiphase flow lab whose mission is development and testing of new technologies for oil and natural gas mining like multiphase flow meters and pumps. Zakho University will be funding all those aspects of the project that are necessary for lining new test rigs and equipping them with the proper measuring technology. Through a broad offering of courses and joint projects, Iraqi researchers will be trained at the HZDR.

October: Russian nuclear physicists visit the HZDR

On October 9, 2014, Prof. Victor A. Matveev, director of the Joint Institute for Nuclear Research (JINR) in Dubna, Russia, paid a visit to the Helmholtz-Zentrum Dresden-Rossendorf. Matveev was joined by Dr. Dmitry V. Kamanin, Head of the JINR Office of International Relations, and Dr. Uwe Meyer, the Helmholtz Association's representative for the German-Russian Science Cooperation. The day-long program featured visits to the HZDR user facilities like the ELBE Center for High-Power Radiation Sources, the High Magnetic Field Laboratory, as well as the Ion Beam Center. Prior to this, Prof. Matveev showed a presentation on his Institute to leading HZDR scientists.

November: Europe's high magnetic field labs forge an even stronger bond



In November 2014, the supporting institutions of Europe's four largest high magnetic field labs - the Centre National de la Recherche Scientifique, Radboud University Nijmegen, the Foundation for Fundamental Research on Matter, and the HZDR - agreed on founding the European Magnetic Field Laboratory (EMFL). Following years of successful and close scientific collaboration, they have now officially become one single unit in legal terms. With its current sites in Dresden, Toulouse, Grenoble, and Nijmegen, the EMFL is helping make World-class research a reality. With the help of magnetic fields, our understanding of materials can be improved and new developments in science and technology promoted.

December: HZDR coordinates setup of Europe's largest-ever raw materials network

On Tuesday, December 9, 2014, the EIT, the European Institute of Innovation & Technology, charged an international consortium with setting up a Knowledge and Innovation Community (KIC) for the raw materials sector. The project is coordinated by the Helmholtz-Zentrum Dresden-Rossendorf and the Fraunhofer-Gesellschaft. The network, called EIT Raw Materials, will help unite more than 100 different European companies, universities, and research institutes that are doing work in the area of resources under one roof. The goal is to improve education, research, and innovation in this important field and to secure the supply of the European industry with raw materials while strengthening the resource sector's international competitive edge.

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Science and Technology Transfer

The HZDR boosts its international standing

One of last year's highlights was the successful integration of the Knowledge and Innovation Community (KIC) EIT Raw Materials. Together with the Fraunhofer-Gesellschaft, the Helmholtz-Zentrum Dresden-Rossendorf is coordinating the set-up of the largest European resource network, which will help unite more than 100 companies, universities, and research institutes from the raw materials sector under one roof. This will help improve the innovation potential of this branch of industry while securing the European economy's supply with critical resources. For the HZDR, this means access to a better network within the European raw materials economy as early as the application process.

The HZDR's international reputation extends to other areas as well. As such, in 2014, the HZDR entered into several collaboration agreements with a number of European big businesses, including with IBA, the World's leading manufacturer of proton beam therapy facilities. The HZDR was also able to strengthen its existing ties within the knowledge and industry site Dresden. Together with the Technical University, the HZDR has initiated ECO, a project that is being funded by the Federal Ministry for Education and Research. Here, the HZDR is developing the concept for setting up a cross-institutional transfer fond for Dresden-based research institutes.

The proportion of patents that are utilized through licensing agreements has increased to 26 percent, up from five percent back in 2009. In all, licensing revenues amounted to 114,000 Euros last year, while industry revenues were at 2.3 million Euros. In order to increase the number of industry orders and licenses, additional measures were planned for 2015. As such, a new innovation manager, who specializes in physical and materials research, will make an important addition to the HZDR transfer team.

The HZDR Innovation GmbH's revenues were at the same level as the previous year. In spite of investments in new lines of business, a profit was made in 2014. The research center's subsidiary was part of the HZDR's 2013 outsourcing of i3membrane GmbH. Last year, the company was able to procure venture capital in the amount of 600,000 Euros from several investors for final development and market rollout of its products. Initial sales are projected for fall 2015. Biconex GmbH, a company which develops innovative technologies for electroplating plastics without the use of chromium sulfuric acid, was yet another HZDR outsourcing in the spring of 2014

