United Nations
Educational, Scientific and
Cultural Organization

International
Year of Light
2015

The International Year of Light and Light-based Technologies 2015

A SUCCESSFUL COMMUNITY PARTNERSHIP FOR GLOBAL OUTREACH

FINAL REPORT

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A shadow of the photographer is cast onto a road, leading towards an epic double rainbow sunset

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FINAL REPORT

This report on the International Year of Light and Light-based Technologies 2015 (IYL 2015) has been assembled from information and data provided by a large number of partners and contributors. While the Editorial Team has taken care to ensure the accuracy, completeness and reliability of the information provided, the data that has been compiled in this report cannot be guaranteed to be free of error. In addition, any ideas or opinions expressed are those of the report contributors and do not necessarily reflect the position of the Editorial Team or their employers, the International Year of Light 2015, UNESCO, or any of the other IYL 2015 partners or organisations involved.

SPIE.
P.O. Box 10
Bellingham, Washington 98227-0010 USA
Website: http://spie.org

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The IYL 2015 Final Report was curated by Jorge Rivero González, European Physical Society.
Website: http://light2015.org

This volume was compiled and edited by the Editorial Team:
John Dudley, Université de Franche - Comté - CNRS
Jorge Rivero González, European Physical Society
Joseph Niemela, The Abdus Salam International Centre for Theoretical Physics
Krisinda Plenkovich, SPIE

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INTERNATIONAL
YEAR OF LIGHT
2015

FOUNDING PARTNERS OF THE INTERNATIONAL YEAR OF LIGHT AND LIGHT-BASED TECHNOLOGIES 2015

- American Institute of Physics (AIP)
- American Physical Society (APS)
- Deutsche Physikalische Gesellschaft (DPG)
- European Physical Society (EPS)
- The Abdus Salam International Centre for Theoretical Physics (ICTP)
- IEEE Photonics Society
- Institute of Physics (IOP)
- Light Science & Applications (LSA)
- Lightsources.org
- 1001 Inventions
- The Optical Society (OSA)
- SPIE

Foreword

The International Year of Light and Light-based Technologies 2015 (IYL 2015) was proclaimed at the United Nations General Assembly in December 2013. Under the leadership of UNESCO, IYL 2015 brought together hundreds of national and international partners to raise awareness of the importance of light science and technology in areas such as sustainable development, energy, education, climate-change, and health.

IYL 2015 saw over 13,000 events take place with an impact that reached 147 countries. The diversity of events was remarkable. The Opening Ceremony in Paris in January 2015 set the scene, and throughout the year we saw activities including: education and outreach for students and the public; specialist workshops in science and industry; forums on the historical development of science; conferences on sustainable development; public light festivals and displays; works of art, music, and literature. Events were targeted at all levels—from preschool children learning science for the first time, to politicians, diplomats, and even royalty convening high-level meetings discussing the importance of technology for the future.

When discussions of IYL 2015 first began in 2009 within the scientific community, I don't think that anyone could have foreseen the extent of the worldwide enthusiasm around the theme of light, and neither did we anticipate the many new linkages that would appear between science and art and culture. I feel personally that a major contributor to the success of IYL 2015 has been the fact that the IYL 2015 partners reached out beyond their traditional memberships and audiences to engage more broadly and to make new connections. I would like to thank UNESCO and all our partners and supporters worldwide for their commitment and efforts. And a special word of thanks is due to all our student volunteers who brought their passion and energy to the IYL 2015 organisation.

This report aims to give a synthetic account of IYL 2015, first describing its origins and goals, and then providing a summary of the many events and activities that took place worldwide. The report also contains information on organisation and communications, and it is hoped that these details may provide guidance for others who may wish to organize a similar global outreach initiative in the future.

I believe that everyone involved in IYL 2015 can feel immensely proud of what has been achieved. We can also feel confident that many of the partnerships established during IYL 2015 will continue. It is sometimes difficult to see how we as individuals can contribute to solving issues of global importance, but I believe that the International Year of Light has provided a timely reminder that through our commitment to education and outreach, we can really make a difference.

It is now up to us to build on what we have learned and what we have accomplished during 2015 to continue to work together for the betterment of all.

