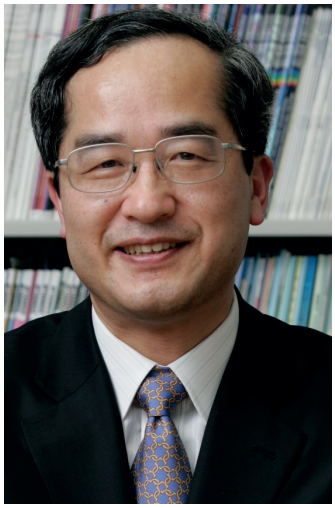
NEWSLETTER

COMMISSION INTERNATIONALE D'OPTIQUE ● INTERNATIONAL COMMISSION FOR OPTICS

ICO President leading the way to becoming a scientific union

Yasuhiko Arakawa foreword to the ICO Strategic Plan 2017–2022.



Since its inception in 1947, the ICO has served the international community of optics and photonics by fostering an exchange of information through scientific events, publications, topical schools, and technical committees with emphasis on the developing world. We contribute toward the development of the science and technology of optics and photonics as well as its application for scientific and societal purposes.

The ICO recognizes distinguished professionals in optics and photonics with three annual awards: the ICO Prize, the ICO Galileo Galilei Award, and the ICO/ICTP Gallieno Denardo Award. As of 2005, the ICO also administers the IUPAP Young Scientist Prize in Optics.

The ICO structure has always been similar to that of the ICSU Union, consisting of 53 Territorial Committees, originally named National Committees, and 7 International Member Societies. The Territorial Committees are missioned to be representative of optics and photonics activity in a given geographical territory and to support its total financial independence. The ICO is currently a Scientific Associate of ICSU and an Affiliated Commission of IUPAP.

Optics and photonics have been identified as a key science and technology for addressing the challenges of society in the 21st century. Optics and photonics have primarily been based on physics however, many other disciplines have evolved and are now deeply connected such as mathematics, geodesy, chemistry, biology, art, and engineering.

To further our contribution to the evolution of human society and culture, we believe there is a need to scientifically expand optics and photonics by emphasizing the interaction with these disciplines. In light of this, the ICO is now in the process of applying to become a scientific union. We ask all scientific communities to recognize the significance of optics and photonics and to support the ICO to become one of the ICSU union members.

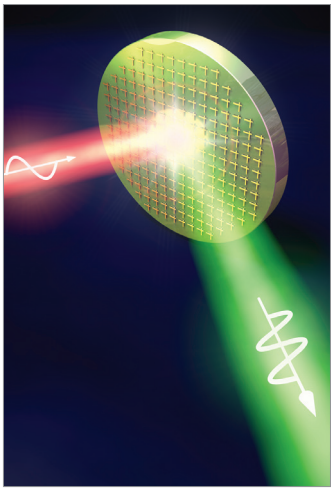
Yasuhiko Arakawa, ICO President, 2014–2017.

ICO Prize 2016 awarded to Andrea Alú

University of Texas, USA.

Prof. Andrea Alù, Temple Foundation Endowed Professor #3 at the University of Texas at Austin, has been awarded the ICO Prize 2016 "for his groundbreaking work on metatronics for ultrafast electronics and the localization of optical radiation in structured materials". He is an internationally recognized leader in nano-optics, nanophotonics, plasmonics, metamaterials, material science, physics and engineering, given his inventions and large number of outstanding contributions to research and education. He has a prolific research activity, as evident from his long list of publications in highly reputable scientific journals and patents, and his outstanding series of prestigious recognitions for his research activity, which include the NSF Alan T Waterman award (2015), the Edith and Peter O'Donnell Award in Engineering from TAMEST (2016), the OSA Adolph Lomb Medal (2013), and the URSI Issac Koga Gold Medal (2011). He is also a Simons Investigator in Physics and an IEEE AP-S Distinguished Lecturer.