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In Brief: Personnel Matters

Appointments / Functions

- In July 2014, the TU Dresden appointed **Prof. Karim Fahmy** of the Institute of Resource Ecology honorary professor of *Structural Dynamics of Biomolecules*. This continues the longtime collaboration between the Head of the Department of Biophysics and the University of Excellence. Since 2007, Fahmy has been active in both research and teaching at the Dresden International Graduate School for Biomedicine and Bioengineering.
- In July 2014, **Prof. Burkhard Kämpfer** was named Helmholtz Professor. This recognition is given by the Helmholtz Association to researchers with distinguished academic careers. Scientists who have proven merit and excellence have the opportunity to continue their research after retirement. At the HZDR, Burkhard Kämpfer was head of the Hadron Physics Department at the Institute of Radiation Physics.
- In late September 2014, the TU Dresden awarded university teacher membership rights to **Prof. Jens Pietzsch** of the Institute of Radiopharmaceutical Cancer Research. At the university, Pietzsch teaches in the area of pathobiochemistry, which studies the pathological changes of chemical processes within cells, tissues, and organs, as well as different diagnostic and therapeutic approaches. At the HZDR, Pietzsch is head of the Department of Radiopharmaceutical and Chemical Biology.
- In November 2014, **Prof. Peter Kaever** was named honorary professor by the Dresden University of Applied Sciences. Kaever, who is head of the HZDR's Department of Research Technology, has been a lecturer at the University since 2011, teaching classes on Ethernet-based distribution automation systems.

Awards

- 2014 HZDR Awards (given out March 13, 2015, at the HZDR Annual Reception)
- The Helmholtz Institute Freiberg for Resource Technology (HIF) and the TU Bergakademie Freiberg have developed a process for recycling cathode ray tubes and LCD screens in an environmentally-friendly and profitable way. For their work, researchers **Prof. Michael Stelter** of Freiberg University and **Prof. Christiane Scharf** of the HIF were the recipients of the 50,000 Euro Kaiserpfalz Award in Metallurgy.
- For his valuable contributions to the field of research “health”, the Helmholtz Association has awarded chemist **Prof. Leone Spiccia** of Australia's Monash University a Helmholtz International Fellow Award. The 20,000 Euro award is meant as an incentive for Spiccia to come and conduct research at the Helmholtz Centers Dresden-Rossendorf and Berlin. HZDR scientists have been working with Spiccia since 2006.
- **Dr. Karl Zeil** of the Institute of Radiation Physics was the recipient of the 2014 Behnken-Berger-Stiftung's 15,000 Euro advancement award for his work on mechanisms of laser particle accelerators. In his doctoral work, the HZDR physicist has been working on high-power lasers that can help simplify the use of charged particles like protons in the fight against cancer.
- Together with the company Freiberger Compound Materials and the TU Bergakademie Freiberg, researchers at the Helmholtz Institute Freiberg for Resource Technology (HIF) were able to develop a process for recycling gallium arsenide from industrial wastewater, which uses only trace amounts of energy and chemicals. In recognition of the innovative nature of this method, the German Federal Ministry for Economic Affairs and Energy presented the researchers with the 2014 German Raw Materials Efficiency Award in the amount of 10,000 Euros.
- For his merits in the area of cancer research and treatment, **Prof. Michael Baumann**, Director of the HZDR Institute of Radiooncology and of the OncoRay Center, was the recipient of the 2013 Wilhelm Warner Award. To date, the eponymous foundation's award in the amount of 10,000 Euros has been awarded to some 60 researchers - among them German Nobel laureate Harald zur Hausen.
- Finland's Turku University and Abo Akademi Turku presented **Prof. Jörg Steinbach**, Director of the Institute of Radiopharmaceutical Cancer Research, with their 2014 Gadolin Award in recognition of

- Steinbach's achievements in the area of radiochemistry. The award, which is given every three years, is in remembrance of the father of modern-day Finnish chemistry research, Johan Gadolin.
- The Saxon capital's Dresden Congress Award 2014 went to HZDR researcher **Dr. Peter Michel** of the Institute of Radiation Physics for the successful organization and execution of the International Particle Accelerator Conference (IPAC). The Conference had brought close to 1,500 accelerator experts to Dresden. With the award, the city honors highly motivated scientists, entrepreneurs, and congress organizers.
- For the 15th time in a row, the Dresden Chamber of Industry and Commerce ranked the HZDR an outstanding company for trainees, which was exemplified by two former trainees, **Christoph Görgen** and **Michael Reimann**, who each scored 95 out of 100 total possible points on their skilled worker exams. Their scores helped catapult them to the top of their profession not only within the Dresden chamber district but in fact within the whole of Saxony.
- The 2013/2014 ITVA Silver Award in the category research/development went to the HZDR for its image film. The entry, entitled "Fascination Research," shows HZDR scientists and staff talking about the center's different research areas and successes. The acronym ITVA stands for Integrated TV & Video Association Germany, which is made up of companies and individuals from the film and video industry.

