



MAX PLANCK INSTITUTE

for the science of light

# Newsletter

n°1 | January 2010



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NEWS items |

## CLUSTER OF EXCELLENCE

▶ The EAM Cluster at the Friedrich-Alexander-University Erlangen-Nuremberg is part of the Excellence Initiative of the German Federal



and State Governments (the acronym stands for "Engineering of Advanced Materials"). Involved since its conception in 2006, the Max-Planck Research Group and the MPL have led the research sub-area 'Engineering of Optical and Photonic Materials', which aims to tailor the optical response of common substances (e.g. glasses, metals or semiconductors) by micro- or nanostructuring, so as to create synthetic materials with radically different or improved optical properties. ■

contact: [michael.scharrer@mpl.mpg.de](mailto:michael.scharrer@mpl.mpg.de)

## LONG NIGHT OF SCIENCE

▶ During the night of the 24-25th October 2009, the MPL participated in the "Long Night of Science", an event aimed at raising the interest of the general

public in science and research. The program included guided tours, lectures, presentations, experiments and demonstrations at many scientific centres in the greater Nuremberg-Furth-Erlangen area. At the MPL visitors were partly mystified – and we hope partly en-



LIGHTened – by answers to intriguing questions such as "what do the world's longest holes look like?" or "can light be bent?". It was an interesting journey towards the discovery of light and its secrets. ■

## CLEO-EUROPE PARTY

▶ In June 2009 a pre-CLEO-Europe party was held in Erlangen. Visitors planning to attend CLEO-Europe in Munich came a day earlier and were taken on a tour of MPL and then out to dinner at a fine restaurant in the local village of Kosbach. ■

Welcome to the first Newsletter of the fledgling Max-Planck Institute for the Science of Light (MPL). We hope you enjoy reading it.

As we write (December 2009) MPL is almost one year old. It has been an exciting and challenging year. Currently MPL consists of three Max-Planck Research Groups, a Max-Planck Fellow Group, an International Max-Planck Research School and two Research Divisions. The Max-Planck Society is actively seeking directors for two further Divisions, and we expect to be able to report more on this in our next Newsletter. MPL also has close links with the University of Erlangen-Nuremberg (FAU), with many collaborative projects.

A highlight of 2009 was our Official Opening Ceremony in July, which was attended by local politicians and dignitaries, representatives from FAU and other universities and institutes as well as many colleagues and friends. We were very happy also to welcome members of the visiting committees who, during the decisive phases of setting up MPL, gave most generously of their time. The ceremony was followed by a two-day scientific Symposium with distinguished speakers from all over the world, including the 2005 Nobel prize winner Roy Glauber from Harvard. Questioned by Ferenc Krausz (MPQ Garching) on the possibility of observing certain short-lived virtual quantum states, Glauber replied "Are you going to discover an embarrassment of Nature, a non-conservation of energy, experimentally? The answer is No".

If you would like more information on any of the research projects described in this Newsletter, please email the listed contact in each case or visit our website <http://mpl.mpg.de>.

We wish you a very successful New Year 2010!

Gerd Leuchs

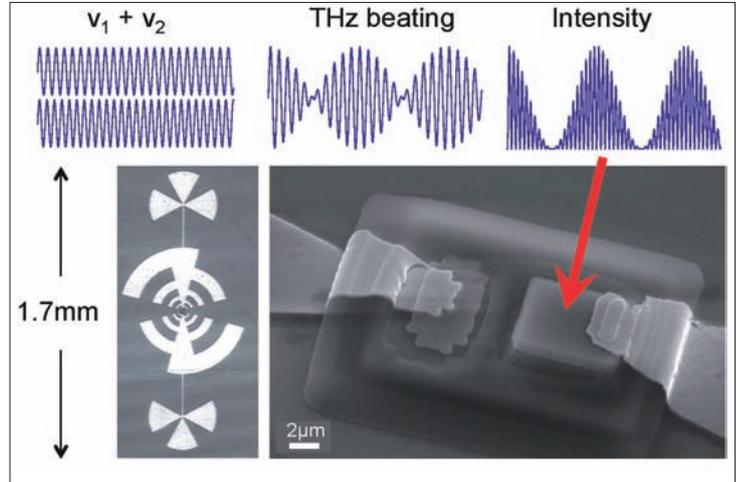
Philip Russell

## RESEARCH articles |

### THZ-RADIATION BY PHOTOMIXING IN SUPERLATTICE DEVICES

► We work on special semiconductor devices for the generation of tunable CW THz radiation (in the frequency range from 0.1 to 3 THz) by photomixing two laser beams. In contrast to non-linear optical difference frequency generation, no phase matching or long interaction lengths are necessary. In the figure, the photomixing scheme is illustrated. Two laser beams are detuned by the desired THz-frequency and superposed. The resulting modulated intensity is absorbed in a n-i-pn-i-p-superlattice device where it creates the THz-current,  $I_{\text{THz}}$ . This current is fed into an antenna which radiates ideally with a conversion efficiency that increases with the laser power squared. To push the roll-off frequencies as high as possible, ballistic electron transport in small area devices is utilized. The advantage of

this type of THz-source is the wide tunability (more than 5 octaves) and the strong coherence as the linewidths of the mixing lasers directly translate into



