

NEWS

FROM THE NEWS EDITOR

Happy New Year and best wishes for 2005! I recently succeeded Dr John Sieber as News Editor of *X-Ray Spectrometry*. My first thought on taking up the position was that in view of the wealth of information available through the internet—which is accessible at high speeds and in huge amounts from anywhere on the globe—we may have to reconsider the method of disseminating information via bimonthly journals like *X-Ray Spectrometry*. However, I would stress that the essence of the journal will not change. One of the most important requirements for the news column is that it must be *informative*. We have only a few pages every two months, but I hope that you will be able to find all the information you are seeking here. I think that selecting the contents for a journal such as this, is very much like acquiring spectroscopic data. I would appreciate it, therefore, if all contributions have an excellent signal to background ratio, reasonable resolution and are suitably smoothed by time-averaging! I expect that you probably already make good use of the internet to collect information and I hope, therefore, that this column will complement such activity. Please do not hesitate to write to me, and I also look forward to receiving your phone calls and faxes. We also welcome all contributions on the announcements of meetings and events, professional news (budgets, awards, prizes etc, but job advertisements cannot be accepted), press releases on new products and services, organizational and address changes, etc, that will be of particular interest to the international X-ray spectrometry community. Please note that submission of an article does not automatically guarantee publication. I will make it my task to select articles that fit the bill as described above.

SCIENCES

Synchrotron sub-microbeam analysis of living bacteria cells (22 October 2004)

Argonne research group recently published details of their successful application of high-spatial-resolution XRF and XAFS measurements, which they performed in order to make elemental maps and qualitative chemical analyses of single free-floating, or planktonic, and surface-adhered, or biofilm, cells of *Pseudomonas fluorescens*. The results revealed differences between the planktonic and biofilm cells in terms of morphology, elemental composition and sensitivity to hexavalent chromium, a heavy-metal contaminant and a known carcinogen. The biofilm cells were more tolerant of the contaminant, which damaged or killed the planktonic cells. The experiments were performed with a 150 nm X-ray beam produced by phase zone plate at the beamline XOR 2-ID, at the Advanced Photon Source (APS), Argonne, USA. For more information, see the paper, 'Elemental and Redox Analysis of Single Bacterial Cells by X-ray Microbeam Analysis', K. M. Kemner *et al.*, *Science*, 2004; **306**, 686–687.

X-rays revealed that Roman cosmetic used tin oxides (4 November 2004)

A whitish cream in a small canister, which was recently discovered during archaeological surveys of the remains of a Roman temple in London, has been found to contain SnO₂. Archaeologists think the SnO₂ was added intentionally, presumably for use as a cosmetic. They believe the unguent was prepared using sophisticated technology: animal fat was heated, possibly with the aim of bleaching it, and the starch was separated by treatment of roots or grains with boiling water, and then white SnO₂, which is readily produced by heating refined tin metal in air, was added. The non-toxic properties of SnO₂ would also have been desirable, because by the second century AD, the dangers of lead were becoming recognized. XRF and XRD analysis played an important role in the identification of the ancient cosmetic cream. For more information, see the paper, 'Archaeology: Formulation of a

Roman cosmetic', R. P. Evershed *et al.*, *Nature*, 2004; **432**, 35–36.

X-ray investigation to solve the mystery of how King Tutankhamen died (13 November 2004)

Zahi Hawass and his co-workers plan to conduct X-ray analysis of the mummy of King Tutankhamen who ruled Egypt about 3,300 years ago and died while still a teenager. They will move the mummy from the tomb in the Valley of the Kings in Luxor, Egypt, where it was discovered in 1922, to the Egyptian Museum in central Cairo by the end of November. Earlier X-ray tests in 1968 revealed bone fragments inside the skull, prompting speculation that the young king was murdered by a blow to the head. However, other evidence suggests death due to illness. This year's experiment is intended to put to rest this mystery by employing a much more powerful X-ray machine donated by Siemens and National Geographic. The main news source is Reuters (url: <http://www.reuters.com/>). For more information about the mummy, see for example, url: <http://www.thebritishmuseum.ac.uk/mummy/>

PROFESSIONAL

New X-ray undulator to be introduced soon at the Japanese second-generation 2.5 GeV synchrotron light source (2 November 2004)

The Photon Factory in Tsukuba, Japan commenced operation in 1982 as a typical second-generation synchrotron radiation facility. The 2.5 GeV storage ring is now being upgraded in order to maintain the competitiveness of its specifications in the field of X-ray sciences via the introduction of new *mini-gap* undulators. If such undulators are installed, it is possible to produce X-rays even at the 2.5 GeV ring (which does not have the same high energy as a third-generation source), since the spectra of undulator radiation depend on the periodic length of the magnet array, as well as the accumulation energy of the storage ring. The plan is to create new straight sections (BL-1, 3, 15, 17, 4, 18), as well as to

lengthen the existing straight sections (BL-2, 5, 13, 14, 16, 19, 28). The facility will cease operation at the end of February 2005 and restart in the fall of the same year.

Obituary — Dale E. Sayers (25 November 2004)

Dale E. Sayers, physics professor at North Carolina State University, died on 25 November 2004 at the age of 60 from complications following a heart attack while exercising at the gym. He was a world leader in X-ray absorption spectroscopy. He came to fame with the publication of the first EXAFS paper, in 1971. With it, he opened up a new field of research, which is now about to celebrate its twelfth bi-annual meeting in 2004 in Sweden. Professor Sayer's work, using synchrotron radiation, led him into a broad variety of research topics including investigations of amorphous materials, biophysical specimens, contaminated soils, nanoscale structures, and cancerous tissues. Professor Sayers was a recipient of the Bertram Eugene Warren Award (American Crystallographic Association); the Case Centennial Scholar Award (Case Western Reserve University); and the N.C. State Alumni Association Outstanding Research Award. His family would appreciate contributions to the Dale E. Sayers Scholarship Fund, PAMS Foundation NCSU, c/o Anita Stallings, College of PAMS, 116 Cox Hall Campus Box 8201, North Carolina State University, Raleigh NC 27695-8201 USA.

NEW PRODUCTS

NITON LLC introduces new advanced lead paint analyzer (October 2004)

NITON LLC has announced the introduction of the XLP 300 Series lead analyzer, which is suitable for fast, dependable on-site analysis of lead applications (lead paint, dust wipes, airborne lead, soil testing etc.) For further information, contact Michelle Drombetta, Marketing Communications Coordinator, Phone: +1-541-388-0779, Fax: +1-541-388-1003, email: mdrombetta@niton.com, url: <http://www.niton.com>

Bruker AXS Inc. launches XRF solutions designed specifically for the petrochemical industry (27 October 2004)

Bruker AXS Inc. has announced the launch of PETRO-QUANT elemental analysis solutions specifically designed for the petrochemical industry. Liquid samples are poured into a container and then analyzed by either the S4 EXPLORER or S4 PIONEER wavelength dispersive X-ray fluorescence spectrometers. For further information, contact Colleen Kenney, Sales & Marketing, Phone: +1-608-276-3043, FAX: +1-608-276-3006, email: colleen.kenney@bruker-axs.com, url: <http://www.bruker-axs.com>

Oxford Instruments Analytical launches new coating thickness analyzer (10 November 2004)