John Dudley
Chair of the IYL 2015 Steering Committee
July 2016

The International Year of Light and Light-based Technologies 2015

FINAL REPORT / EXECUTIVE SUMMARY

I. BACKGROUND

1. At the request of Ghana, Mexico, the Russian Federation, and New Zealand, an item on the proclamation of 2015 as the United Nations International Year of Light was included in the agenda of the 190th session of the Executive Board of the United Nations Educational, Scientific, and Cultural Organization (UNESCO). 190 EX/Decision 47 invited the Director-General to support all efforts leading the United Nations General Assembly to proclaim 2015 as the International Year of Light. After adoption of 37 C/ Res.25 at the 37th Session of the General Conference of UNESCO, the International Year of Light and Light-based Technologies 2015 (IYL 2015) was proclaimed at the UN General Assembly (A/RES/68/221) on 20 December 2013, requesting that UNESCO, mindful of the provisions of paragraphs 23 to 27 of the annex to Economic and Social Council Resolution 1980/67, inform the Assembly at its seventy-first session on the implementation of the resolution.
2. The organization of IYL 2015 was implemented through the **UNESCO International Basic Sciences Programme (IBSP)** and an operational Global Secretariat hosted at the UNESCO Category I Institute, the **Abdus Salam International Centre for Theoretical Physics (ICTP)**. The choice of ICTP as Global Secretariat was motivated by its strong links with international optics organizations through its Trieste Optical Sciences Advisory Board, and its participation together with IBSP in UNESCO's Active Learning in Optics and Photonics (ALOP) initiative.
3. IYL 2015 provided an unparalleled opportunity to **demonstrate the importance of light science and its applications in contributing to the United Nations 2030 Agenda for Sustainable Development**. In particular, light-based technologies contribute directly to the effective delivery of the Sustainable Development Goals (SDGs), as they provide practical and cost-effective solutions to challenges in areas such as: agriculture and food science, energy and environment, poverty eradication, water purification, combatting diseases, and climate change. Moreover, light science is an inspiring subject to stimulate children's interest in education, and industries based on light in the field of *photonics* and are major economic drivers. A central aim of IYL 2015 was to raise global awareness of the importance of these issues and to stimulate associated capacity building and research in the basic sciences and engineering. In addition, IYL 2015 also promoted themes of visual arts and culture, architecture and light pollution, all of which resonated with the objectives set in the resolution A/RES/68/221.

II. ADMINISTRATIVE MATTERS

4. IYL 2015 brought together **hundreds of national and international partners** in a multi-disciplinary consortium. IYL 2015 was endorsed by a number of scientific unions and the International Council of Science. Amongst the scientific community, the Founding Partners of IYL 2015 were the American Institute of Physics (AIP), the American Physical Society (APS), the German Physical Society (DPG), the European Physical Society (EPS), the Abdus Salam International Centre of Theoretical Physics (ICTP), the IEEE Photonics Society (IPS), the Institute of Physics (IOP), Light: Science and Applications, the lightsources.org International Network, 1001 Inventions, The Optical Society (OSA), and the International Society for Optics and Photonics (SPIE). Patron Sponsors included Bosca, Royal Philips Lighting, the International Association of Lighting Designers (IALD), Thorlabs, and UL. Major associate (Gold+) partners included Axis Lighting, China International Optoelectronic Expo (CIOE), and The International Commission on Illumination (CIE).
5. Governance of IYL 2015 was via a **Steering Committee** that provided overall direction for planning of activities, and an **Advisory Board** that facilitated wide interactions with a range of international partners. Key members of the Steering Committee included: John Dudley (New Zealand, Chair); Ana María Cetto (Mexico, Vice-Chair); Maciej Nalecz (former UNESCO Director, Division of Science Policy and Capacity-

Building 2014-2015, Member); Jean-Paul Ngome Abiaga (UNESCO IBSP, Member); Joseph Niemela (ICTP, Member); Francis Allotey (Ghana, Member). The members of the Steering Committee and Advisory Board came from 25 countries, and participation of women was 35%.