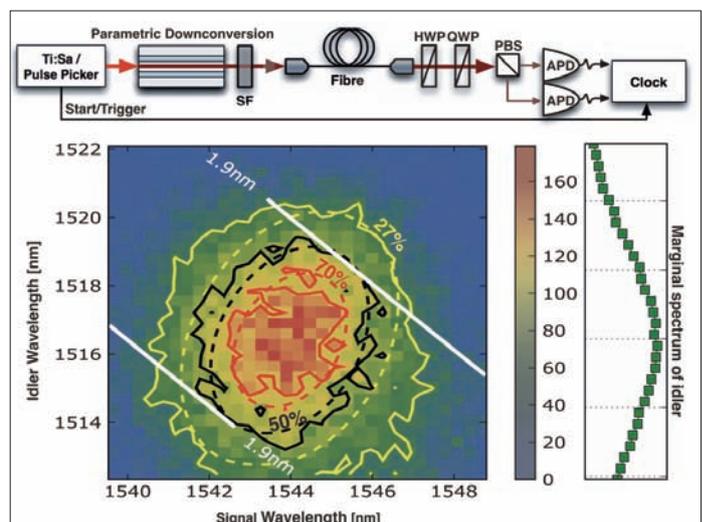
the THz-beam properties. Commercial laser diodes exhibit linewidths in the MHz-range, resulting in THz radiation showing coherence lengths in the tens of meter range. This allows phase sensitive measurements (for imaging or spectroscopy) over such distances. ■

Contact: stefan.malzer@physik.uni-erlangen.de  
 Group: Wang Max-Planck Fellow Group (THz project)  
 Reference: S. Preu *et al.*, Appl. Phys. Lett. **92**, 221107 (2008).

### FIBRE ASSISTED SINGLE PHOTON SPECTROGRAPH

► High-quality sources of photon pairs are a key resource for optical implementations of future quantum-enhanced technologies, for example precision measurement techniques or quantum imaging. Photons in ultrashort femtosecond wavepackets intrinsically exhibit very precise timing information and broad frequency distributions. The spectral structure can have a dramatic

effect on the quantum characteristics displayed by the individual single photons. Hence it is essential to measure ►



accurately the spectrum of broadband pair sources, requiring an instrument capable of high-resolution measurement at very low light levels. We have developed an exceptionally sensitive device to record both single photon spectra and the joint spectra of photon pairs generated in a parametric down-conversion process in a waveguide structure. Broadband photons are chirped by transmission through an optical fibre with very high chromatic dispersion, hence correlating frequency with arrival time at the fibre output. A single detector can then record the entire photon

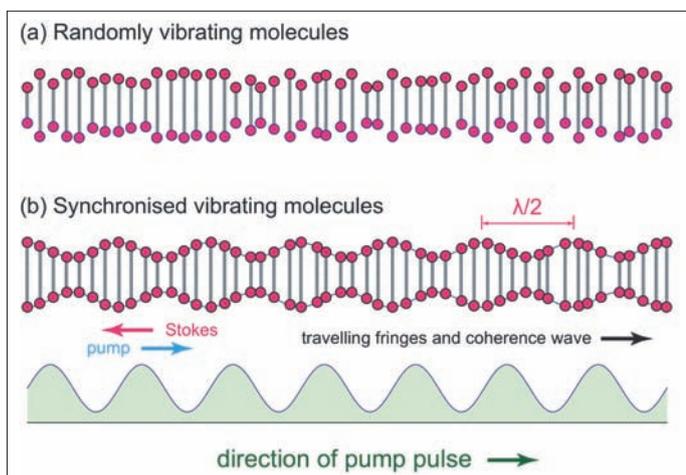
spectrum via an ensemble measurement of arrival times, yielding a high sensitivity, low noise signal. Employing two detectors we mapped the correlation spectrum of the photon pairs for a 1.9 nm broad pump pulse. This technique will allow us to tailor the spectra of our photon pairs to ensure optimum performance for various applications. ■

Contact: christine.silberhorn@mpl.mpg.de  
Group: *Integrated Quantum Optics* (IQO)  
Reference: M. Avenhaus *et al.*, *Opt Lett.* **34**, 2873 (2009).  
Highlighted in: *Nature Photonics* **3**, Nov. 2009.

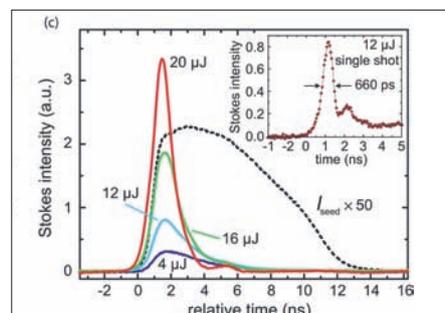
## BACKWARD SEEDED SRS IN HYDROGEN

► Nonlinear interactions between light and matter increase with the intensity of the light, giving rise to many striking phenomena such as the generation of new laser frequencies. An example is stimulated Raman scattering (SRS) in hydrogen gas.