Oxford Instruments has announced the introduction of the X-Strata960, a new XRF analyzer for coating thickness and composition analysis, specifically designed to deliver clear performance advantages for the general metal finishing, electronics and precious metals industries. For further information, contact Analytical Head Office, Oxford Instruments Analytical, Halifax Road, High Wycombe, Bucks, UK, HP12 3 SE, Phone: +44-1494-442255, Fax: +44-1494-524129,

email: analytical@oxinst.co.uk, url: <http://www.oxford-instruments.com/>

CORPORATE

Bede forms alliance with Scientech in Taiwan and China (16 November 2004)

Bede plc has announced a new alliance with Scientech, which is a supplier of equipment, instrument, material, and outsourcing services to the semiconductor, flat panel display, data storage, scientific instruments and related industries. Scientech will be the sole distributor for Bede's x-ray metrology tools in Taiwan and China. For further information, contact Scientech, 11F, No. 208, Rui-Kuang Rd., Taipei, Taiwan R.O.C., Phone: +886 2 8751-2323, Fax: +886 2 8751-2020, email: info@scientech.com.tw, url: <http://www.scientech.com.tw/>

FUTURE X-RAY DEVICES

Advances in soft and hard x-ray sources are one of the most stimulating topics for the internal x-ray spectrometry community, even though the subject area is far from mature. Below, we list several interesting reports published during the period from September to November 2004.

'A high-intensity highly coherent soft X-ray femtosecond laser seeded by a high harmonic beam', Ph. Zeitoun *et al.*, *Nature*, 2004; **431**, 426.

'Monoenergetic beams of relativistic electrons from intense laser-plasma interactions', S.P.D. Mangles *et al.*, *Nature*, 2004; **431**, 535.

'A laser-plasma accelerator producing monoenergetic electron beams', J. Faure *et al.*, *Nature*, 2004; **431**, 541.

'X-ray Generation in Strongly Nonlinear Plasma Waves', S. Kiselev *et al.*, *Phys. Rev. Lett.* 2004; **93**, 135004.

'Production of a keV X-Ray Beam from Synchrotron Radiation in Relativistic Laser-Plasma Interaction', A. Rousse *et al.*, *Phys. Rev. Lett.* 2004; **93**, 135005.

'Kinetics of ultrashort relativistic electron pulses emitted from solid targets', E.E. Fill. *Phys. Rev.* 2004; **E 70**, 036409.

'Two-beam free-electron laser', B.W.J. McNeil *et al.*, *Phys. Rev.* 2004; **E70**, 035501.

'Model for the dynamics of a water cluster in an x-ray free electron laser beam', M. Bergh *et al.*, *Phys. Rev.* 2004; **E70**, 051904.

'Electron-beam conditioning by Thomson scattering', C. B. Schroeder *et al.*, *Phys. Rev. Lett.* 2004; **93**, 194801.

'Driver-pulse configuration of the nickel-like Ta x-ray laser at 4.48 nm', J.Y. Zhong *et al.*, *Phys. Rev.* 2004; **A 70**, 053803.

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NEWS

SCIENCES

Novel X-ray imaging technique allows nanoscale world to be seen in real space (16 December 2004)

Scientists at German and American synchrotron facilities have recently reported the significance of lensless imaging in achieving extremely high-spatial resolution. Although lenses are generally good at obtaining a magnified image of a sample, they also unfortunately introduce aberrations in the image, which ultimately limit the spatial resolution obtainable. In principle, one can form an image without a lens, by means of a coherent scattering experiment. The challenge is to solve the so-called phase problem. The team recently developed a new approach to X-ray holography, realizing a Fourier transform holography geometry by use of a micro- and nanostructured mask. Special contrast mechanisms can be exploited by resonant soft x-ray scattering and, in the experiment at BESSY, they recorded an image revealing the randomly organized 'north' and 'south' magnetic regions of a cobalt-platinum film to a spatial resolution of 50 nm, which is 10 times better than that achievable with conventional X-ray focusing optics. In the future, the technique will be used as a method for ultra-fast stroboscopic imaging on a femtosecond time scale using a X-ray free electron laser such as the Linac Coherent Light Source (LCLS), which is expected to open at Stanford in 2009. For more information, see the paper, 'Lensless imaging of magnetic nanostructures by X-ray spectro-holography', S. Eisebitt *et al.*, *Nature*, 2004; 432: 885–888.

Remote-controlled X-ray spectrometer on surface of Mars (3 December 2004)

One of the most exciting recent scientific discoveries is that Mars was possibly once wet and salty, suggesting an environment that could serve as a candidate for early life. The two Mars Rovers, Spirit and Opportunity, have been collecting large amounts of data on the soil, rock and atmosphere by utilizing state-of-the-art analytical instruments including an X-ray spectrometer, which recently determined the major and minor elements of soil and rock samples taken from Meridiani Planum. For more information, see the paper, 'Chemistry of rocks and soils at Meridiani Planum from the Alpha Particle X-ray Spectrometer', R. Rieder *et al.*, *Science*, 2004; 306: 1746–1749.

Imaging atomic motions in materials (3 December 2004)

The ultra-fast X-ray diffraction technique has now become widely used. Many experiments using this technique are, in principle, a so-called pump-probe measurement, using a Ti:sapphire laser system (wavelength 800 nm, 1-kHz repetition rate with 5-mJ pulse energy and 45-fs duration) and, for example, a moving, 20-mm-thick Cu band to generate characteristic X-ray pulses. Recently, a German group reported the successful imaging of coherent atomic motions in a GaAs/AlGaAs superlattice. The motions are of great interest and are due to the excitation of electron-hole pairs in the GaAs subband. Both expansion of the GaAs layers and contrast of the AlGaAs layers were observed, mainly because bonding in the GaAs layers was affected by the excitation. For more information, see the paper, 'Coherent Atomic Motions in a Nanostructure Studied by Femtosecond X-ray Diffraction' M. Bargheer *et al.*, *Science*, 306: 1771–1773.

Ultra short pulses in XUV region (2 December 2004)

So far, it has been difficult to observe non-linear responses to an optical field in the extreme ultraviolet (XUV) and soft X-ray regions. A research group from the University of Tokyo recently succeeded in generating intense isolated XUV pulses (photon energy 27.9 eV) that were shorter than 1 femtosecond through high-harmonic (9th) generation by using a sub-10-femtosecond blue laser (photon energy 3.1 eV) producing a large dipole moment. For more information, see the paper, 'Nonlinear optics in the extreme ultraviolet', T. Sekikawa *et al.*, *Nature*, 432: 605–608.