Over the past few years, Prof. Alù has made an important number of seminal contributions to the conception, modelling and application of nanostructured artificial materials and metamaterials to mold electromagnetic waves, light and sound in exotic ways, going beyond the limitations and challenges associated with the use of natural materials. During his research activity, he has introduced several powerful concepts in optics, material science, physics and engineering, spanning from basic science to applied technology. In his seminal work on metatronics, optical nanocircuits and nanoantennas, he put forward a powerful paradigm to translate the concepts of radio-frequency circuits and antennas to nanostructures, effectively transforming optical signal processing, computing and communications [*Nat. Phot.* 2, 307 (2008)]. During the past few years, he has been able to bridge the relevant engineering concepts at the basis of antennas and modular circuitry to the nanoworld, envisioning new nanodevice functionali-



ties that can process, transform and control light signals in unprecedented ways and with sub-diffractive resolution. In a recent paper [*Science* 343, 160 (2014)], he and co-authors proposed the application of these concepts to realize analog computation in a subwavelength metamaterial layer, which may lead to ultrafast, ultralow-energy opto-electronics.

Prof. Alù's research in the area of plasmonic nanoparticles and metamaterials has also significantly advanced our understanding of the unusual interactions of light and matter, and the possibility of manipulating scattering, refraction, reflection, absorption and emission of light, by controlling at the nanoscale the optical wavefront. In a series of seminal papers on these topics, he has proposed several opportunities offered by metamaterials to enhance nonlinearities, induce optical magnetism and chirality in nanoclusters and nanostructured optical materials [*Nat. Comm.* 3, 870 (2012), *Nat. Nanotech.* 8 (2013)]. More recently, he extended these concepts to control and manipulate the optical wavefront over planar arrays of these elements, i.e., optical metasurfaces [*Phys. Rev. X* 6, 041008 (2016)]. In this context, he has been exploring over the years the possibility of enriching the optical metamaterial platform with new degrees of freedom, which include spatio-temporal modulation [*Nat. Phys.* 10, 923 (2014)], gain [*Phys. Rev. X* 6, 041018 (2016)] and large material nonlinearities [*Nano Lett.* 11, 5514 (2011)].

In this area, Prof. Alù has also significantly contributed to the concept and realization of giant enhancement of the nonlinear response of optical materials using hybrid metamaterials. He and his co-authors introduced the concept of controlling material resonances and electromagnetic resonances on the same material platform, realizing unprecedented levels of nonlinearities in condensed matter systems. This concept [*Nature* 511, 65 (2014)], demonstrated unprecedented, giant nonlinear response at mid-infrared wavelengths, many orders of magnitude larger than what available in any natural material platform, enabling concentrated nonlinear optical responses amenable for frequency generation, ultrafast optical switching and modulation, integrated nanophotonic systems [*Optica* 3, 283 (2016)].

ICO evolving towards an ICSU Union

Update on the process of application to ICSU.

Contribute your ideas to the **ICO's mission and vision to become a Union**

Visit the survey site **www.surveymonkey.com/r/CX95WLP**

As directed by the ICO General Assembly in 2014, the ICO Bureau has been working on the application to ICSU to become the International Union of Optics and Photonics (IUOP). The creation of a union will greatly enhance the impact and recognition of optics as a discipline and, consequently, it will have a positive impact on optics education, industries, and society in general. Ultimately, the success of the new union will depend on the interests of its members and their willingness to become involved in both old and new initiatives.

In 2015, the ICO Bureau created a working group consisting of the ICO executive committee members, the ICO past-president, Maria L Calvo, and the ICO past-secretary-general, Pierre Chavel.

The ICO working group needs your help to define the mission and vision of the new International Union of Optics and Photonics. We need to answer some specific questions about our role within ICSU. I have prepared a survey in Survey Monkey, with six crucial questions in the application with which we would particularly like your help. Please visit the Survey Monkey link at www.surveymonkey.com/r/CX95WLP to share your vision for our new union.

The ICO working group has gathered application procedure information and has initiated actions to obtain supporting letters from ICSU unions and national members. Currently, we have supporting letters from the International Union of Biological Sciences (IUBS), the International Union of Radio Science (URSI), the International Union of Material Research Societies (IUMRS), the International Union of Physical and Engineering Sciences in Medicine (IUPESM), the Mexican Academy of Sciences, the National Research Council of Italy, the National Council of Scientific Research of Spain, the Deutsche Forschungsgemeinschaft (DFG, Germany), the Chinese Academy of Sciences, the Royal Society of New Zealand, and the Science Council of Japan. We are confident that we will soon receive support from the Royal Academy of Sciences in the UK. The ICO working group has also prepared a draft of a Strategic Plan 2017–2022 for consideration by the General Assembly. The document is posted online.