Obituaries

- On July 15, 2014, **Prof. Heino Nitsche** passed away unexpectedly at his home in Oakland, California. From 1993 to 1998, Nitsche headed the Institute of Radiochemistry (today's Institute of Resource Ecology) at what was then the Rossendorf Research Center (FZR). During his tenure as institute director, Nitsche triggered a number of decisions that helped shape the HZDR's high scientific quality to this day. In 1998, Nietsche accepted the professorship of Nobel laureate Glenn T. Seaborg in Berkeley.
- On August 20, **Dr. Helmar Carl**, a longtime HZDR employee, passed away aged 66. Since he started working at what was then the Central Institute for Nuclear Research in 1982, Carl conducted research on fuel elements of pressurized water reactors. His work was an important contribution to improving nuclear fuel utilization and determining the safety buffer of fuel elements. In addition to his research, Carl was committed to mentoring and promoting junior researchers and students.

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PhD Degrees

Following is a list of PhD degrees awarded by the HZDR in 2014

Institute of Fluid Dynamics

Dr. Xincheng Miao: Numerical study of a continuous casting process with electromagnetic brake (Dr. Gunter Gerbeth)

Dr. Thomas Barth: Experimentelle Untersuchungen zur Ablagerung und Remobilisierung von Aerosolpartikeln in turbulenten Strömungen (Prof. Uwe Hampel)

Dr. Klaus Timmel: Experimentelle Untersuchung zur Strömungsbeeinflussung mittels elektromagnetischer Bremsen beim kontinuierlichen Strangguss von Stahl (Dr. Sven Eckert / Prof. Rüdiger Schwarze)

Helmholtz Institute Freiberg for Resource Technology

Dr. Albertus Smith: The geometallurgical characterization of the Merensky Reef at Bafokeng Rasimone Platinum Mine (Prof. Jens Gutzmer)

Dr. Jenny Feige: Supernova-produced radionuclides in deep-sea sediments measured with AMS (Dr. Silke Merchel / Prof. Robin Golser / Dr. Anton Wallner)

Dr. Margret Fuchs: Neotectonics of the Pamir Region (Dr. Richard Gloaguen)

Dr. Sara Attarchi: Remote sensing of forest environments (Dr. Richard Gloaguen)

Dr. Mehdi Rahnama: Remote sensing tectonic geomorphology (Dr. Richard Gloaguen)

Dr. Stephanie Duwe: Recycling von Magnesium - Untersuchung thermodynamischer Grundlagen zum Verhalten von Nickel und Zirkon in Magnesium-Aluminium-Legierungen (Prof. Christiane Scharf)

Institute of Ion Beam Physics and Materials Research

Dr. Kerstin Bernert: Spin-transfer torques in MgO-based magnetic tunnel junctions (Prof. Jürgen Fassbender)

Dr. Roman Böttger: Self-organized nanostructures by heavy ion irradiation: defect kinetics and melt pool dynamics (Prof. Jürgen Fassbender)

Dr. Matthias Buhl: Spin transfer torque-induced nanomagnet switching in lateral geometry at room temperature (Prof. Jürgen Fassbender)

Dr. Steffen Cornelius: Charge transport limits and electrical dopant activation in transparent conductive (Al, Ga):ZnO and Nb:TiO2 thin films prepared by reactive magnetron sputtering (Prof. Jürgen Fassbender)

Dr. Kun Gao: Highly mismatched GaAs1-xNx and Ge1-xSnx alloys prepared by ion implantation and ultrashort annealing (Prof. Manfred Helm)

Dr. Tim Kaspar: Metall-Halbleiter-Feldeffekttransistoren mit magnetischem Halbleiterkanal auf Zinkoxidbasis (Prof. Manfred Helm)

Dr. Tim Kunze: Atomistic simulations on the nanotribology of tetrahedral amorphous carbon films (Dr. Matthias Posselt / Prof. Gotthard Seifert)

Dr. Martin Mittendorf: Carrier relaxation dynamics in graphene (Prof. Manfred Helm)

Dr. Peter Phillip: Phase transformation in tetrahedral amorphous carbon by focused ion beam irradiation (Prof. Jürgen Fassbender)

Dr. Martin Teich: Non-linear THz spectroscopy in semiconductor quantum structures (Prof. Manfred Helm)

Dr. Ulrich Wiesenhütter: Elektrische Charakterisierung von FePt-Nanopartikeln (Prof. Jürgen Fassbender)

Dr. Richard Arthur Wilhelm: Wechselwirkung langsamer hochgeladener Ionen mit Ionenkristalloberflächen und ultradünnen Kohlenstoffmembranen (Prof. Jürgen Fassbender)

Dr. Sebastian Wintz: Spin vortices in magnetic multilayers (Prof. Jürgen Fassbender)

Dresden High Magnetic Field Laboratory

Dr. Geoffrey Chanda: Magnetooptische Untersuchungen von stark korrelierten Materialien mit Hilfe der THz-Spektroskopie (Prof. Joachim Wosnitza)