PROFESSIONAL

Japanese and U.S. scientists named as recipients of the 2005 Japan Prize (13 January 2005)

The Science and Technology Foundation of Japan announced the names of the three laureates for the 2005 (21st) Japan Prize. They are Dr Makoto Nagao (President, National Institute of Information and Communications Technology) for his 'Pioneering Contributions to Natural Language Processing and Intelligent Image Processing' in the prize category of 'Information and Media Technology', and Dr Masatoshi Takeichi (Director, RIKEN Center for Developmental Biology) and Dr Erkki Ruoslahti (Distinguished Professor of The Burnham Institute, also Scientific Advisory Board Chairman of The Nanotech Company, LLC) for their 'Fundamental Contribution in Elucidating the Molecular Mechanisms of Cell Adhesion' in the prize category of 'Cell Biology'. The three scientists will receive certificates of merit, and commemorative medals. There is also a cash award of 50 million yen for each prize category. The presentation ceremony is scheduled to be held in Tokyo at the National Theatre on Wednesday 20 April 2005, in the presence of the emperor and empress. The prize categories for 2006 (22nd) Japan Prize will be 'Global Change' and 'The Development of Novel Therapeutic Concepts and Technologies'. For further details of the Japan Prize, contact M. Ueda, The Science and Technology Foundation of Japan, Phone: +81-3-3432-5951, Fax: +81-3-3432-5954, email: info@japanprize.jp, url: <http://www.japanprize.jp/English.htm>

Miniworkshop on future X-ray detector technology (24 November 2004)

A miniworkshop on Pixel Array Detector: Status and Applications was held at the National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan. The contributors were M.O.Lampert (Canberra-EURYSIS), H.Oyanagi (AIST), G.Foran (ASRP), S.Muto (NIFS), T.Satoh (JAERI), H.Takahashi (Univ. of Tokyo), and M.Okubo (AIST). The requirements and solutions for pixel array detectors with high energy-resolution were discussed with particular emphasis on applications in X-ray spectrometry and plasma physics. The abstract booklet is available from Professor Hiroyuki Oyanagi, AIST, Phone: +81-29-8 615 072, Fax: +81-29-8 615 085, email: h.oyanagi@aist.go.jp

Obituary — Martin J. Berger (6 November 2004)

Martin J. Berger, former Chief of the Radiation Theory Section and Director of the Photon and Charged-Particle Data Center at NBS, died on 6 November 2004 at the age of 82, from the effects of a hematoma following a fall in which he struck his head. Dr Berger was born in 1922 in Vienna, Austria. He earned a BS degree with a major in physics in 1943, received an MS and PhD, in physics in 1951, all at the University of Chicago. He started working at the National Bureau of Standards (NBS) in Washington in 1952. His main area of interest was mathematical physics in relation to the penetration, diffusion and slowing of high-energy radiations through matter, and he rose to fame because of his theoretical works and Monte Carlo codes in the fields of electron and proton transport. He published more than 149 scientific papers, including the seminal 1963 monograph, *Monte Carlo Calculation of the Penetration and Diffusion of Fast Charged Particles*. During his career at NBS, Berger received several awards for distinguished service, including the Silver and Gold Medals of the US Department of Commerce and the 1990 Radiation Science and Technology Award from the American Nuclear Society. In August of 2003, he was awarded the L. H. Gray Medal by the International Commission on Radiation Units and Measurements, becoming only the eleventh recipient of this prestigious award. In October of that same year, Mr Berger was added to the NIST Gallery of Distinguished Scientists, Engineers and Administrators. The Washington Post (28 November 2004) carries an obituary written by Joe Holley.

Obituary—Howard F. McMurdie (26 September 2004)

Howard F. McMurdie, a chemist and well-known member of NBS, died of pneumonia on 26 September 2004 aged 99. Dr McMurdie was born in Detroit, MI, in 1905 and graduated with a BSc in chemistry from Northwestern University in Evanston, IL. He started work at NBS in April 1928. He became very famous as an editor of the series *Phase Diagrams for Ceramists* published by the American Ceramic Society. Dr McMurdie was chief of the Crystallographic Section (formerly the Constitution and Microstructure Section) from 1944 until his official retirement at the end of 1965. Under his leadership, a project began that used X-ray diffraction on single crystals to determine their atomic structure. This led to a relationship with the International Centre for Diffraction Data (ICDD), which publishes the *Powder Diffraction File*, a compilation of diffraction patterns used for identification of crystalline solids. He was awarded the US Department of Commerce Silver Medal in 1957 for valuable contributions to the science of crystal chemistry and very valuable leadership in the development of a comprehensive program of work in this field. In 1999, he received the highest award in the field of X-ray diffraction analysis, the *Charles S. Barrett Award* of the Denver X-Ray Conference. In 2003, on the occasion of his second retirement, he received a *Certificate of Appreciation* from the NIST Materials Science and Engineering Laboratory. He was a Fellow of the American Ceramic Society and the Mineralogical Society of America and a member of the American Crystallographic Association and the Electron Microscope Society of America.

NEW PRODUCTS

Thermo Electron announces latest metrology tool for metal film thickness and composition measurement (1 January 2005)

Thermo Electron Corporation has announced the release of its latest X-ray fluorescence instrument for semiconductor metrology, the MicroXR™ microbeam XRF platform, which is designed for on-line and near-line measurements on semiconductor wafers, optical devices, high-density chip-scale packaging and substrate applications. The instrument uses a combination of microbeam X-ray collimation technology and energy-dispersive XRF (EDXRF) spectroscopy, as well as a 50 W X-ray tube. The end-result is a non-destructive metrology technique that measures the thickness and composition of up to five layers of deposited metals simultaneously. Metal film thickness ranges from micron to angstrom levels. The MicroXR series is available in benchtop, console, and automated wafer handling configurations. The console and wafer handler models incorporate an embedded vibration isolation system and are compatible with most wafer sizes (150, 200 and 300 mm). The platform can be configured with different types of optical collimators and X-ray detectors. For more information, Phone: +1 800-532-4752, email: analyze@thermo.com, url: <http://www.thermo.com/microanalysis>

PANalytical announces new version 3.0 software for MiniPal and MiniMate series of spectrometers (23 December 2004)

With its recently released version 3.0, PANalytical has significantly improved the software for its range of MiniPal and MiniMate EDXRF benchtop spectrometers. The new software includes recalibration, spectra comparison, and extended database formatting possibilities, as well as a variety of other

enhancements and modifications. Applications can now be copied to other systems of the same type with minimum effort. Another advantage with this extended recalibration is that one set of calibration data can be copied from a research lab to a quality control or process control machine. It is possible to compare spectra of samples from the same application or from different applications. Up to 64 spectra can be displayed at the same time. Spectra can also be scaled and shown in 3D. For further information, contact PANalytical B.V., P.O. Box 13, 7600 AA, Almelo, The Netherlands. Phone: +31-546-534 444, Fax: +31-546-534 598, email: info@panalytical.com, url: <http://www.panalytical.com/>

Institute for Scientific Instruments introduces an X-ray source with capillary optics that can be used for X-ray excitation in a SEM/EDAX (December 2004)

The X-ray fluorescence module developed by the Institute for Scientific Instruments GmbH (IfG)—iMOXS consists of a low-powered X-ray tube, focusing polycapillary optics and an adjustment unit. In the scanning electron microscope (SEM), a focused electron beam scans the surface of a sample and generates its image. Although the advantage of this electron probe microanalysis is its high spatial resolution, the detection limit ranges from 1 ~ 0.01% due to electron-induced bremsstrahlung background. A photon excitation option in SEM reduces the background significantly. The polycapillary can concentrate the X-ray beam down to a spot size of 30 µm for Mo-K radiation. For more information, contact IfG, Rudower Chaussee 29, D-12 489 Berlin, Germany. Phone: +49-30-6392.6500, email: info@ifg-adlershof.de, url: <http://www.ifg-adlershof.de>

CORPORATE

SPECTRO Analytical Instruments opens new US sales & support office (18 October 2004)

SPECTRO Analytical Instruments, Inc. has relocated its US headquarters from Fitchburg, MA where it has been operating for the past 23 years, to a new facility in Marlborough, MA near the intersection of route 495 and the Mass Turnpike, just west of Boston. The new address is SPECTRO Analytical Instruments Inc., 450 Donald Lynch Blvd. Marlborough, MA 01 752, USA For further information, contact Marie-Chantal Stucki. Phone: +49-2821-8 922 102, Fax: +49-2821-8 922 202, email: info@spectro.com

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NEWS

SCIENCES

X-ray reveals mystery of Antarctic oil painting (28 March 2005)

X-ray analysis has been applied to a 230-year-old picture painted by William Hodges, the artist who accompanied Captain James Cook on his second voyage to the Pacific (1772-75). Recently it was noticed that the canvas was thicker in some areas than others. The x-ray revealed two icebergs behind the lush greens of New Zealand, proving that it is the oldest painting of Antarctica. The discovery ignited many discussions about why Hodges erased it after surviving the extremely hard voyage around the frozen continent. The main news source is an article by Matt Apuzzo, Associated Press (<http://hosted.ap.org/dynamic/fronts/HOME/>). For more information about the William Hodges's painting, see for example, <http://www.nmm.ac.uk/upload/package/30/home.php>.