Transient SRS occurs before relaxation processes (with lifetime  $T_2$ ) destroy the mutual coherence of the vibrating molecules interacting with the optical fields. In traditional experiments, ps pulses with GW peak powers and high gas pressures are needed to study transient SRS. Under these conditions, SRS cannot easily be separated from competing effects such as self-phase modulation and self-focusing. Gas-filled hollow-core photonic crystal fibre (PCF) is ideal for avoiding these problems. The very low optical attenuation allows almost unlimited path lengths and the single-mode nature of the guidance maintains a constant gas-light overlap. In recent work we filled a hollow core PCF with a low pressure hydrogen (1.5 bar), pumped with ns pulses at sub-kW peak powers, and seeded with weak back-



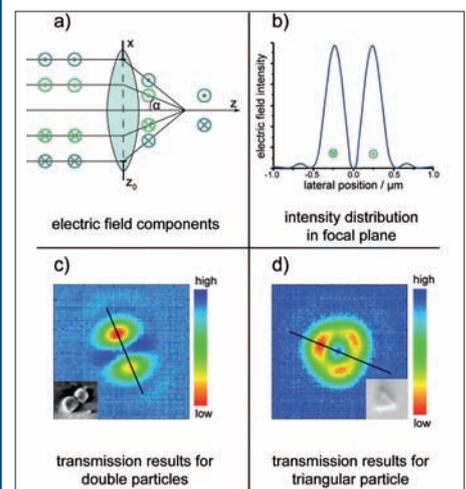
ward Stokes pulses. Very short ( $\ll T_2$ ) high energy Stokes pulses were generated, with shapes that were insensitive to the temporal structure of the seed pulse, suggesting that these pulses are similar to solitary pulses generated in coherent laser amplifiers. ■



Contact: alexander.nazarkin@mpl.mpg.de  
Group: Russell Division  
Reference: A. Abdolvand *et al.*, *Phys. Rev. Lett.* **103**, 183902 (2009).

## CHARACTERIZATION OF SINGLE METALLIC NANO-PARTICLES

► Since the advent of advanced material processing schemes during the last decades, a variety of new, specially tailored nanoparticles can be manufactured. The optical properties of these different nanoparticles strongly depend on their shape and material. By changing these characteristics, one can tailor their optical properties to enhance their use in fields like sub-wavelength directed energy transport. Our aim is to optically characterize and distinguish single nanoparticles with different shapes by using a highly focused azimuthally polarised light source, providing an inhomogeneous polarisation distribution at sub-wavelength scale (see Fig. a). The existence of longitudinal



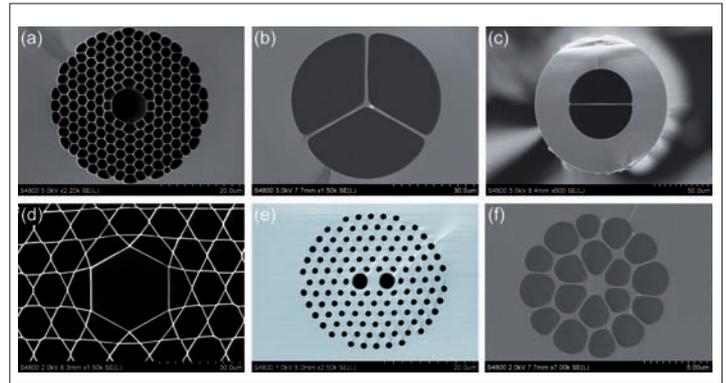
and transversal magnetic and electric fields in the focal plane (see Fig. b) of the beam enables one to explore different field-particle interaction regimes. Distinct reflection patterns form, permitting us to distinguish different particle geometries. The results of measurements on two attached particles with diameters of around 150 nm show maximum interaction for field components polarized along the major axis of the particle (see Fig. c) For a triangular particle, a distinct pattern with trigonal symmetry is seen (see Fig. d). ■

Contact: thomas.bauer@mpl.mpg.de  
Group: Leuchs Division (InMik)  
Reference: R. Dorn *et al.*, *Phys. Rev. Lett.* **93**, 3901 (2003).