6. Whilst clear governance was necessary to provide a framework to guide international actions, all **citizens around the world were encouraged to participate** in the International Year, and could do so by a simple request to UNESCO IBSP or the Global Secretariat for endorsement of their planned activities. This process was implemented efficiently by establishing national coordinating committees in 94 countries with authorization to endorse local activities. The membership of national committees was approved by the Steering Committee. Not all countries used a formal national committee structure, but rather activities were planned by ad hoc organising committees. In total, IYL 2015 reached 147 countries.

7. IYL 2015 was financed entirely from extra-budgetary resources raised through the actions of the Steering Committee and Global Secretariat. The search for sponsors began in January 2014 after proclamation of A/RES/68/221, and continued until February 2016 at the time of the Closing Ceremony. The diverse nature of potential IYL 2015 participants suggested a strategy of *crowdfunding*, seeking modest funding from a large number of sponsors. A multi-tier sponsorship model was used and support was sought from scientific and other societies, universities and similar organisations, philanthropic foundations, as well as the private sector. Sponsorship contributions ranged from €500 to €50,000. At the end of 2015, IYL 2015 had received financial support from 119 sponsors reaching a total of €550,000 which was placed in a dedicated IYL Global Fund account held at the ICTP Global Secretariat (run by its Office of External Activities). Global Fund budget oversight was provided by the bureau of the Steering Committee which approved all expenditures from the fund. Approximately 55% of sponsorship was from the private sector (industry) with the remainder from public institutions, public-private partnerships, charities, foundations, etc.

8. An **indicative breakdown of expenditure** (including budgeted expenses in 2016) from the IYL 2015 Global Fund is as follows: Opening and Closing Ceremonies (35%); ALOP programme (10%); Conferences at UNESCO Headquarters (10%); Support for Worldwide Events (15%); Administration and Communications (10%); Legacy Actions (20%). Some Founding Partners (notably ICTP, EPS, and SPIE) donated considerable staff time to organise the international programme of IYL 2015, allowing administrative costs to be kept very low. **Global Fund sponsorship, however, was only a very small fraction of the total budget**. Estimates provided by partners for fundraising by national committees, as well as in-kind contributions and volunteer time, suggest a total cost of IYL 2015 exceeding €15 million.

III. ACTIVITIES AND IMPACT

9. IYL 2015 involved a total of **13,168 activities of various types reaching 147 countries**, on all continents including Antarctica. Specific events (e.g. outreach, conferences) were carried out in 129 countries and a further 18 countries issued commemorative stamps or coins or supported IYL in other ways (e.g. in UNESCO or the UN). The figure below shows the distribution of the activities amongst the different UN Regional Groups.

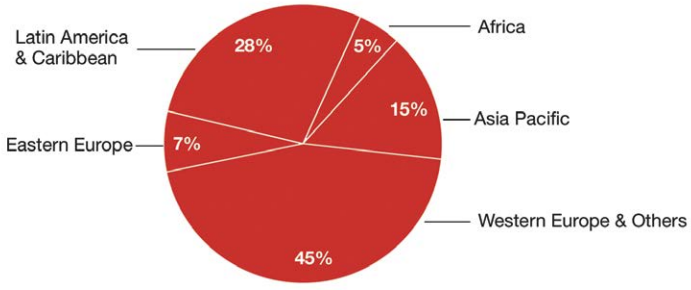


Figure 1. Distribution of IYL 2015 activities within the different UN Regional Groups.

10. An indicative breakdown of the distribution of activities is as follows: Multi-day scientific conferences (30%); Light-themed exhibitions and festivals (25%); One day conferences and special events (22%); Activities in schools (10%); Art and music and light shows (6%); Citizen Science activities (3%); Other e.g. Light-themed competitions, Open Days, Launch Events, Stamps and Coins, etc. (4%). Also see the figure on next page. The estimated reach of all IYL 2015 activities worldwide is estimated to exceed 100 million.