Micro X-ray fluorescence imaging to see invisible fingerprints (21 March 2005)

Los Alamos National Laboratory scientists, C. Worley, S. S. Wiltshire, T. C. Miller, G. J. Havrilla and V. Majidi, have developed a novel method for detecting fingerprints on surfaces that typically make them invisible. The technique uses micro-X-ray fluorescence (MXRF), and therefore can determine the elements in a fingerprint and get a pattern at the same time. The salts, such as sodium chloride and potassium chloride, excreted in sweat are sometimes present in detectable quantities in human fingerprints. As the new method might also be able to tell if the person that left fingerprints handled something like bomb-making materials or not, it has the potential to be used as a forensic investigation tool. For more information, contact Todd Hanson, Phone +1-505-65-2085, tahanson@lanl.gov, <http://www.lanl.gov/>.

X-ray fluorescence analysis clarified zinc deficiency linked to increased risk of cancer (16 February 2005)

Researchers at the National Cancer Institute (NCI), part of the National Institutes of Health, have found that zinc deficiency in humans is associated with an increased risk of developing esophageal squamous cell carcinoma, an often-fatal form of esophageal cancer that has about 7,000 cases a year. The research basically measures zinc concentration contained in the tissue by X-ray fluorescence analysis with synchrotron radiation at Advanced Photon Source, Argonne, USA. For more details, see the paper, 'Zinc concentration in esophageal biopsy specimens measured by X-ray fluorescence and esophageal cancer risk', C.C. Abnet, B. Lai, Y.-L. Qiao, S. Vogt, X.-M. Luo, P.R. Taylor, Z.-W. Dong, S.D. Mark, S.M. Dawsey, *J. Nat. Cancer I*; **97**: 301 (2005). Information about cancer is available at <http://www.cancer.gov> or NCI's Cancer Information Service at +1-800-422-6237.

Laser produces coherent 1 keV X-ray pulses (10 February 2005)

An Austrian research group recently succeeded in obtaining highly collimated, spatially coherent X-rays, at a wavelength of about 1 nm and at photon energies extending to 1.3 keV, from high-order harmonic generation in an atomic gas ionized by a 720-nm, 5-fs, 0.2-TW laser pulse. The beam divergence was evaluated as 0.2 mrad for the spectral range above 200 eV from a knife-edge scan, indicating perfect coherence of the atomic dipoles within a macroscopic volume of diameter of 13f \hat{E} m and 4f \hat{E} m at photon energies of 0.3 keV and 1 keV, respectively. The beam seems to be diffraction-limited to within a factor of five. The spectrum of the generated radiation has been observed by an energy-dispersive X-ray spectrometer with some filters. They detected the copper L-edges (~950 eV). The progress comes with the temporal intensity gradient in the driving pulse, which allows some 25% of the helium atoms to be ionized within half a cycle before the pulse peak. The electrons detached within this time are pushed in the most intense half-cycle back to the atomic core. For more information, see the paper, 'Source of coherent kiloelectronvolt X-rays', J. Seres *et al.*, *Nature*; **433**: 596 (2005). C. Streltsov and P. Wobrauschek (Atominstut der Osterreichischen Universitaten, Technische Universitat Wien) joined as co-authors of this paper.

PROFESSIONAL

7th Ewald Prize — P. Coppens (9 February 2005)

The international union of crystallography (IUCr) announced that Professor P. Coppens (Department of Chemistry, State University of New York at Buffalo, USA) has been awarded the seventh Ewald Prize for his contributions to developing the fields of electron density determination and the crystallography of molecular excited states, and for his contributions to the education and inspiration of young crystallographers as an enthusiastic teacher by participating in and organizing many courses and workshops. The Prize consists of a medal, a certificate, and an award of USD \$30,000. The former recipients are Michael M. Woolfson (UK, 2002), G.N. Ramachandran (1999), M. G. Rossmann (USA, 1996), N. Kato (Japan, 1993), B.K. Vainshtein (Russia, 1990), J.M. Cowley (USA) and A.F. Moodie (Australia) in 1987.

New web site on synchrotron sources launched (17 February 2005)

[lightsources.org](http://www.lightsources.org) is a new web site, created through a collaboration of communicators from worldwide synchrotron radiation facilities. One can find the current light-source news from the world's press, photos and graphics from individual facilities, and all important facility-related news for users. Visit <http://www.lightsources.org/>.

Nine European countries participate in the XFEL (24 January 2005)

With France, Germany, Greece, Italy, Poland, Spain, Sweden, Switzerland, and the United Kingdom, nine countries have signed a Memorandum of Understanding in which they agree to jointly prepare the foundation of the European X-ray free electron laser (XFEL) facility. The XFEL opens up completely new possibilities for the vast field of structural research, by generating extremely brilliant, ultra-short X-ray pulses with laser-like properties. More information on this European project is available at http://xfel.desy.de/content/e169/index_eng.html.

NEW PRODUCTS

Kodak develops faster X-ray film (8 March 2005)

Eastman Kodak Co. announced a new general-purpose medical imaging film, Hyper Speed G Medical Film, which can cut the radiation dose by up to 50 percent without sacrificing image quality. This film will be manufactured in standard sizes and will be available in Europe, Latin American and Asia in May. For more information, Phone: +1-800-242-2424, <http://www.kodak.com/go/health>.

INNOV-X launches compact XRF handheld analyzers (1 March 2005)

Innov-X Systems, Inc. announces the introduction of the new handheld analyzers, 'Alpha Series', which provide on the spot, elemental analysis from phosphorus to uranium. They are designed as 'point and shoot' analyzers that produce results at a production line, field site, power plant, scrap yard etc. For more information, contact Steven M. Pomerantz, VP-Sales and Marketing, Innov-X Systems, Inc. 10 Gill Street, Ste. Q Woburn, MA 01801, Phone +1-781-938-5005, spomerantz@innov-x.com, <http://www.innov-x.com>.

Austin AI releases world's first push probe for the in-situ determination of heavy and hazardous elements in soil (27 February 2005)

Austin AI's newly released cone penetrometer for elemental analysis of soil (CP-1000), after rigorous lab and field testing has been accepted by the Japanese civil engineering firm, Nikken Sekkei. The CP-1000, based on energy dispersive X-ray fluorescence (EDXRF) technology is capable of determining hazardous metals such as As, Cd, Pb, Hg, Se, and Ag down to the concentrations of 100 ppm and lower. The system is designed to operate in continuous push or stop and measure mode. For details, contact Dianne Hillhouse, MarCom Manager, Phone: +1-512-837-9400, dhillhouse@austinai.com, <http://www.austinai.com/>.