## PHOTONIC CRYSTAL FIBRE FABRICATION

► Photonic crystal fibre (PCF) provides new ways to guide light, and is currently used in a wide variety of scientific and technical contexts. Many MPL projects rely on the availability of custom-designed high quality PCF. In our state-of-the-art fabrication facility, we are able to design, draw and characterize all types of PCF, including kagome-lattice and photonic-band-gap hollow-core PCF, many varieties of solid core PCF, and fibres with unconventional nano/micro structures tailored for specific experiments. Although we work mostly with pure fused-silica glass, we also draw fibres made from lead-silicate glass, and are presently setting up a glass facility for

producing more exotic glass compositions. PCF is commonly made by the stack-and-draw technique, in which rods and tubes of glass (~1 mm in diameter) are stacked into a macroscopic version of the desired structure. This is then drawn down to PCF in two stages, the cross-sectional structure being preserved even after a 1,000 times reduction in scale. The figure shows electron micrographs of a selection of structures produced at MPL (core widths in brackets): (a) hollow core (10 µm); (b) “Mer-



cedes” (2 µm); (c) nanoweb (~500 nm); (d) kagome (28 µm); (e) birefringent (3 µm); (f) lead silicate PCF (1.5 µm). ■

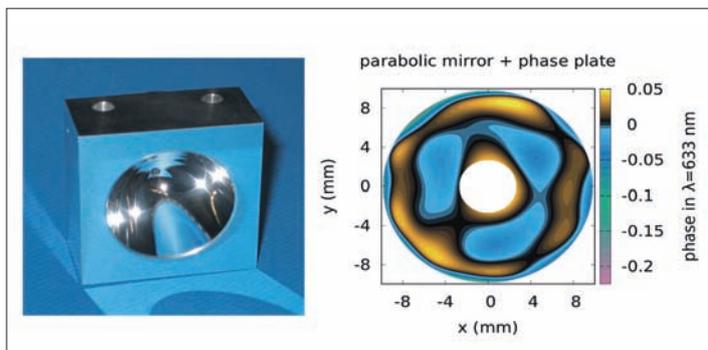
Contact: nicolas.joly@mpl.mpg.de  
 Group: Russell Division  
 Reference: P. St. J. Russell, *J. Lightwave Techn.* **24**, 4729 (2006).

## SINGLE PHOTON-ION COUPLING OVER 4PI

► Achieving efficient free space coupling of single atoms/ions to a single quantum of light may prove highly beneficial in fundamental research as well as in applications. One of the key requirements for such coupling is illumination by a dipole

wave incident over the entire  $4\pi$  solid angle. We tackle this challenge by using a deep parabolic mirror. In order to cope with its unavoidable aberrations, we have performed interferometric characterization of the paraboloidal surface. Based on these measurements, a suitably designed phase plate allowed us to reduce the mirror aberrations to about 0.1 wavelengths at 633 nm in a proof of principle experiment (cf. Figure, right).

The ideal light field for the creation of linear electric dipole radiation is similar to a radially polarized doughnut mode. It has been shown theoretically that for appropriately chosen parameters this mode is capable of imitating ideal dipole radiation with high fidelity. A further key issue is the localization of an ion in the focus of the parabolic mirror without loss of optical accessibility. We have designed a suitable ion trap in cooperation with the NIST (Boulder, USA) and successfully tested a prototype. ■

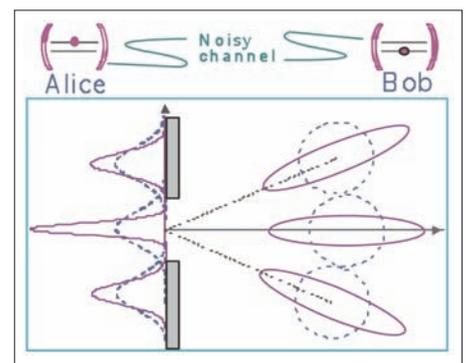


Contact: markus.sondermann@mpl.mpg.de  
 Group: Leuchs Division (4piPAC)  
 Reference: R. Maiwald *et al.*, *Nature Physics* **5**, 551 (2009).

## SQUEEZING ENTANGLEMENT THROUGH NOISY CHANNELS

► One of the big challenges for quantum communication is to extend it to larger distances. Though solved in theory by the so-called quantum repeater, current proposals for implementation remain either impractical or inefficient. Heralded single-photon-based schemes achieve high entangled-state fidelities but operate at very low rates. In a “hybrid” quantum repeater, bright light pulses mediate the nonlocal entangling

interaction between the repeater stations and efficient homodyne detection is employed instead of counting single photons. As a result, entanglement distribution rates increase significantly, at the expense of only modest initial fidelities. New results now show that near-unit initial fidelities can be achieved in a hybrid repeater scheme. This is accomplished by two innovations: coherent light pulses are replaced by squeezed ►



light, and each probe beam is reamplified at the receiving repeater station. While the former variation means exploiting nonclassical features, the latter one is inherited from classical repeater networks and would be impossible with single-photon states. The figure shows

two atomic qubits entangled over a distance. A squeezed light field dispersively interacts with both atoms. Even though photon loss in the channel degrades the output fidelities, squeezing results in better distinguishabilities when a qubit Bell state is condi-