We ask all ICO territorial committees to ask the ICSU representative in their country to support the ICO initiative. For that purpose, the ICO secretariat is ready to provide you with a list of the ICSU contacts in your respective territories, along with a template letter requesting the support. We are also providing a rationale in support of our application. Please be aware that we will need to promote the participation of your ICSU representatives in the ICSU General Assembly in Taipei in 2017. They can delegate their vote to another attending delegate in favour of our application. In the case that the ICSU delegation of your territory cannot attend, we suggest that they delegate their vote to the German DFG delegation, one of the largest supporters of ICSU programmes and activities.

On behalf of ICO, I thank you for your participation in the survey and outreach.

Angela M Guzmán, ICO Secretary General 2008–2017.

IUPAP Young Scientist Prize in Optics 2016

Laura Na Liu, University of Heidelberg, Germany, is this year's recipient.

Laura Na Liu, Professor at the Kirchhoff Institute of Physics, University of Heidelberg, and Group Leader at the Max-Planck Institute for Intelligent Systems, Germany, is the recipient of the 2016 IUPAP Young Scientist Prize in Optics for "outstanding contributions to nano-optics, nanophotonics, nanoplasmonics, and metamaterials".

She graduated with a BS in physics from Jilin University, China, and a MS in physics from the Hong Kong University of Science and Technology. She obtained her PhD in physics with "summa cum laude" from the University of Stuttgart, Germany, in 2009. In 2010, she was postdoc at the Lawrence Berkeley Lab, University of California, Berkeley, USA. In 2011–2012 she was Texas Instruments Visiting Professor at the Electrical Engineering Department of Rice University, Houston, TX, USA. Since 2012, she is the leader of the Smart Nanoplasmonics group at the Max Planck Institute for Intelligent Systems, Stuttgart, Germany, and in 2015 she became Full Professor at the Kirchhoff Institute of Physics of the University of Heidelberg. Her research group focuses on developing sophisticated and smart plasmonic nanostructures for gaining precise insight into cell biology and catalytic chemistry.

She has received multiple awards: between them a Chinese Government Award for outstanding students abroad in 2008. In 2012, she was awarded the Sofja Kovalevskaja Award of the Alexander von Humboldt Foundation, which provides young researchers with up to €1.5 million as risk capital for innovative projects at an early stage of their careers. Na Liu proposed to use nanoplasmonics to observe biological and chemical processes at the level of individual particles, by combining gold nanoparticles with DNA and observing the dynamics of chemical reactions with high-resolution microscopes. She was awarded the Elisabeth Schiemann-Kolleg Fellowship of the Max Planck Society and the Heinz Maier-Leibnitz Prize of the Deutsche Forschungsgemeinschaft (DFG) in 2013. In 2014, her project "dynamic nanoplasmonics" was awarded a Starting Grant (€1.5 million) of the European Research Council (ERC). During the International Year of Light, the European Optical Society (EOS), awarded her with the Light 2015 Young Woman in Photonics Award.

Example of her work is the creation of a "nanowalker" consisting of a gold nanocylinder with DNA feet that can walk across a DNA origami platform. The movements of the nanowalker can be traced by measuring plasmon resonances in the gold nanocylinder, and the walker's position by monitoring spectral changes resulting from the interaction with circular polarized light.

ICO 2016 Galileo Galilei Award

Guillermo Kaufmann, Argentina.

Guillermo H Kaufmann, Professor of Physics with the Universidad Nacional de Rosario in Buenos Aires, Argentina, is the recipient of the ICO Galileo Galilei award for 2016. Kaufmann, also Chief Scientist of the Argentinean National Council for Scientific and Technical Research and Head of the Optical Metrology Laboratory at the Instituto de Física Rosario, received his DSc degree in physics in 1978 from the University of Buenos Aires. During the last eight years he has served as the director of the French Argentine International Centre of Information and Systems Sciences. He receives the ICO Galileo Galilei award "for the development of novel speckle interferometry techniques and their application in experimental mechanics, materials technology and nondestructive testing".

Kaufmann was a post-doc at the National Physical Laboratory, UK, in 1978 and at the University of Michigan, USA, in 1984. He was a visiting researcher at the Swiss Federal Institute of Technology at Lausanne in 1989 and at the University of Cambridge in 1990. Since 1992, he has had several research stays at Loughborough University, UK, at the Centro de Investigaciones en Optica, México. In 1993, he obtained a research award from the government of Japan to visit the Mechanical Engineering Laboratory in Tsukuba.