NORAN System SIX Extends X-ray Microanalysis Tools (22 February 2005)

Two new software tools, *Xphase* and *Spectral Match*, for the NORAN System SIX X-ray Microanalysis system have been announced. They provide a method of identifying and visualizing the phase distribution within a sample and unique matching capabilities for spectral analysis, respectively. For more information, call +1-800-532-4752.

CORPORATE

Thermo Electron purchases NITON LLC (29 March 2005)

Thermo Electron announced that it has purchased NITON LLC, a leading provider of portable X-ray analyzers for non-destructive testing of a range of metals for petrochemical, environmental and other variety of industries. NITON is headquartered in Billerica, Massachusetts, and will become part of the Scientific Instruments product line of Thermo's Life and Laboratory Sciences segment. For more information, contact Lori Gorski, Phone: +1 781-622-1242, lori.gorski@thermo.com, <http://www.thermo.com/>.

Rigaku/MSC, Inc. purchases RoboDesign International (3 March 2005)

Rigaku/MSC, Inc. announced the purchase of all outstanding shares of RoboDesign International Incorporated, well known for its automation instruments and robotics for pharmaceutical and biotechnology industries. The main strategy seems to be the integration of Rigaku/MSC's X-ray diffraction technologies and RoboDesign's fully automated solutions for high throughput protein crystal growth and screening for life science markets. For further information, contact: Keith Crane, President & COO RoboDesign International 5920 Pasteur Court, Carlsbad, CA 92008, Phone: +1-760 438-5282, info@robodesign.com, <http://www.robodesign.com/>.

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NEWS

SCIENCES

X-ray spectroscopy can observe movement of atoms at 100 times improved resolution (5 May 2005)

A joint research group from the Universities of Sheffield and Warwick (both in the United Kingdom) and the European Synchrotron Radiation Facility (ESRF) in Grenoble, France, have recently reported an interesting application of a dispersive XAFS (x-ray absorption fine structure) spectrometer, which has no moving parts and is thus inherently more stable than a conventional step-scanning instrument, thereby permitting comparative measurements to be taken rapidly. The measurements were performed on a FeCo alloy thin film located between the poles of a magnet, which induces a saturating field in the sample. The magnets were rotated via a stepping motor such that the induced magnetization, causing the strain, lies either along, or perpendicular to, the x-ray polarization vector. Transmitted x-ray intensity measurements were made repeatedly at every 90-degree angle between the magnetization vector and the polarization vector. An entire four-quadrant measurement took about 1 s, with repeated measurements accumulated over a 2 h period. The differential absorption spectra obtained in this way can give atomic displacements due to magnetostriction. The research group demonstrated that it is possible to observe the movement of atoms with a resolution of 0.01 Å, i.e. an improvement of 100 times on the previous level. For further details, see the paper, 'Measurement of femtometre-scale atomic displacements by x-ray absorption spectroscopy', R. F. Pettifer *et al.*, *Nature*, 2005; **435**: 78–81.

Sub-picosecond x-ray pulse reveals atomic-scale dynamics (15 April 2005)

Projects involving international collaboration are currently under way at the Stanford Linear Accelerator Center, in the U.S., using very bright pulses of x-ray light one thousand times shorter than those typically produced in conventional synchrotron rings. One of the topics studied very recently concerns melting—how solids transform into liquids on ultra fast time scales. In the experiment, laser light was used to melt a crystal of InSb, and then ultra-short x-ray pulses were sent to probe the material. The scattered x-rays provided a glimpse of the first step in the transition from solid to liquid. It was found that the transition state is governed by inertial dynamics, simply stated by Newton's First Law as: an object in motion continues in motion. For more information, see the paper, 'Atomic-scale visualization of inertial dynamics', A. M. Lindenberg *et al.*, *Science*, 2005; **308**: 392–395.

X-ray fluorescence analysis suggests the possible death by poison of Agnès Sorel, the first royal mistress of France (2 April 2005)

At beamline ID18, ESRF, scientists studied pieces of hair and skin of Agnès Sorel, the beautiful mistress of 15th century French king, Charles VII. Very recently, using x-ray fluorescence spectra, they found that Sorel's remains contained abnormal levels of mercury. The manner of her death was previously unknown, but incredibly high levels of mercury have been found in her remains. This finding will give fresh impetus to the search to reveal the truth behind

this historical event. The source of this news is the web page of ESRF, <http://www.esrf.fr/NewsAndEvents/PressReleases/sorel/>

Creep damage analysis by synchrotron x-rays (1 April 2005)

A team of scientists from the Technical University in Vienna, the Technical University in Berlin and the ESRF have combined tomography and diffraction using 80 keV x-rays to observe creep void evolution and the correlation to texture and microstructure development, which are important parameters for understanding the lifetime of components subjected to high temperature loading. The studies were carried out for a brass alloy, CuZn₄₀Pb₂, which contains three phases: -brass, s-brass, and Pb. They developed a specifically designed creep device in order to avoid artifacts during the tomography, and therefore the path of the incoming and the emerging x-rays over a complete 360 degree turn of the sample is identical. A tensile load of 25 MPa was applied by using a spring in order to avoid vibrations, and the sample was heated to 375 °C by an induction-heated loop around the bottom of the sample. The results reveal that void growth versus time follows an exponential growth law and that the formation of large void volumes coincides with texture evolution and a steady state in the development of dislocation density. The *in-situ* determination of void evolution in bulk samples opens up new ways for the assessment of creep damage to the strength of materials and subsequently towards lifetime predictions of samples and components subject to high temperature loading. For more information, see the paper, 'Simultaneous tomography and diffraction analysis of creep damage', A. Pyzalla *et al.*, *Science*, 2005; **308**: 92–95.

New wiring technology makes possible super-conducting detector arrays (24 March 2005)

Super conducting devices are promising as high energy-resolution detectors for soft x-ray and/or mass spectrometry. As the device size is quite small, e.g. several hundred microns squared, arraying has been one of the most important technical targets for enhancing detection efficiency. So far, it has been difficult to increase the number of arrays, because of the incoming heat problem when connecting wires from devices operated at 0.3 K to electronic circuits at normal temperature. Dr M. Ohkubo and his colleagues at the National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan, recently succeeded in developing a novel technology using thin co-axis wires of 0.33 mm in diameter. They also attached great importance to material selection. As a result, it has become possible to connect more than 100 arrays, yet the incoming heat is extremely small at 5.4 × 10.6 W. The increase in temperature has effectively been suppressed to 15 mK. For more information, contact Dr M. Ohkubo, Phone +81-29-861-5685, Fax +81-29-861-5730, email, m.ohkubo@aist.go.jp, url, <http://unit.aist.go.jp/riif/srg/index.htm>.