tionally prepared through homodyne detection. ■

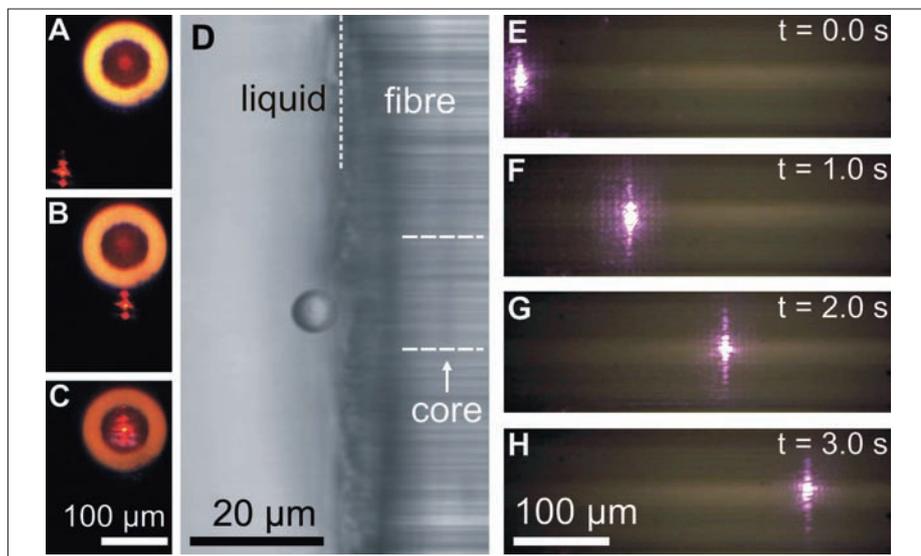
Contact: peter.vanloock@mpl.mpg.de  
Group: Optical Quantum Information Theory (OQI)  
Reference: P. van Loock *et al.*, Phys. Rev. Lett. **96**, 240501 (2006).

## GOING AGAINST THE FLOW

► In optical tweezers, radiation forces near the focus of a laser beam allow trapping and micromanipulation of particles and cells. In hollow-core photonic crystal fibre (PCF), light propagates in a single, non-diffracting optical mode.

Consequently, radiation forces are constant along the fibre, allowing guidance and propulsion of particles over long distances. We have recently demonstrated that  $\mu\text{m}$ -sized particles can be controllably launched into and propelled by the fundamental mode of a fluid-filled PCF.

The figure shows the loading process (A-D) and light driven motion (E-H) of a glass bead that is pushed through a liquid-filled core by radiation pressure provided by a laser beam incoming from the left. The particle attains a speed of  $\sim 100 \mu\text{m}$  per second, i.e., 50 times its diameter in one second. Particles can also be held stationary against a liquid counter-flow by careful balancing of the drag and radiation forces. The technique offers a unique way to study the viscous forces acting on single particles in microfluidic channels. By loading the liquid with photo-activated chemicals, a particle can be coated with successive layers of different materials in a highly controlled manner. ■



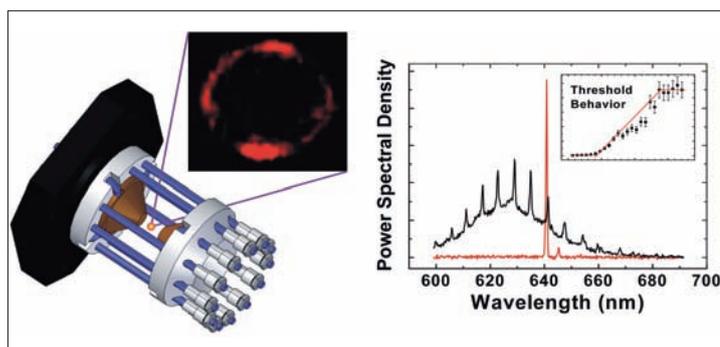
Contact: tijmen.euser@mpl.mpg.de  
Group: Russell Division  
Reference: T. G. Euser *et al.*, Opt. Lett. **34**, 3674 (2009).  
Highlighted in: OSA, www.opticsinfobase.org/spotlight/

## LEVITATED MICRODROP QUANTUM DOT LASER

► Nanocrystal quantum dots (QDs) are tiny semiconductor particles chemically synthesized to high precision. They are ideal candidates for laser applications. However, at their particularly small sizes, non-radiative transitions that compete with optical gain become

more likely. As a result, lasing can only be achieved at high doping densities, primarily close-packed solid cavities. We have demonstrated lasing from QDs with CdSe cores and ZnS shells for a liquid system at QD densities two orders of magnitude smaller than reported elsewhere. The QDs had a core radius of 2.6 nm resulting in a photoluminescence peak at 645 nm. The nanocrystal solution – with glycerol added to reduce evapo-

ration – was dispersed into microdrops of diameters between 10 and 50  $\mu\text{m}$ , charged and trapped in an oscillating electric field. Due to surface tension, an isolated microdrop forms a high quality sphere and thus provides strong cavity feedback. Lasing was observed upon pumping with 10 ns green pulses, and single mode lasing was achieved in smaller droplets. Calibration of the spectral acquisition system allowed us to estimate the average photon emission per quantum dot. ■

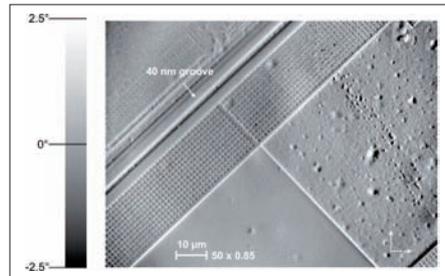


Contact: jan.schaefer@mpl.mpg.de  
Group: Wang Max-Planck Fellow Group  
Reference: J. Schäfer *et al.*, Nano Lett. **8**, 1709 (2008).