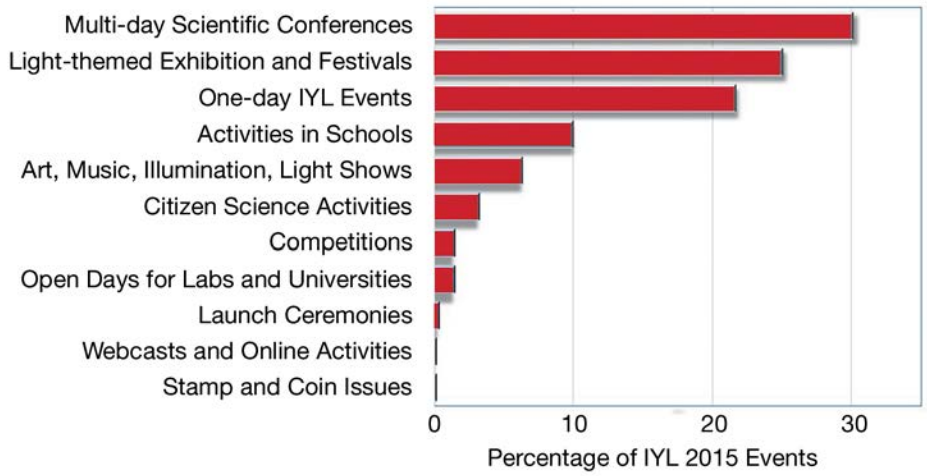


Figure 2. Indicative breakdown of IYL 2015 events by category.

11. The **communication strategy** of IYL 2015 employed a website (light2015.org), a blog (light2015blog.org), as well as a Twitter account (@IYL2015), Facebook and YouTube social media, and a page on UNESCO's website. News dissemination was via UNESCO's Sector for External Relations and Public Information and 28 media partners who were approved by the Steering Committee. Media impact studies were carried out using standard web analytics and media monitoring tools (www.meltwater.com). Key summary statistics are: 2.4 million website visits from 600,000 visitors from 190 countries from 1 October 2014 to 29 February 2016; more than 6,000 tweets resulting in 4 million impressions. Media influence was reported as: 23,000 distinct media mentions (newspapers, online, TV) from 120 different countries. The potential audience (Comscore) of these media mentions is 37 billion, with an equivalent value in terms of paid advertising of USD $348 million.
12. Major attention during IYL 2015 was paid to promoting the **objectives of the 2030 Agenda for Sustainable Development**: education for girls and boys (related to SDG 4); capacity building for innovation with local benefit (related to SDG 9); promoting gender equality in science (related to SDG 5); contributing to means to combat climate change (related to SDG 13), both in terms of developing new technologies to guide policy decision-making, and encouraging solar-based energy or energy efficient LED lighting solutions (related to SDG 7). Emphasis was also placed on awareness raising of how light-based science and technology can improve societies and help them harness the full possibilities of a sustainable life (related to SDG 11) and the importance of light and light-based technologies in achieving poverty alleviation (related to SDG 1).
13. Another significant measure of the impact of IYL 2015 can be seen in the **number and the diversity of the stakeholders** involved, which include representatives of the public and private sectors, actors of civil society as well as scientific academies and research institutions. Reinforcing partnerships across the globe (related to SDG 17) has been a central objective and outcome of the Year. These new collaborations put into place during 2015 have enhanced global knowledge of the importance of science as a central pillar for development, and the particular role of light as a multidisciplinary theme.

IV. DESCRIPTIONS OF HIGH-LEVEL EVENTS WITH UNESCO PARTICIPATION

14. The **IYL 2015 Opening Ceremony** took place on 19-20 January at UNESCO Headquarters in Paris. The 55 speakers included UNESCO leadership, five Nobel laureates, distinguished international scientists, students, NGO representatives, and industry CEOs. The speaker programme was complemented by cultural performances, displays of educational resources, art and music, and an exhibit on the *1001 Inventions and the World of Ibn Al-Haytham* global campaign. The faces of the UNESCO Fontenoy building were also lit for 3 nights in the colours of the Aurora Borealis.
15. The **IYL 2015 Closing Ceremony** took place from 4-6 February 2016 in the city of Mérida, Mexico. A message from the Secretary-General of the United Nations, to close IYL 2015, stressed how "IYL 2015 has shown how the science of light, photonics, and related technologies can promote sustainable development in many fields." The 47 speakers included two Nobel laureates, and interactive Panel Discussions among the 300 participants defined follow-up actions for the future. The Closing Ceremony was accompanied by art events, a high school outreach programme, a film festival, and a light installation at the archaeological site Chichén Itzá.