Synchrotron microbeam detects trace of tin in rat sperm (24 March 2005)

A Japanese group is using a brilliant synchrotron microbeam at the SPring-8, Harima, Japan to study the marine pollution problem caused by organic tin compounds, which are

known as environmental hormones because of their harmful influence on the endocrine system. The scientists attempted to determine Sn distribution in the testes of rats exposed to tributyltin chloride, which was orally administered to rats at a dose of 45×10^{-6} mol/kg per day for three days. They employed a 37.5 keV x-ray beam of 3×3 micron² to detect Sn K x-ray fluorescence from the sperm of a seminiferous tubule, the key point being that measurement can be performed for single cells, thus enabling cell-selective analysis. For more information, see the paper, 'Tin accumulation in spermatozoa of rats exposed to tributyltin chloride by synchrotron radiation x-ray fluorescence (SR-XRF) analysis with microprobe', S. Homma-Takeda *et al.*, *Nucl. Instrum. & Methods*, 2005; B231: 333–337.

PROFESSIONAL

7th Compton Award — G. Schmahl & J. Kirz (1 March 2005)

The Advanced Photon Source (APS) and APS Users Organization (APSUO) announced that the 2005 Arthur H. Compton Award was presented to Gunter Schmahl and Janos Kirz for pioneering and developing the field of x-ray microscopy using Fresnel zone plates. Because of their leadership over the last 30 years, x-ray microscopy has evolved into a powerful method for the study of nanoscale structures and phenomena in many areas of science. Former recipients of the award are: Martin Blume, Doon Gibbs, Namikawa Kazumichi, Denis McWhan (2003); Wayne A. Hendrickson (2001); Sunil K. Sinha (2000); Donald H. Bilderback, Andreas K. Freund, Gordon S. Knapp, Dennis M. Mills (1998); Philip M. Platzman, Peter M. Eisenberger (1997); Nikolai Vinokurov, Klaus Halbach (1995).

NEW PRODUCTS

UNC scientists develop promising new x-ray device using carbon nanotubes (12 May 2005)

Dr Otto Zhou and his colleagues at the University of North Carolina (UNC) and a UNC start-up company, Xintek, Inc., have invented a field emission x-ray source based on carbon nanotubes that can generate a scanning x-ray beam to image an object from multiple projection angles without mechanical motion. The key concept is a gated carbon nanotube field emission cathode with an array of electron-emitting pixels that are individually addressable via a metal-oxide-semiconductor field effect transistor-based electronic circuit. The device can potentially lead to a fast data acquisition rate for tomography and other related radiography with greatly simplified instrumentation. The research group has already obtained U.S. patents. For more information, see the paper, 'Stationary scanning x-ray source based on carbon nanotube field emitters', J. Zhang *et al.*, *Appl. Phys. Lett.* 2005, **86**: 184 104, or contact Dr Zhou, Phone +1-919-962-3297, email, Zhou@physics.unc.edu.

GE Inspection Technologies sells new compact industrial x-ray film processor (24 April 2005)

The new NOVA x-ray film processor is the latest addition to GE Inspection Technologies Agfa range of field-proven processors. It has been designed for non-destructive

testing applications in industrial environments, such as pipeline inspections to be carried out by split teams. The NOVA, measuring 0.4 m² (1.3 ft²) and weighing 80 kg (176 lb), has a standard processing capacity of up to thirty 35 × 43 cm (13.8 × 16.9 inches) films per hour, while developer immersion times range from 12–150 seconds. For more information, Phone +49-22336010, Fax +49-2233601402, email, GEInspectionTechnologies@ae.ge.com, and url, <http://www.geinspectiontechnologies.com/products/XRay/FilmEquipment/Equipment/nova.html>.

CORPORATE

PANalytical opens new regional application laboratory in Shanghai, China (27 April 2005)

PANalytical has announced the opening of a new regional application laboratory, in Shanghai, China. One purpose of the lab is to ensure an assessment of the analytical requirements for individual samples so that users can test the technology before buying. Another task is developing analytical methods and solutions based on requirements from the customer side. The company decided to open the new laboratory because of the rapid and significant growth in demand for analytical applications in the Asia Pacific region, in particular in China. For further information, Phone +31-546-534444, Fax +31-546-534598, email, info@panalytical.com

SourceOne Healthcare Technologies, Inc., and Shimadzu Medical Systems form alliance in the U.S. medical market (13 April 2005)

SourceOne Healthcare Technologies, Inc., and Shimadzu Medical Systems, a division of Shimadzu Precision Instruments, Inc. (Shimadzu Corp. SHMZF), announced that they have signed a contract giving SourceOne nationwide rights in the U.S. to market and distribute a medical-imaging system specifically manufactured by Shimadzu for SourceOne. Shimadzu will produce the x-ray clinical diagnostic unit for SourceOne, which will distribute the system nationally as the Mobile Star II, a cordless mobile x-ray product equipped with a high frequency inverter x-ray generator and designed to perform radiography examinations in remote locations. For more about SourceOne Healthcare Technologies and Shimadzu, see <http://www.sourceonehealth.com> and <http://www.shimadzu.com> respectively.

SpectroscopyNow.com

For additional news about x-ray analysis and other spectroscopy sciences, browse the Wiley website. <http://www.SpectroscopyNow.com>.

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NEWS

SCIENCES

X-ray fluorescence spectrometer analyzes minerals and soils on Mars (7 July 2005)

X-ray analysis is a strong tool for speculating on the chemical and physical weathering processes on Mars. The elemental compositions of the bright dust, dark soil and other soil components collected at different sites on Mars, such as the Gusev crater and Meridiani Planum, have been determined by X-ray fluorescence spectrometers fitted to the Mars Explorer Rovers. A comparison between the results obtained at both sites generally shows that the bright dust is global in nature and not dominated by the composition of local rocks, and also that the dark soil has the same origin, while other soil components are fairly different. For more information, see the paper, 'An integrated view of the chemistry and mineralogy of martian soils', A. S. Yen *et al.*, *Nature*, 2005; **436**: 49–54.

High resolution soft X-ray microscope capable of viewing 15 nm objects now available at Berkeley (30 June 2005)

For many years, great efforts have been made around the world to develop soft and hard X-ray microscopes. Very recently, scientists at Lawrence Berkeley Laboratory, California, USA, have succeeded in fabricating an extremely high-performance objective lens, i.e., a micro zone plate, which projects a full-field image of the sample. The spatial resolution is 15 nm or even smaller for synchrotron soft X-rays (150 ~ 1800 eV). The key point is the improvement in electron beam lithography, since the spread due to electron scattering has previously been a big problem when patterning. The Berkeley team separately drew two different zone-plate patterns and then overlaid them very accurately. For more information, see the paper, 'Soft X-ray microscopy at a spatial resolution better than 15 nm', W. Chao *et al.*, *Nature*, 2005; **435**: 1210–1213.

A table-top EUV microscope for nano sciences and technologies (30 May 2005)

A joint research group from Russia, the Ukraine and the USA has developed a table-top microscope, consisting of a pulsed extreme ultraviolet (EUV) capillary discharge laser emitting at 46.9 nm, a Schwarzschild condenser, a zone plate objective, and a CCD camera. To reduce image-degrading effects such as speckle and interference, the team shortened the laser's capillary tube length from 36 to 18 cm to give a low-coherence beam with a pulse energy of around 0.1 mJ. The spatial resolution is currently 100 nm. Typical exposure time is 20 ~ 70 seconds. For more information, see the paper, 'Reflection mode imaging with nanoscale resolution using a compact extreme ultraviolet laser', F. Brizuela *et al.*, *Optics Express*, 2005; **435**: 1210–1213; <http://www.opticsexpress.org/abstract.cfm?URI=OPEX-13-11-3983>.

