



# NEWSLETTER

COMMISSION INTERNATIONALE D'OPTIQUE • INTERNATIONAL COMMISSION FOR OPTICS

## Iranian wins 2009 Gallieno Denardo prize

**The 2009 Gallieno Denardo prize winner has characterized atmospheric turbulence using Moiré techniques.**



Saifollah Rasouli, winner of the 2009 ICO/ICTP Gallieno Denardo prize.

The ICO/ICTP Gallieno Denardo prize is awarded to young researchers from developing countries (as defined by the United Nations) who conduct their research in these countries. The award is for scientists under 40 years old who are active in optics research and have contributed to the promotion of optics research in their own, or another, developing nation.

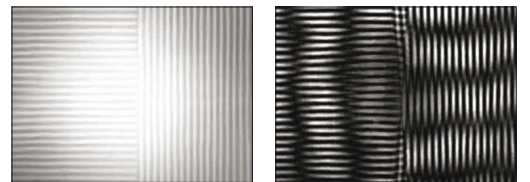
This year the prize has been awarded to Dr Saifollah Rasouli, a postdoctoral researcher in the physics department at the Institute for Advanced Studies in Basic Sciences in Iran – the institution that granted his MSc and PhD degrees in physics, with a specialization in optics, in 1997 and 2007, respectively. The citation of Rasouli's award reads: "The prize is assigned for his creative implementation of Moiré interferometry to fiber optics, optical metrology, and atmospheric optics, including measurements of turbulence parameters, and possible applications to wavefront distortion compensation in adaptive optics systems." The prize was awarded to Rasouli in a special award ceremony during the ICTP's Winter College on Optics.

Rasouli was born in Zanjan, Iran. In 1994 he received his BSc degree in applied physics, with a specialization in condensed matter, from the Shahid Beheshti University, Iran. Much of his recent research is about imaging through the turbulent atmosphere. The resolution afforded by large earth-based telescopes is limited not by diffraction but by the uncorrected effects of atmospheric turbulence. A lightwave travelling through the atmosphere gains distortions as it passes through regions of turbulence-produced refractive index variation. A laser beam, for example, is seen to wander; curvature induced in the wavefront from a star causes astigmatic defocus of the star image in a telescope greater than about 10 cm in diameter. With large-aperture telescopes even the most dramatic effects of wavefront distortions can be observed. A short-exposure image of a star, for example, may have the appearance of a laser speckle pattern.

Rasouli has concentrated on the exploitation of Moiré techniques for displaying and quantifying the effects of local tilt, or variations in the local angle of arrival, of a lightwave entering an aperture. He has three Iranian patents relating to Moiré techniques: a Moiré deflectometer



From left: A Guzmán (ICO secretary), M L Calvo (ICO president), and members of the ICO/ICTP Gallieno Denardo Prize Committee – A Wagué (chair), J Niemela, S Rasouli (prize winner), A Consortini and M Danailov.



A grating recorded in a turbulent atmosphere (left) and a Moiré pattern produced by two superimposed gratings.

(2003), a Moiré slope meter (2006), and a Moiré deflectometer for atmospheric turbulence measurements (2008).

The measurement of angle-of-arrival fluctuations in light propagating through the turbulent atmosphere is important to the evaluation of astronomical imaging, aerial surveying, terrestrial geodesy, optical ranging and wireless optical communication. Measurements made by Rasouli's systems can be sent to a real-time processor that controls a rubber mirror actuator that removes, as much as possible, the wavefront distortions introduced by the atmosphere.

His latest scheme, noteworthy both for its simplicity and its cleverness, illustrates the basic idea. A monochromatic lightwave from a small and distant source is incident on a fine-pitch Ronchi ruling. A short distance beyond, a Talbot image of the ruling appears.

With diverging-light illumination of the Ronchi ruling, the Talbot image is slightly larger in scale than the ruling itself. If a duplicate of the ruling is placed in the Talbot image plane, in exactly the same orientation as the original ruling, large fringes result from the Moiré effect.

Most importantly, any turbulence-produced

local variations in the angle of arrival of the incident wave, even if quite small, manifest themselves as easily seen distortions of the Moiré fringe pattern. These distortions, captured by a CCD video camera, are analysed by a computer program executing what is, according to Rasouli, a computationally efficient algorithm. He has used the technique to determine parameters that characterize the strength of turbulence measured along horizontal paths. He notes that the technique has a range of applications, many of which he has already explored,

including shaping and glass casting processes, measurements of the refractive index profile of optical fibres, and monitoring the vibrations of large civil structures.

