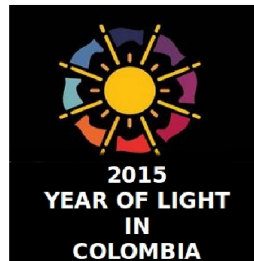


Colombia in the International Year of Light



**INTERNATIONAL CONFERENCE
Colombia in the International Year of Light
June 16-19 2015
Bogota and Medellin, Colombia**

Sponsored by: Universidad Nacional de Colombia;
Universidad de los Andes; Universidad de
Antioquia; Universidad de Cartagena; Academia
Colombiana de Ciencias Exactas, Físicas y
Naturales; Ministerio de Educación Nacional;
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Tuesday 16 June 2015 - Friday 19 June 2015

Scientific Programme

1. Background

A group of scientists from several countries presented to UNESCO on May 16, 2012 the initiative to promote global activities dedicated to light [1]. The United Nations General Assembly welcomed the initiative and agreed to dedicate 2015 to the celebration, calling it the **International Year of Light and Light-based Technologies** [2,3]. Scientists promoters are: Ana María Cetto of the National Autonomous University of Mexico (UNAM), Yanne Chembo Kouomou African Physical Society, John Dudley, president of the European Physical Society, Anthony M. Johnson, former president of the Optical Society and representative of the International Centre for Theoretical Physics (ICTP), and H. Philip Stahl, president-elect of the International Society for Optics and Photonics (SPIE). The UN agreed to focus the celebration to promote educational aspects and sustainable development based on optics and photonics. It also decided to highlight new applications of light in archeology and cultural heritage and connections with areas such as art and philosophy.

The choice of 2015 for the celebration is supported, among other things, by the fact that this year marks 1000 years of the work in optics by Ibn Al-Haytham (1015), 200 years after the publication by Augustin-Jean Fresnel of an article in which he proposed the wave nature of light (1815) and 150 years of the work of James Clerk Maxwell on electromagnetism (1865), which paved the way for modern technologies based on electromagnetic waves, such as lasers and mobile phones. The year 2015 is also the first centenary of the introduction of the speed of light as an essential part of the equations of Einstein's general theory of relativity (1915), considered the most complete description of space and time, and 50 years of the discovery (1965) of the cosmic background radiation (electromagnetic echo of the big bang) by Arno Penzias and Robert Woodrow Wilson and of Charles Kao's achievements concerning the transmission of light in fibers for optical communication (1965) [3] [4].

2. Relevance to Colombia

At the meeting of the UN, more than 30 member countries approved the initiative. Consequently, it is a mandate for Colombia. For its part, the Colombian scientific community recognizes the importance of light to improve the standard of living of its population and for overall economic development. It is also aware of the limitations in the teaching of optics and related disciplines at different levels of education. The event is a unique opportunity to discuss these problems and promote initiatives to raise the level of optics and related issues in the country. It should be emphasized that the issue touches various sciences, as experimentation with light and applications thereof cannot be made independently of matter; indeed, the production and detection of light and its propagation and manipulation require material stuff. The connections with mathematics, atomic and molecular physics and other areas of physics, chemistry and biology are also evident. Science in the XXI century unfolds in close collaboration between diverse disciplines. Given the above, the International Year of Light is of interest not only to specialists in optical science in particular and physicists and scientists in general, it is of the interest of all society. The relevance of the celebration in different fields of science and technology, education, art, philosophy and humanities, is especially true in Colombia.

Arguably the

light is central protagonist of modern technology and modern life. The nuclear magnetic resonance imaging, routinely used for medical diagnostics, is based on the manipulation of the nuclear spins by radio frequency photons. Laparoscopic surgery is done on a daily basis. Fluorimetry allows early detection of small cancers. The storage systems on optical discs are now obsolete, but huge advances are provided with computers based on optical circuits. Satellite systems based on radio waves and microwaves are already part of everyday life; from evil military communication applications to many beneficial applications, such as satellite weather prospecting, mining, agriculture, disaster prevention, optics plays a fundamental role. The observation of the stars through telescopes initiated by Galileo is already in space; satellite telescopes Cobe, Planck and Hubble are giving us unsuspected information about the universe, and have completely changed our understanding of it. New cosmological observations, energy, dark matter and the motions of distant stars are challenging our current state of knowledge. Identification systems and light-based encryption are a reality, just to mention those based on fingerprints and iris. The useful tool called GPS integrates these technologies and uses results of the special theory and the general theory of relativity. These are all issues that are on the agenda, in which there are great challenges for the scientific community.

The year 2005 was dedicated to celebrate 100 years of the formulation by Einstein's special theory of relativity. It is expected that the call by the United Nations, which declared 2015 as the International Year of Light and light related technologies, will constitute a similar success story. Colombia is organizing a number of activities in celebration of the International Year of Light, similar to those being held in many countries. The main promotion will surely be made by educational institutions, scientific societies of physicists, astronomers, biologists and chemists, as well as research groups and other organizations directly involved with the study of light and its applications. But it would be desirable for the national government to get involved in a meaningful way; similarly, authorities of the departments and municipalities should, whenever possible, lead and fund the various initiatives.

This description has two purposes. First, draw attention to the importance of the celebration organized by the United Nations. Second, call attention to an activity being led by the **Colombian Academy of Exact, Physical and Natural Sciences**. It is proposed to hold an international event that will bring together Colombian researchers in optics and related fields, with the presence of international scientists who have made important contributions in some of the prominent fields in the call.

This event will not compete with other initiatives such as conferences and other outreach activities that will certainly take place in Colombia throughout 2015.