## MICRODEFLECTOMETRY

► We have developed a microscopic adaptation of phase-measuring deflectometry (PMD). PMD is a method for measuring specular free-form surfaces. It is based on the observation of sinusoidal gratings using the surface under test as a mirror. As PMD intrinsically measures the local slope, the method is very information efficient. For microscopic deflectometry, we project an aerial image of the grating at a remote distance from the surface under test. In incident light mode we use the same micro-objective for both illumination and observation. Within the resolution cell

of the microscope, we can easily achieve a height sensitivity of 1 nm. The angular dynamic range can be up to  $\pm 60^\circ$ . With a microscope setup, applications such as the inspection of micro-optical elements or wafers are possible. The figure shows an intensity encoded slope



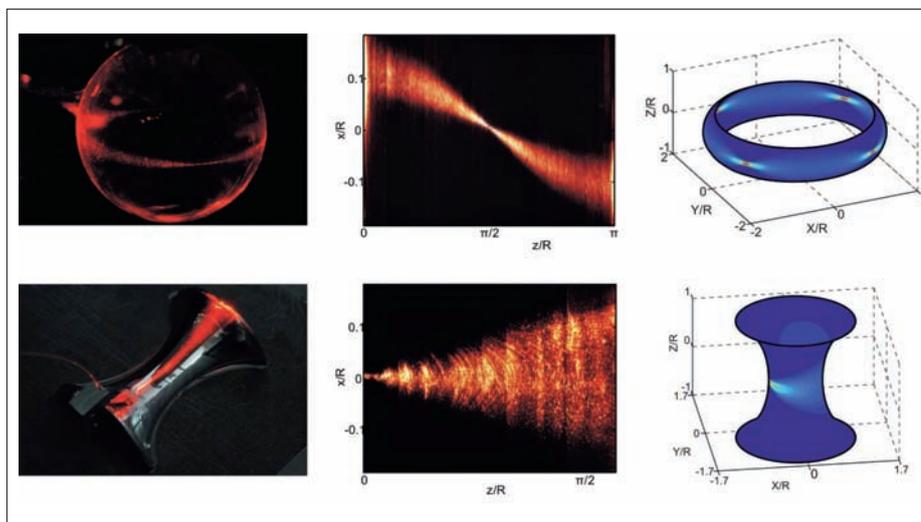
map of a wafer section to illustrate the sensitivity of the method. Microdeflectometry provides appealing pictures, with high lateral resolution, nanometer sensitivity for local surface features, low noise and quantitative 3D features. By combining microdeflectometry with the expansion of the depth of field, we obtain SEM-like images (including quantitative 3D data). The technology is simple, incoherent, and has the potential to rival interferometry. ■

Contact: markus.knauer@physik.uni-erlangen.de  
Group: Leuchs Division (OSMIN)  
Reference: G. Häusler *et al.*, Opt Lett. 33, 396 (2008).

## OPTICS IN CURVED SPACE

► Although from Einstein we know that space is curved in principle, the effects of this become important only on astronomic scales, making their observation difficult. To experimentally investigate wave dynamics in curved space we abandon one spatial dimension and monitor light propagation on surfaces of three dimensional bodies. It turns out that field propagation is only influenced by the product of the two radii of curva-

ture of a sphere, has a strong focusing effect resulting in self-imaging, periodic recovery and diffraction free propagation. In contrast light on negatively curved surfaces spreads exponentially (see Figure). Even nonlinearity cannot balance this spreading. Bright spatial solitons, which are extremely robust in flat space, are torn apart by the expanding space. These findings demonstrate that curvature generates new exciting



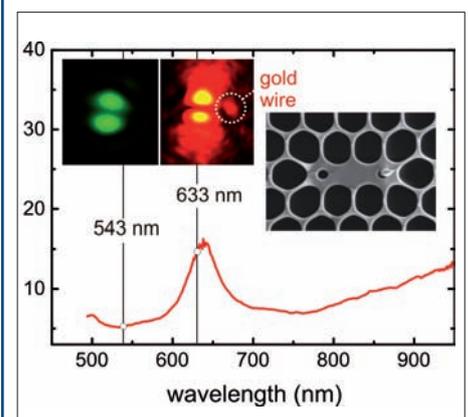
ture – the so-called Gaussian curvature, whereas the topology of the surface has no local effect. We manufactured different bodies with surfaces of constant positive or negative Gaussian curvature. We could demonstrate that a positive Gaussian curvature, as is present on the

effects. We thus further develop classical optics while benefiting from the knowledge of general relativity. ■

Contact: ulf.peschel@mpl.mpg.de  
Group: Leuchs Division (NONA)  
Reference: S. Batz and U. Peschel, Phys. Rev. A 78, 043821 (2008).