Institute of Radiopharmaceutical Cancer Research

Dr. Steffen Braune: In vitro static and dynamic hemocompatibility testing of poly(ether imide) membranes functionalized with oligoglycerols (Prof. Jens Pietzsch / Prof. Jörg Steinbach)

Dr. Silke Fähnemann: Synthese und Charakterisierung von radiomarkierten Bispidin-Kupferkomplexen (Dr. Holger Stephan / Prof. Jörg Steinbach)

Dr. Manja Kubeil: Design und Synthese von mehrfunktionalen Cyclamliganden zur Entwicklung von stabilen radioaktiven Kupferkomplexen für Diagnostik und Therapie (Dr. Holger Stephan / Prof. Jörg Steinbach)

Dr. Markus Laube: Synthese von Cyclooxygenase-2-Inhibitoren als Grundlage für die funktionelle Charakterisierung der Cox-2-Expression mittels PET (Dr. Torsten Knieß / Prof. Jörg Steinbach)

Dr. Doreen Pietzsch: Entwicklung rekombinanter Rezeptorliganden für die Radionuklid-basierte Diagnostik und Therapie von Tumoren (Prof. Jens Pietzsch / Prof. Jörg Steinbach)

Dr. Marc Pretze: Entwicklung von Radiotracern für die radiopharmakologische Charakterisierung von Eph-Rezeptoren (Dr. Constantin Mamat / Prof. Jörg Steinbach)

Dr. Susann Wolf: Die Bedeutung von S100A4 und dessen Interaktion mit RAGE bei der Metastasierung des malignen Melanoms (Prof. Jens Pietzsch / Prof. Jörg Steinbach)

Dr. Claudia Arndt: Entwicklung humanisierter Antikörpermodule für die Therapie der Akuten Myeloischen Leukämie und des Prostatakarzinoms (Prof. Michael Bachmann)

Dr. Mathias Geib: Entwicklung chimerer Antigenrezeptoren zur adjuvanten Therapie des Prostatakarzinoms (Prof. Michael Bachmann)

Institute of Radiation Physics

Dr. Maik Butterling: Application of high-energy photons for positron annihilation spectroscopy and positronium chemistry (Dr. Andreas Wagner / Prof. Reinhard Krause-Rehberg)

Dr. Ralph Massarczyk: The effect of neutron excess and nuclear deformation on dipole strength functions below the neutron separation energy – nuclear resonance fluorescence experiments on 124,128,132,134Xe at ELBE and HIGS (Dr. Ronald Schwengner / Prof. Tom Cowan)

Dr. Roland Beyer: Inelastische Neutronenstreuung an 56Fe (Dr. Arnd Junghans / Prof. Tom Cowan)

Dr. Marko Röder: Measurement of the Coulomb dissociation cross sections of the neutron rich nitrogen isotopes 20,21N (PD Dr. Daniel Bemmerer / Prof. Kai Zuber)

Dr. Axel Jochmann: Development and characterization of a tunable ultrafast X-ray source via inverse Compton scattering (Prof. Sauerbrey / Prof. Schramm)

Institute of Radiooncology

Dr. Berit Kummer: Therapeutische Wirkung des Polo-like Kinase 1-Inhibitors BI 6727 in Kombination mit Bestrahlung in einem Xenograft eines humanen Plattenepithelkarzinoms am Mausmodell (Prof. Mechthild Krause)

Dr. Katharina Höhne: Untersuchung der Rolle von H2AX-Foci als prädiktiver Marker für die Strahlenempfindlichkeit von Tumoren in vivo (Prof. Mechthild Krause)

Institute of Resource Ecology

Dr. Enas Attia: Interaction of flavonoid-metal complexes with biomembrane and DNA (Prof. Karim Fahmy)

Dr. Daniela Baldova: Core design of high conversion light water reactors (Dr. Emil Fridman / Dr. Jan Frýbort)

Dr. Yuii Bilodid: Spectral history modeling in the reactor dynamics code DYN3D (Prof. Frank-Peter Weiß / Dr. Siegfried Mittag)

Dr. Alfatih Osman: Investigation of Uranium binding forms in environmental relevant waters and in bio-fluids (Prof. Gert Bernhard / Dr. Gerhard Geipel)

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HZDR Facts and Figures

Total annual budget including investments	approx. 125 million Euros
of that, external revenues	approx. 25 Millionen Euro

Number of employees	1.079
Number of PhD students	138 (as of December 2014)

Professors	
Number of joint appointments at Saxon Universities	13

Publications	
ISI cited	475
Other cited publications	48

Large-scale scientific facilities (performance category II)	
Ion Beam Center IBC	11.973 user hours
ELBE Center for High-Power Radiation Sources	3.737 user hours
Dresden High Magnetic Field Laboratory	95 measurement campaigns (proposals)

Science and technology transfer	
Applications by priority	9