Synchrotron X-ray fluorescence unveils Archimedes' hidden manuscript (18 May 2005)

Recently, a very old copy of Archimedes' writings, which had been erased, written over and even painted over during the past 1,000 years, has been analyzed by X-ray fluorescence with a sub-micron X-ray beam at Stanford Synchrotron Radiation Laboratory, California, United States. The palimpsest, which is preserved at Walters Art Museum in Baltimore, is a goatskin parchment on which a 10th-century scribe copied some of Archimedes' manuscripts originally written around 220 B. C. Later, the ink was erased by being scraped off with a pumice stone. Further damage was done when forgers painted Byzantine religious images on four pages. Archaeologists have successfully analyzed much of the 174-page palimpsest by conventional methods using visible and ultraviolet light, but several pages, including those under the paintings, remained obscured. The main idea behind the work at Stanford is that the ink contains iron pigment, and therefore the analysis is basically the mapping of iron K X-ray fluorescence. As the ink is only 1–2 microns thick, the use of a sub-micron beam was crucial. The analysis revealed that the hidden text on two of the pages is about floating bodies and the equilibrium of planes. Surprisingly, the third page is a previously unknown introduction to Archimedes' Method of Mechanical Theorems. The main source of the news is an article by Heather Rock Woods, Stanford University, <http://news-service.stanford.edu/news/2005/may25/archimedes-052505.html>. For further details, contact Neil Calder, Stanford Linear Accelerator Center, Phone +1-650-926-8707, or Uwe Bergmann, Stanford Synchrotron Radiation Laboratory, Phone +1-650-926-3048, bergmann@SLAC.Stanford.edu

PROFESSIONAL

Australian-Japanese collaboration in synchrotron sciences (3 June 2005)

Australian Synchrotron and SPring-8 (Japan) have signed a new partnership agreement to share expertise and develop new technology. This agreement will allow scientists to move freely between both facilities and to work together to exchange ideas and develop new experimental technology, such as new detectors.

NEW PRODUCTS

PANalytical introduces MiniPal 4 EDXRF spectrometer (14 July 2005)

PANalytical's new MiniPal 4 energy-dispersive XRF bench-top spectrometer performs non-destructive analysis of elements from sodium to uranium, in concentrations from 100% down to ppm levels. In addition to employing a new silicon drift detector, its intelligent software can be useful for fast elemental analysis across the entire periodic table. With a mass of only 28 kg, it is configured with a 12-position sample changer (with optional sample spinner),

a helium gas attachment for liquids analysis and a selection of X-ray tube anodes (Rh, Cr and other on request) for analytical flexibility. For more information, Phone: +31-546-534 444, Fax: +31-546-534 592, info@panalytical.com, <http://www.panalytical.com/>

Bede offers combined XRR/XRF capability for rapid film thickness determination (13 July 2005)

The latest version of the BedeMetrix(TM)-F X-ray metrology tool features non-destructive, high-speed film thickness measurement on patterned wafers through combined XRR (X-ray Reflectivity) and XRF (X-ray Fluorescence), providing an extended thickness measurement range of 1 nm to 10 microns on a wide range of material types. Proprietary small spot X-ray optics enable measurement on test pads and in scribe lines down to 100 microns for XRR, and 30 microns for XRF, for in-line measurement on product wafers. For further information, Phone: +44-191-332-4700, Fax: +44-191-332-4800, info@bede.co.uk, <http://www.bede.com>

Rigaku releases horizontal-layout X-ray diffractometer for thin films (12 July 2005)

Rigaku/MSK, Inc. has announced its new SmartLab system, which is a horizontal sample mount x-ray diffractometer for thin films. This product is designed to enable R&D of advanced thin film materials such as: organic EL films for flexible displays, GaN epitaxial films for blue lasers, and next generation magnetic films for ultra high density magnetic recording media. Besides its sophisticated automation software, the new system's high-resolution horizontal sample mount geometry offers substantial benefits, such as preventing bending or bowing of the sample. The system can handle samples up to 8" ϕ . For further information, contact: Thomas F. McNulty, Director, XRD Product Marketing, Rigaku/MSK, Inc., Phone: +1-281-363-1033 ex. 207, tmcnulty@RigakuMSK.com, <http://www.RigakuMSK.com>

Oxford launches new handheld XRF analyzer for RoHS compliance screening (12 July 2005)

Oxford Instruments has announced the new X-MET3000TXR—an X-ray tube-based analyzer designed specifically for measuring heavy metals in plastics, solder materials and printed circuit boards. The Restriction of the use of certain Hazardous Substances (RoHS) comes into force on 1st July 2006 in the US. The product provides rapid quantitative

analysis of all restricted elements; Pb, Cd, Hg, Cr and Br. Various types of materials can be measured with one instrument; cables, PCBs, components, plastic housings, solder material, fasteners etc. X-MET can also be used as a quick on-site quality control tool to analyze various other elements like Ag, Cu, Bi etc from solder and Cl, Ti, Ca, Zn etc in plastics. For further information, Phone: +1-510-656-8820, Fax: +1-510-656-8944, info@ma.oxinst.com, <http://www.oxford-instruments.com/>

CORPORATE

AMETEK acquires SPECTRO Analytical Instruments (13 June 2005)

AMETEK, Inc. (NYSE: AME) has acquired SPECTRO Beteiligungs GmbH ("SPECTRO"), the holding company of SPECTRO Analytical Instruments GmbH & Co KG and its affiliates. SPECTRO was acquired from an investor group led by German Equity Partners BV for approximately 80 million Euro. SPECTRO designs, manufactures, and services atomic spectroscopic instrumentation used to analyze the elemental composition of solids and liquids. SPECTRO joins AMETEK as part of its Electronic Instruments Group (EIG), selling its instruments to the process, aerospace, power, and industrial markets worldwide. For further information, contact SPECTRO Analytical Instruments, Tom Milner, Phone: +49-2821-892-3106, Fax: +49-2821-892-3206, info@spectro.com

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NEWS

SCIENCES

Ultra fast X-ray diffraction — watching the birth and death of exotic molecules (19 August 2005)

Some very interesting structural studies have been performed recently at the European Synchrotron Radiation Facility (ESRF), Grenoble, France, on photo-chemically generated, short-lived ($<10^{-6}$ sec) iodo radicals. The research team dissolved a molecule of $C_2H_4I_2$ in liquid methanol and then subjected it to a short laser pulse. This excited the molecule, which then cooled down while releasing heat into the surrounding liquid. As a consequence, the temperature rose and the liquid started to expand in response to the increase in temperature. The absorption of light triggered a chemical reaction, which the researchers studied with picosecond time resolution. The research team measured the change in shape and composition as early as 100 picoseconds after the initial explosion, then at an interval of 10 nanoseconds, then 1 microsecond, and so on. From these measurements, the team obtained direct structural evidence of the bridged radical (CH_2ICH_2) in a polar solution. This transient intermediate has long been hypothesized to explain stereo-chemical control in many association and/or dissociation reactions involving haloalkanes. For more information, see the paper, 'Ultrafast X-ray Diffraction of Transient Molecular Structures in Solution', H. Ihee *et al.*, *Science*, 2005; **309**: 1223–1227.