## NANOWIRES IN PHOTONIC CRYSTAL FIBRE

► There is considerable current interest in the optical properties of nanoscale structures. In a series of experiments, we have developed a high pressure technique for filling the hollow channels in fused-silica PCF with molten metals, semiconductors and soft glasses. Wires as narrow as 200 nm have been produced in lengths of several cm. The figure shows the loss spectrum of light launched into the glass core of a birefringent PCF, one of two 600 nm channels in the core being filled with Au. At a wavelength of 633 nm, light couples from the two-lobed core mode to a single plasmon resonance on the nanowire. At 543 nm, on the other hand, no such coupling is observed. The plasmon resonances are formed by surface plasmon polaritons that spiral around the wire at discrete angles determined by the need ►

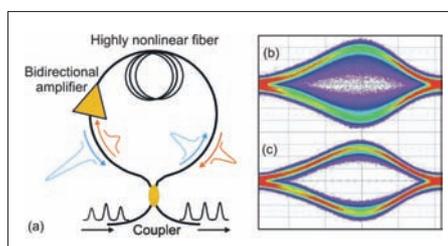


for an integer number of azimuthal periods. PCF provides an ideal environment for exciting these resonances over long interaction lengths. In PCFs with a single Ge nanowire placed close to the core we have observed strong polarization-dependent transmission, and in capillaries filled with chalcogenide glass we have been able to generate white-light supercontinua into the mid-IR using a 1550 nm pump laser. ■

Contact: markus.schmidt@mpl.mpg.de  
Group: Russell Division  
Reference: M. A. Schmidt *et al.*, Phys. Rev. B **77**, 033417 (2008).  
Highlighted in: Editor's Choice, Science **319**, 1011 (2008).

## PHASE AND AMPLITUDE REGENERATION USING A NALM

► Nonlinear amplifying loop mirrors (NALMs), based on fibre Sagnac interferometers, are able to suppress amplitude fluctuations without introducing phase noise (Fig. a). With the implementation of phase-encoded modulation formats in optical transmission systems, such phase-preserving amplitude regenerators have become essential in preventing the accumulation of nonlinear phase noise (NPN) along transmission lines. Until recently only a few practical designs have been reported, since it is very difficult to create the necessary nonlinear transfer function without destroying the signal phase. Experimental results on the improved performance of a differential phase-shift keying (DPSK) transmission system using a NALM were reported [see ref.]. In the experiments, a 10-Gb/s DPSK signal and a 100-km transmission system were used. Signal eye diagrams with and without a NALM are shown in Fig. b and c. Without the NALM, amplitude fluctu-



ations from the amplifiers are converted into NPN and thus the eye is completely closed, resulting in poor received signal quality. With the NALM, however, the amplitude fluctuations are removed and no NPN is accumulated. These results show that the performance of DPSK transmission systems can be significantly enhanced using NALMs. ■

Contact: georgy.onishchukov@mpl.mpg.de  
Group: Leuchs Division (OCOM)  
Reference: C. Stephan *et al.* in Proc. LEOS Winter Topical Meetings (2009).

## FREE SPACE QUANTUM KEY DISTRIBUTION

► Quantum key distribution (QKD) is the process of establishing a secret shared key between two parties, traditionally named Alice and Bob. The security is based on the laws of quan-



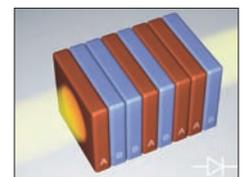
tum mechanics, whereas in classical schemes security relies only on the unproven lack of efficient mathematical algorithms. We have developed a QKD protocol which is particularly suitable for atmospheric transmission: We employ a local oscillator to perform optical homodyne detection of weak coherent signal states which are nearly perfect quantum states. Alice utilizes polarization states to combine signal and local oscillator in a single beam. As a consequence, Bob's detection is very efficient and perfectly shielded against any stray light. We have experimentally demon-

strated the feasibility of this protocol over a distance of 100m on the roof of the MPL building. As the next step, we are now establishing a link of length 1.5km between the MPL and the University computing centre. The figure shows the QKD link on the roof of the MPL building. ■

Contact: dominique.elser@mpl.mpg.de  
Group: Leuchs Division (QIV)  
Reference: D. Elser *et al.*, New J. Phys. **11**, 045014 (2009).

## ALL-OPTICAL DIODE WITH QUASIPERIODIC PHOTONIC CRYSTALS

► An ideal all-optical optical diode is a device that allows total transmission of light in one direction, while reflecting light completely in the opposite direction. This is the analogue of the electronic diode, but working with photons instead of electrons. However, contrary to electronic diodes, the practical implementation of an optical diode is very difficult, and must be based on the principles of nonlinear optics. Thus it is necessary to use light of high intensity, a fact that severely limits the number of practical applications. However, designs of a different, novel conception, based on the surprising properties of quasiperiodic sequences, can be realized (see figure for an example of a crystal based on the so-called Thue-Morse sequence of 3rd generation). The advantage of using quasiperiodic photonic crystals is that, due to their unique field localization properties, one can achieve a strong asymmetry between the propagation of forward and backward waves, but at the same time maintaining some of the transmission properties typical of more conventional periodic structures. We anticipate that, in the near future, these crystals will become a fertile area of research. ■



Contact: fabio.biancalana@mpl.mpg.de  
Group: Nonlinear Photonic Nanostructures (NPN)  
Reference: F. Biancalana *et al.*, J. Appl. Phys. **104**, 093113 (2008).