3. Description of the activities

It is proposed that the conference takes place from Tuesday, June 16 through Friday June 19, 2015. The program will be organized in such a way that on **Tuesday June 16** the activities will be carried out at the National University of Colombia in Bogotá, while on **Wednesday June 17**, they will be moved to the Universidad de los Andes. **Thursday June 18** and **Friday June 19 the conference will move to Medellín**, and activities there will be organized by the University of Antioquia and the National University of Colombia, Medellín branch.

A memoir based on the discussions and conclusions of the event will be published.

3.1. Speakers

In convening the International Year of Light and Light-based Technologies (IYL 2015) by the United Nations, several anniversaries related to light were mentioned. It was also suggested to focus celebrations on education, sustainable development from the optics and photonics points of view, and on new applications of light to find solutions to global challenges in energy, education, agriculture and health. We therefore propose to invite several personalities who dedicate their activity to some of these issues.

Professor Alain Aspect. Augustin Fresnel Chair, Institut d'Optique, France. Winner of the UNESCO Bohr gold medal, nominated for the Nobel Prize in physics in 2011 and 2013. Known for his experiments to settle the dispute between Bohr and Einstein about meaning of the wave function [5].

Professor Suzanne Fery-Forgues. University of Toulouse, France. Works on innovative methods for the detection of cancerous tumors based on fluorescence spectroscopy [6].

Professor Jean-Pierre Galaup. CNRS, Laboratoire Aimé Cotton, France. Carries out recognized experimental research in different applications of optics and in the use of materials for processing information. His main contributions concern applications of optical tweezers and photon echoes [7].

Professor Alejandra Catalina Valencia. University of The Andes, Bogota,

Colombia. Experimental quantum optics focused on studying the generation, characterization and manipulation at the quantum level of various light sources, and applications in quantum information [8].

Professor Serge Haroche. The College de France; Nobel Prize in Physics 2012. His experimental work has to do with control and measurement of photons trapped through interaction with Rydberg atoms in a trap stand [9].

Professor John Henry Reina. University of Valle, Colombia. Recent work relates to the use of light in the quantum control of molecules [10].

Professor Ana Maria Rey. JILA laboratory and the University of Colorado, Boulder, USA. She is a Colombian born scientist who has earned international awards. Her contributions consist of different theoretical methods to study certain related interfaces between atomic and molecular physics and optics, condensed matter physics and science of quantum information phenomena [11].

Professor Paulo Soares Guimarães. Universidade Federal de Minas Gerais, Brazil. He is recognized for his theoretical and experimental contributions in the application of photonic crystals [12].

Professor William Unruh. University of British Columbia, Canada. He has contributed to our understanding of gravity, black holes, cosmology, and quantum fields in curved spaces, including the discovery of the so-called Unruh effect and Unruh radiation [13].

Professor David Wineland. The National Institute of Standards and Technology and University of Colorado, Boulder, USA. Nobel Prize in Physics 2012. His experimental works includes methods to control and measure charged atoms, or ions, through their interaction with photons [14].

Professor Alejandro Mira. University of Antioquia, Colombia. Classical Optics. Possible topic: Optical encryption [15].

Professor Boris Rodriguez. University of Antioquia, Colombia. Quantum Optics. Possible topic: Entanglement and decoherence [16].

References

[1] Proposal for the proclamation by the United Nations of 2015 as an international year of light

<http://unesdoc.unesco.org/images/0021/002177/217792e.pdf>

[2] International Year of Light 2015

http://www.eps.org/?page=event_iyol

http://www.un.org/ga/search/view_doc.asp?symbol=A/68/440/Add.2

[3] Year of Light initiative at UN headquarters in New York

http://c.ymcdn.com/sites/www.eps.org/resource/resmgr/events/EPS_PR_lyolPresented_AtUN.pdf

[4] The United Nations proclaims an International Year of Light in 2015

<http://spie.org/Documents/AboutSPIE/PDF/IYL2015-proclamation.pdf>

[5] Dr. Alain Aspect

<http://www.lcf.institutoptique.fr/Groupes-de-recherche/Optique-atomique>

Niels Bohr Medal 2013,

<http://www2.cnrs.fr/presse/communique/3261.htm>

[6] Dr. Suzanne Fery-Forgues

<http://www.itav-recherche.fr/index.php/fr/menu-itavequipsff>

[7] Dr. Jean-Pierre Galaup

https://web-ast.dsi.cnrs.fr/l3c/owa/personnel.frame_infos?p_etat=pe&p_numero_sel=268315&p_i=0&p_nb_res=0&p_numero=0

[8] Dr. Alejandra Catalina Valencia

<http://fisica.uniaandes.edu.co/personal/profesores-de-planta/alejandra-valencia-es>

[9] Dr. Serge Haroche

<http://www.college-de-france.fr/site/serge-haroche/#course>

[10] Dr. John Henry Reina

<https://sites.google.com/a/correounivalle.edu.co/grupo-de-investigacion-tecnologia-informacion-y-complejidad-quantic/>

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<http://jila-amo.colorado.edu/>

[12] Dr. Paulo Sérgio Soares Guimarães

<http://www.fisica.ufmg.br/~pssg/english.html>

[13] Dr. William George Unruh

http://en.wikipedia.org/wiki/W._G._Unruh

<https://www.phas.ubc.ca/users/william-unruh>

http://en.wikipedia.org/wiki/Unruh_effect

[14] Dr. David Wineland

<http://www.nist.gov/pml/div688/grp10/index.cfm>

[15] Dr. Alejandro Mira

<http://www.linkedin.com/pub/alejandro-mira-agudelo/60/290/447>

[16] Dr. Boris Rodríguez

<http://scholar.google.com/citations?user=swUKsPkAAAAJ&hl=en>