Synchrotron X-ray microprobe contributes to development of cheaper solar cells (14 August 2005)

Professor E. Weber's team at Berkeley, California, US has recently succeeded in finding a new technique to handle metal defects in low-grade silicon, which could dramatically reduce the cost of solar cells. At present, around 90% of solar cells in the world are made from a refined, highly purified form of silicon. This is because solar cells made from cheaper forms of silicon do not perform well and also because removing impurities is expensive. The new idea is to manipulate the impurities in a way that reduces their detrimental impact on the solar cell, instead of purifying the material. The team analyzed how metal contaminants in silicon respond to different types of processing using a synchrotron X-ray microprobe capable of detecting metal clusters as small as 30 nanometers. In addition to micro-XRF and micro-XAFS, they employed a new method based on a spectrally resolved X-ray-beam-induced current, which generates a map of the minority-carrier diffusion length, revealing the precise impacts of metal impurity clusters on local material performance. They found that they were able to manipulate the distribution of the metal impurities by varying the cooling rate of the silicon. When the material is cooled quickly, the metal defects are quickly locked in a scattered distribution. For more information, see the paper, 'Engineering metal-impurity nanodefects for low-cost solar cells', T. Buonassisi *et al.*, *Nature Materials*, 2005; **4**: 676–679.

X-ray analysis reveals why anthocyanin found in red roses turns other flowers a brilliant blue (11 August 2005)

It is known that the colours of many flowers are produced by anthocyanin, which has 6 different types of structure; a cyanidin-type anthocyanin is responsible for the red in roses, while most blue flowers have delphinidin-type anthocyanin. However, the same cyanidin-type anthocyanin makes roses red but cornflowers blue. The phenomenon has so far not been entirely explained. A Japanese group led by Professor K. Takeda (Tokyo Gakugei University, Koganei, Tokyo) recently carried out detailed X-ray analysis and clarified that a complex of six molecules each of anthocyanin and flavone, with one ferric iron, one magnesium and two calcium ions is responsible for the blue in cornflowers. For more information, see the paper, 'Phytochemistry: Structure of the blue cornflower pigment', M. Shiono *et al.*, *Nature*, 2005; **436**: 791.

Brilliant X-ray source assists in the discovery of a novel stable high-pressure form of silica with a pyrite-type structure (5 August 2005)

The mineral silica (SiO_2) is a common substance that is a constituent of all of the planets in our solar system. At SPring-8, Harima, Japan, Dr. K. Hirose (Tokyo Institute of Technology; Japan Agency for Marine-Earth Science and Technology) and his co-workers recently found that, above 268 GPa and 1800 K, silica exhibits a novel stable high-pressure form with a pyrite-type structure, which is much denser than other known silica phases. This form of silica could be one of the main constituents of the core of a gas-giant planet such as Uranus or Neptune. For more information, see the paper, 'The Pyrite-Type High-Pressure Form of Silica', Y. Kuwayama *et al.*, *Science*, 2005; **309**: 923–925.

PROFESSIONAL

VUV free-electron laser starts at DESY (3 August 2005)

The first user operation of the VUV free-electron laser (FEL) at DESY, Hamburg in Germany is now under way. German Chancellor Gerhard Schroeder paid a visit to the facility to join the celebrations. The VUV-FEL employs the new technology developed at DESY from 1992 to 2004 by the international team as part of the TESLA Collaboration. Electrons are brought to high energies by a superconducting linear accelerator, and then race through an undulator, which is a periodic arrangement of magnets that forces the electrons to follow a slalom course and thereby radiate flashes of light. According to self-amplified spontaneous emission (SASE), the process finally generates intense flashes of short-wavelength laser light. Its peak brilliance surpasses that of the most modern synchrotron radiation sources by a factor of ten million. Its radiation is coherent, and its wavelength is tunable within a range of 6 to 30 nm. The very intense radiation pulses have an extremely short duration of 10 ~ 50 femto seconds. Five experimental stations have

been constructed at the facility. For more information, visit the Web page <http://www.desy.de>

Denver X-Ray Conference Awards (3 August 2005)

The following awards were presented during the plenary session of the 54th Annual Denver X-Ray Conference:

The 2005 Barrett Award in X-ray Diffraction to D. Keith Bowen—Bede Scientific Instruments, Ltd., Durham, UK and Brian Tanner—University of Durham, Durham, UK.

The 2005 Jenkins Award for Lifetime Achievement in the Advancement of the Use of X-rays for Materials Analysis to Victor E. Buhrke—Consultant, Portola Valley, CA.

NEW PRODUCTS

Hamamatsu releases new X-ray flat panel sensor with low noise and high resolution (15 September 2005)

Hamamatsu Photonics K.K., a Japanese company manufacturer of photomultiplier tubes, light sources, imaging tubes, opto-semiconductors, and other imaging and analyzing systems, recently announced a new X-ray flat panel sensor, the C10013SK. The 1.1-million-pixel sensor has quite a large area of 50 mm × 50 mm. Each pixel is equipped with an individual amplifier, thereby allowing the enhancement of the signal to background ratio. The Gd₂O₃ scintillator is employed with specifically designed fiber optics. For more information, contact T. Inutsuka, Phone +81-53-434-3311, Fax +81-53-434-5184, <http://www.hamamatsu.com/>

Kodak introduces new digital imaging systems for molecular imaging (1 September 2005)

Eastman Kodak Co. has announced the availability of two new products, the Image Station In-Vivo F and FX systems, developed for *in-vivo* molecular imaging, which makes possible non-invasive measurement of biological processes at a molecular level within a living organism. The In-Vivo FX system includes a digital X-ray imaging module in addition to its optical imaging capability. In contrast to conventional diagnostic imaging that highlights conditions caused by disease, molecular imaging can identify molecular abnormalities that are the origin of disease at a very early stage. For additional information, call +1-203-786-5657, or visit <http://www.kodak.com/go/molecular>

EMT added XRF analysis as part of RoHS test methods (23 August 2005)

Environmental Monitoring and Technologies, Inc. (EMT), Morton Grove, Illinois, which conducts testing of materials to detect substances of concern addressed in the Restriction

of Hazardous Substances in Electronic and Electrical Equipment (RoHS) Directive, recently announced the addition of X-ray fluorescence (XRF) to the suite of analytical test methods offered for the evaluation of electronic and electrical components. The XRF method is promising from the standpoint of compiling material content declarations, specifically for the determination of various metals and brominated compounds in plastics and alloys. While XRF analysis does not provide definitive results for all of the RoHS-regulated substances, it has, however, several clear advantages including a rapid turnaround of results and the ability to perform non-destructive testing. For more information, contact Kris Erickson, Phone: +1-(847) 324-3346, Fax: +1-(847) 967-6735, info@emt.com, <http://www.emt.com/>

Bruker AXS announces AUTOSTRUCTURE software for automated X-ray structure determination (23 August 2005)

Bruker AXS Inc. has launched AUTOSTRUCTURE, a program suite for the automatic determination of 3D crystal structures of organic, mineralogical and inorganic molecules from X-ray data. Through collaboration with the University of Durham, UK, the software requires only approximate information on elemental composition from the user. It then processes diffraction intensity data and cascades through Patterson, direct and dual space methods to propose a structure model within seconds. The software is suitable for use in chemical crystallography as well as peptide and small protein structures of moderate resolution. For further information, contact Roger Durst, executive vice president, Phone +1-608-276-3066, roger.durst@bruker-axs.com, <http://www.bruker-axs.de/>

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