## A NEW CHAPTER FOR OSA'S STUDENT CHAPTER

▶ The student chapter of the Optical Society of America (OSA) at MPL has recently elected new board members. In an on-going series of activities, the chapter was honoured in 2008 to co-organize a ceremony at which Adolf W. Lohmann was awarded OSA's first Emmett N. Leith Medal. The ceremony included fascinating lectures by Dr Fritz Keilmann ("Wired Light") and the then President of the OSA, Dr Rod C. Alferness, who spoke about the "Life and Work of Emmett Leith". The new board is also keen to invite well-known optical scientists to Erlangen, and warmly thanks Prof. Robert Byer (Stanford University) and Dr. Nicolas Forget (Fastlite, Orsay) for their wonderful talks. ■

contact: [marta.ziemienczuk@mpl.mpg.de](mailto:marta.ziemienczuk@mpl.mpg.de)



Left to right: Nicolas Joly, Philipp Hoelzer, Marta Ziemienczuk and guest lecturer Professor Robert Byer

## IMPRS STUDENTS DO WELL

▶ In September 2009 the students of the International Max Planck Research School for Optics and Imaging spent two days in Veilbronn at the Friends-of-Nature house (Naturfreundehaus) – an enchanting place situated on a mountain top. This gave them a great opportunity to discuss their work in a friendly and relaxing environment, with common meals, social events and a hiking tour. The event included talks by students whose IMPRS scholarships were up for renewal, which incidentally provided a nice excuse for their advisors to escape from their day jobs. We are delighted to report that the scholarships of all the speakers were extended. ■

contact: [heike.auer@mpl.mpg.de](mailto:heike.auer@mpl.mpg.de)

## BIENVENUE

▶ The MPL is delighted to welcome Professor Nicolas Joly from the University of Lille, who took up his new associate (W2) professor appointment at the University of Erlangen-Nuremberg in January 2009. In addition to his plans to explore nonlinear dynamics in optical systems, Nicolas is playing a leading role in the fabrication of photonic crystal fibre. ■

contact: [nicolas.joly@mpl.mpg.de](mailto:nicolas.joly@mpl.mpg.de)

## NEWS IN BRIEF

▶ In September 2009 the MPL received a visit from the CSU leader Horst Seehofer, who donned full clean-room clothing and toured the fibre drawing facility.

▶ Congratulations to Christine Silberhorn, who on the 1st of April 2010 will take up her new position as W3 Professor at the University of Paderborn.

▶ The first meeting of the committee for the new MPL building took place on the 9th of September 2009. The plans are taking shape.



Left to right: Daniela Wurst (MPG-GV), Barbara Müller (MPG-GV), Sabine König (MPL), Dieter Grömling (MPG-GV), Robert Schlögl (Fritz-Haber Institute), Gerd Leuchs (MPL), Philip Russell (MPL)

## HERZLICH WILLKOMMEN

▶ With pleasure MPL announces the appointment (W2) of Dr. habil. Silke Christiansen, formerly at IPHT Jena and MPI for Microstructure Physics in Halle. She will lead the newly formed scientific service unit "Photonic Nanostructures" which, in common with all the MPL scientific service units, will actively engage in research. Among her specialties is the fabrication of metallic nano-structures and the investigation of their interactions with light. ■

contact: [silke.christiansen@mpl.mpg.de](mailto:silke.christiansen@mpl.mpg.de)

## RETIREMENT (SORT OF)

▶ Marga Schwender was Gerd Leuchs's super-efficient secretary for nearly 15 years. Well-organized, able to prioritize, and a multitasking genius, she had become a real institution for everyone at the MPL and for the many visitors



whom she took great care of. Her organizational skills were key in the successful establishment of the first Max Planck Institute in Franconia, during a long process that lasted from 2000 to 2009. At her farewell party, she also proved (if proof be needed) that she is an excellent cook – the 10 cheesecakes and 6 tiramisu's were to say the least exceedingly good. Thank you Marga for your kindness, your unstinting help over the years and your wonderful cakes! We all think the world of you and the work you have done and we wish you a happy retirement. We are happy to see you from time to time in the Leuchs office – when you do finally finally leave, you will be greatly missed! ■

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### Enquiries:

[presse@mpl.mpg.de](mailto:presse@mpl.mpg.de)

### Coordination:

Daniela Benigni

### Layout and Design:

Birke|Partner Kommunikationsagentur

[www.mpl.mpg.de](http://www.mpl.mpg.de)