Prof. Kaufmann has edited two books, and authored more than 170 scientific papers and three book chapters. His major research interests include the development of coherent optics techniques for strain analysis and nondestructive testing, speckle metrology, phase shifting interferometry, fringe analysis and digital image processing. He was the coordinator of the Optics Division of the Asociación Física Argentina and the Argentine representative to the International Commission for Optics. He is a member of the Editorial Board of *Optics and Lasers in Engineering*, a former member of the Editorial Board of *Optics & Photonics News*, and a topical editor of *Applied Optics*. He is a fellow of SPIE and of the OSA. In 2003, the Secretary of Science and Technology of Argentina awarded him the Bernardo Houssay Prize for his contributions in the field of optical engineering. He is the recipient of the 2015 Chandra S Vikram Award for Optical Metrology awarded by SPIE.

Towards a Brighter Mexico

A Technology Roadmap for Optics and Photonics: In search of a location for the Mexican Photonics Cluster

On 9 November, The International Commission for Optics, the Academia Mexicana de Óptica – ICO Mexico Territorial Committee for Optics, the Red Iberoamericana de Óptica and ProMéxico presented, "Towards a Brighter Mexico: A Technology Roadmap for Optics and Photonics", the first Mexican Photonics Initiative (MPI) roadmap for the optics and photonics sector development in Mexico; which is available for download at the ProMéxico website www.promexico.mx/documentos/biblioteca/hacia-un-mexico-mas-brillante.pdf.

"Towards a Brighter Mexico" is intended to serve as a starting point to create a sustainable and competitive photonics ecosystem jointly coordinated by industry, academia and government. This roadmap focuses on four areas: energy, telecommunications and information technologies, health and medicine, and advanced manufacturing; and proposes a timeline for building strong capabilities in specific technologies like light-emitting diodes (LEDs), optical fibres, photovoltaic cells, lasers and detectors. It also includes several recommendations such as the establishment of the Mexican Photonics Cluster to host not only R&D laboratories and photonics related companies, but also cutting-edge scientific facilities like an ultra-high power laser, a photonics manufacturing institute and a certification centre for photonics products. Thus, Mexico joins other major economies in the world that have already recognized the importance of optics and photonics in the future development.

Contacts

Forthcoming events with ICO participation

Below is a list of 2017 events with ICO participation. For further information, visit the new ICO webpage at http://e-ico.org/node/103.

13–24 February 2017
Wintercollege on Optics
Trieste, Italy
Contact: Joe Niemela
tel: +39-040-2240555
niemela@ictp.it
http://indico.ictp.it/event/7920/

4–7 April 2017
International Conference on Optical and Photonic Engineering (icOPEN 2017)
Singapore
Contact: Anand Asundi
tel: +65-67905936
d-cole@ntu.edu.sg
www.icopen.com.sg/

8–12 May 2017
International Conference on Applications of Optics and Photonics (AOP 2017)
Faro, Portugal
Contact: Manuel da Costa
tel: +35-1253604070
president@optica.pt
www.optica.pt/aop2017

29–31 May 2017
ETOP 2017: The 14th International Conference on Education and Training in Optics and Photonics
Zijingang Campus, Zhejiang University
866 Yuhangtang Road, Hangzhou, Zhejiang Province, 310058 P. R. China
Contact: Dr. Yaocheng Shi
tel: +86-13732241781
fax: +86-571-87951617
yaocheng@zju.edu.cn

21–25 August 2017
24th Congress of the International Commission for Optics (ICO-24)
Tokyo, Japan
Contact: Yasuhiko Arakawa
tel: +81-3-5452-6245
arakawa@iis.u-tokyo.ac.jp
http://ico24.org

11–15 September 2017
213th International Conference on Correlation Optics "Correlation Optics '17"
Chernivtsi, Ukraine
Contact: Oleg V Angelsky
tel: +380372244730
o.angelsky@chnu.edu.ua
http://ptcsi.chnu.edu.ua/en/corropt17

Responsibility for the correctness of the information on this page rests with ICO, the International Commission for Optics; http://www.e-ico.org/. *President*: Prof. Yasuhiko Arakawa, Director, Collaborative Institute for Nano & Quantum Information Electronics, University of Tokyo, Japan, arakawa@iis.u-tokyo.ac.jp.
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