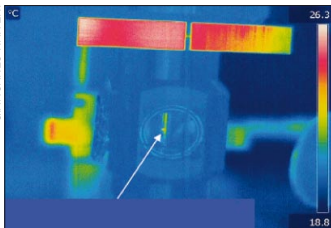
Dr Rasouli will soon spend an extended period of time at the Inter-University centre for Astronomy and Astrophysics (IUCAA) in Pune, India. There, in collaboration with the IUCAA's instrumentation group, he will test the performance of his prototype wavefront sensor on the 2 m optical telescope at the centre's Garawali Observatory.

# Optics research at the Abdus Salam ICTP

## SPIE offers its perspective on the work of the ICTP.



A high-energy Ti:Sapphire-based ultrafast system for photoinjector applications in the laboratory for lasers and optical fibres at Elletra, Sincrotrone-Trieste, Italy.



Infrared-camera view of a QCL head emitting through the viewport of a liquid-nitrogen cryostat.

The International Society for Optics and Photonics (SPIE) subscribes enthusiastically to the core tenets of the Abdus Salam International Centre for Theoretical Physics (ICTP). Science is indeed a globally enriching enterprise, and the practice of science transcends boundaries. It is largely due to the inspiration of the late Gallieno Denardo that SPIE became involved with the activities of the ICTP; the interest of SPIE's leadership, who were familiar with the ICO, was also a crucial factor.

SPIE sees the ICTP as a leader in attempts to develop scientific infrastructure in parts of the world where it is weak. Some of these areas have a proud history of contributions to science, but the cycles of history have and will redistribute the interest and leadership in science. SPIE also believes that the functioning societies of the future and their economic standing will at least in part be based on the strength of local science and technological enterprise.

Gallieno Denardo was not trained in optics, but he did believe that optics was an accessible and affordable modern science for countries with limited scientific infrastructures. The Winter School for Optics at ICTP – which is supported by SPIE, the Optical Society of America, the ICO, the US National Academy of Sciences, the Societa Italiana di Ottica e Fotonica and the European Optical Society – is a part of his legacy. (Major support also comes from the Central European Initiative, UNESCO and the International Atomic Energy Agency.)

Gallieno also planned to include experimental opportunities in optics for students from “the South” (of Italy), and he helped build the laboratory run by Dr M Danailov that is now housed at the Elettra synchrotron facility, which is close to the ICTP in Trieste.

His goal of having a research capability where students could participate in “competitive research” at ICTP is also strongly supported by Prof. K R Sreenivasan, ICTP director, and has been implemented by Gallieno's successor Dr Joe Niemela, with a commitment from SPIE to give \$30 000 (€23 000) every year for at



Participants gather at the 2009 Winter College on Optics in Environmental Science at the ICTP in Trieste.

least three years and with funds from the ICTP. A Vacchi of the Istituto Nazionale di Fisica Nucleare (INFN) Trieste and the ICTP is leading the effort in collaboration with the Institute for Nanoelectronics at Technische Universität München (TUM). Dr Giancarlo Raiteri, from the University of Trieste, has become an ICTP employee and is in the process of setting up a laboratory in Trieste to mimic part of the work on quantum-cascade lasers at TUM.

The immediate goal of the project is to measure the hyperfine splitting of the energy level of the muonic-hydrogen ground state (*i-p*)1S by inducing a 6778 nm laser-stimulated singlet-to-triplet transition to lead to information about magnetic structure and polarizability of the proton (Bakalov *et al.* 1993 *Phys. Lett. A* 172 277). The aim is that the development and operation of the tunable distributed feedback quantum-cascade lasers will ultimately lead to the deployment of these sources at research centres for various other research applications.

Within limits these lasers can be designed and constructed to provide intense coherent light through the infrared and so be customized for a plethora of applications in science and medicine. At TUM Raiteri has operated sources at 6770–6790 nm with a linewidth of <0.07 nm and tuning precision that is better than 0.007 nm. Focused power densities of more than  $10^7 \text{ W cm}^{-2}$  in 100 ns pulses have been demonstrated.

When the laboratory in Trieste is complete the project will be available for participants from the developing nations. We are hopeful that this will seed high-level and challenging optical research, particularly in African centres.

# US committee promotes ICO programmes

**The US continues to support international optics and photonics activities through its Advisory Committee.**



Prof. Iam-Choon Khoo, USAC/ICO chair and appointed ICO vice-president by the IEEE/LEOS.

US involvement with the ICO is promoted not only through professional societies but by the active and effective US Advisory Committee (USAC), which operates through the US National Academy of Sciences (NAS). The chair of USAC/ICO rotates between the different member societies. Currently the post is held by Prof. Iam-Choon Khoo, appointed ICO vice-president by the IEEE/LEOS. The committee is coordinated by Kathie Bailey Mathae, director of the Board on International Scientific Organizations of the US National Academies – an entity that evaluates opportunities for international scientific research collaboration and strengthens US participation in international scientific, engineering and medical organizations.

While IEEE/LEOS, the Optical Society of America (OSA), and SPIE all participate with ICO as individual societies, they and other NAS representatives work together on the USAC promoting international and domestic optics and photonics, and supporting and augmenting ICO programmes at an international level.

USAC supports ICTP's Winter College in Optics by funding two lecturers, and efforts are being made to expand US support. Kathie Bailey Mathae and a representative from IEEE/LEOS joined the Trieste System on Optical Sciences and Applications (TSOSA) advisory committee this year in search of more opportunities to further strengthen ICTP's educational and research activities.

The committee also supports the Education and Training in Optics and Photonics (ETOP) conference – a biennial international conference dedicated to the exchange of ideas and experiences related to education and training in optics and photonics. ETOP – a joint initiative between ICO, OSA and SPIE – brings together leading optics and photonics educators and training personnel from all levels and orientations to discuss and learn about new developments and approaches to teaching in these fields. USAC will help a number of Americans to attend the 2009 conference in St Asaph, Wales, through a grant from the US National Science Foundation.

USAC/ICO has also supported UNESCO's Active Learning in Optics and Photonics workshops – the next of which will be held this year in Bogota, Colombia, on 23–27 June.

In 1998, the National Research Council (NRC) in the US published a report entitled *Harnessing Light, Optical Science and Engineering for the 21st Century*, which highlighted seven major areas where breakthroughs were taking place: information technology and telecommunications; healthcare and life sciences; optical sensing, lighting and energy; optics in manufacturing; manufacturing of optical components and systems; and optics research and education. USAC believes that the time has come to update this report and is working with the NRC and US funding agencies to further this goal.

**Kathie Bailey Mathae**

## PHOTONICS-2008 pulls in a large crowd

**Indian photonics event brings together more than 550 participants from all over the world.**



From left: PHOTONICS-2008 general chairs Prof. A Sharma and Prof. B Pal, and C K N Patel – chief guest.

The Fiber Optics Group at the Indian Institute of Technology in Delhi (IITD) organized PHOTONICS-2008, the 9th international conference on fibre optics and photonics, on 13–17 December 2008 in New Delhi.

The conference inauguration was a glittering affair, presided over by IITD director Prof. S Prasad, in the institute's Dogra Hall on the evening of 14 December. Dr C K N Patel of CO<sub>2</sub> laser fame and former executive director of Bell Laboratories presented the keynote address entitled "All about infrared lasers and applications". All technical sessions and plenary talks were held at the India Habitat Convention Center.

The conference focused on emerging topics such as nanophotonics, biophotonics, plasmonics, ultrafast optical processing, as well as a general focus on guided wave optics covering both fibre and integrated optics, which have revolutionized the general area of photonics. The internet revolution and deregulation of the telecoms sector have substantially accelerated this

unprecedented growth in photonics.

This conference is held biennially in India. The first was held at IISc Bangalore under the name CEOT'92, and was renamed PHOTONICS in 1996 when it was held at the Indian Institute of Technology (IIT) Madras. This year the conference was preceded by a series of short courses held at the IIT Delhi on certain contemporary topics like microstructured optical fibres, silicon photonics and photonic technologies for quantum information processing. All were delivered by outstanding researchers and speakers.

At the end of the conference the following two special awards intended to foster technological development were granted: the Photonics Endowment Prize, established in 2004 for the best device-oriented paper from an Indian institution or laboratory; and the IITD-FOS award, established by the IIT Delhi and the company Fiber Optic Services of Mumbai, for the best technology-oriented paper with potential for commercialization from India. >>



The first award was given in 2008 to A Kumar De, D Roy and D Goswami from the IIT Kanpur, for their work on stable optical trapping of nanoparticles aimed towards trapping single molecules. The IITD-FOS award was shared by D Ghosh *et al.* for the collaborative work between CGCRI of Kolkata, India, and Heriot-Watt University, Scotland, which led to the poster “Supercontinuum Generation in Highly non-linear microstructured silica fiber”, and by S K Majumdar *et al.* from RRCAT, Indore, India, for the poster presenta-

tion entitled “In-vivo diagnosis of human oral cancer using near infra-red Raman spectroscopy”. Several cash awards were offered by OSA, IEEE/LEOS and SPIE for other outstanding papers by students. With more than 550 registered participants from all over the world, and a concurrently technical exhibition consisting of 24 exhibition booths, the conference was a great success in technical content and overall organization.

**Bishnu Pal and Anurag Sharma, conference general chairs**

## Young scientists get the chance to shine

**The ICO is introducing a new award to recognize outstanding scientists in optics and photonics.**

In 2005 the International Union of Pure and Applied Physics (IUPAP) created the Young Scientist prizes for its commissions. The ICO, as an affiliated commission of IUPAP, decided in 2008 to adopt the IUPAP Young Scientist Prize in Optics to recognize the scientific achievements of outstanding young scientists in applied optics and photonics. The prize will be awarded annually to a scientist with a maximum of eight years of research experience (excluding career interrup-



tions) following their PhD. The winner receives a medal prepared by IUPAP and €1000. The prize will be handed out at a major ICO meeting, where the recipient also gives an invited presentation.

Nominations for the 2009 IUPAP Young Scientist Prize in Optics are now solicited. The deadline for nominations is 15 July. General rules and full details of the nomination and selection procedures are available on the ICO website at [www.ico.optics.org](http://www.ico.optics.org). Information can also be obtained from the chair of the prize committee, Prof. Ari T Friberg ([ari.friberg@tkk.fi](mailto:ari.friberg@tkk.fi)).

## Contacts

International Commission for Optics ([www.ico-optics.org](http://www.ico-optics.org)).

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## Forthcoming events with ICO participation

Below is a list of events with ICO participation that are coming up in 2009. For further information, see [www.ico-optics.org/events.html](http://www.ico-optics.org/events.html).

### 13–16 April 2009

#### VI. International Workshop TecnoLaser 2009 and II. Meeting Optics, Life & Heritage

La Habana, Cuba

Contact (TecnoLaser): Justo Ravelo Triana, tel +53 7 209 3920. Contact (Optics, Life & Heritage): Angel Augier, German Muniz, tel +53 7 878 5018, [augier@instec.cu](mailto:augier@instec.cu), [muniz@electrica.cujae.edu.cu](mailto:muniz@electrica.cujae.edu.cu), [www.ceaden.cu/tecnolaser/index\\_ing.asp](http://www.ceaden.cu/tecnolaser/index_ing.asp)

### 27–29 May 2009

#### 4th Asian and Pacific Rim Symposium of Biophotonics (APBP 2009)

Jeju Island, Korea

Contact: Donghyun Kim, tel +82 2 2123 2777, fax +82 2 313 2879, [kimd@yonsei.ac.kr](mailto:kimd@yonsei.ac.kr), [www.apbp2009.org](http://www.apbp2009.org)

### 11–14 June 2009

#### 12th International Conference on Photorefractive Materials, Effects and Devices – Control of Light and Matter

Responsibility for the accuracy of this information rests with ICO. President: M L Calvo, Universidad Complutense de Madrid, Departamento de Óptica, Facultad de Ciencias Físicas, Ciudad Universitaria s/n, E 28040 Madrid, Spain; [mcalvo@fis.ucm.es](mailto:mcalvo@fis.ucm.es). Associate secretary: Gert von Bally, Centrum für Biomedizinische Optik und Photonik, Universitätsklinikum Münster, Robert-Koch-Straße 45, 48149 Münster, Germany; [Ce.BOP@uni-muenster.de](mailto:Ce.BOP@uni-muenster.de).

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Contact: Cornelia Denz, tel +49 251 83 33516, fax +49 251 83 39811, [denz@uni-muenster.de](mailto:denz@uni-muenster.de), [www.pr09.de](http://www.pr09.de)

### 21–24 June 2009

#### Nanophotonics Down Under 2009: Devices and Applications

Melbourne, Australia

Contact: Min Gu, tel +61 3 92148776, fax +61 3 921 45435, [mgu@swin.edu.au](mailto:mgu@swin.edu.au), [www.smonp2009.com](http://www.smonp2009.com)

### 5–7 July 2009

#### Education and Training in Optics and Photonics, ETOP 2009

St Asaph, North Wales, UK

Contact: Sonja Hardy, tel +44 1745 535100, [sonja.hardy@optictchnium.org](mailto:sonja.hardy@optictchnium.org), [www.etop.org.uk](http://www.etop.org.uk)

### 31 August – 3 September 2009

#### International Conference: Micro- to Nanophotonics II – ROMOPTO 2009

Sibiu, Romania

Contact: Valentin Vlad, tel +40 21 457 44 67, fax +40 21 457 4479, [v\\_i\\_vlad@yahoo.com](mailto:v_i_vlad@yahoo.com), [www.infim.ro/ROMOPTO2009](http://www.infim.ro/ROMOPTO2009)