16. Other high-level events included: two conferences at UNESCO Headquarters as part of the **UNESCO Executive Board** Information Meeting *Future Prospects Initiative* with participation of Nobel laureates William D. Phillips (21 January 2015) and Hiroshi Amano (8 June 2015); participation of the UNESCO Director-General at the launch of IYL 2015 in Algeria (11 April 2015); participation of the UNESCO Assistant Director-General for Natural Sciences at the world's largest photonics conference in Germany (22 June 2015), and at the opening of *The Islamic Golden Age of Science for the Knowledge-Based Society* Conference at UNESCO Headquarters (14 September 2015). IYL 2015 and the theme of Ibn Al-Haytham were also included in the *World Arabic Language Day* programme on Arabic Language & the Sciences held on 18 December 2015 at UNESCO Headquarters.

17. Other significant events of this type also included: the *African Regional Conference and Exhibition on Harnessing Light and Light-based Technologies for Africa's Development* in Accra (Ghana) from 14 to 16 September 2015, organized by the Ghana National Commission for UNESCO; a session on IYL 2015 co-organized by UNESCO took place at the World Science Forum in Budapest on 6 November 2015; a side event to the 2016 ECOSOC Youth Forum held at the UN Headquarters in New York on 2 February 2016 hosted by 1001 Inventions and the Permanent Mission of Saudi Arabia to the UN, in partnership with UNESCO.

V. OTHER HIGH-LEVEL EVENTS AND HIGH-LEVEL SUPPORT

18. Several countries obtained **high-level support and patronage** from Figures of State. Such support included: Queen Letizia of Spain chairing the Spanish Committee of Honour of the International Year of Light; Prince Andrew, Duke of York, serving as Patron of IYL 2015 in the United Kingdom; the President of Ireland, Michael D. Higgins, serving as Patron of IYL 2015 in his country; President François Hollande acting as Patron of the International Year of Light in France. In addition, President Mahama of Ghana provided a *Message for the African Regional Conference and Exhibition on Harnessing Light and Light-based Technologies for Africa's Development*.

19. Several **governments officially recognized** IYL 2015: The National Assembly of Korea passed a resolution in support of IYL 2015 on 16 February 2015; the Puerto Rico House of Representatives passed a resolution in support of IYL 2015 on 1 June 2015; IYL 2015 was highlighted in a speech to the United States Senate on 17 December 2015. In the United Kingdom, two events were organised by the Parliamentary and Scientific Committee during 2015; the closure of the International Year of Light in Andorra was celebrated at the headquarters of the Parliament; Member of the Duma and Nobel Laureate Zhores Alferov spoke on IYL 2015 at the Russian Parliament.

20. The **philatelic programme** of 26 countries celebrated IYL 2015. Stamps were issued by: Algeria, Antigua and Barbuda, Bosnia and Herzegovina, Central African Republic, Equatorial Guinea, Gambia, Grenada, Guyana, Israel, Italy, Kyrgyzstan, Liechtenstein, Maldives, Malta, Mexico, Moldova (Republic of), Montserrat, Portugal, Saint Kitts and Nevis, Sao Tome and Principe, Serbia, Sierra Leone, Spain, The United Kingdom, Uruguay, and the Holy See. San Marino and Spain also issued commemorative coins.

VI. SELECTED THEMES AND EVENTS DURING 2015

N.B. *With such a large number of events taking place during 2015, it is difficult to select highlights without leaving out some that were truly exceptional. Nonetheless, the short selection and descriptions below endeavour to provide a snapshot of how IYL 2015 was implemented around the world.*

21. Many countries chose light as the theme for important **national science education initiatives**. For example: the Week of Science in the Democratic Republic of Congo in April 2015; the National Science Week School Theme in Australia in August 2015; the *National Week of Science and Technology* (SNCT) in Brazil in October 2015; the *Fête de la Science* in France in October 2015; Mexico's 22nd *National Science and Technology Week* in November 2015. Other light-based themes were selected for national or regional focus in, for example, Argentina, the Canary Islands (Spain), the Czech Republic, and New Zealand. Regionally, the European Commission provided €2.85 million for Coordination and Support Actions in 30 European countries to promote the importance of **light science and careers in photonics** to young people, entrepreneurs, and the general public.

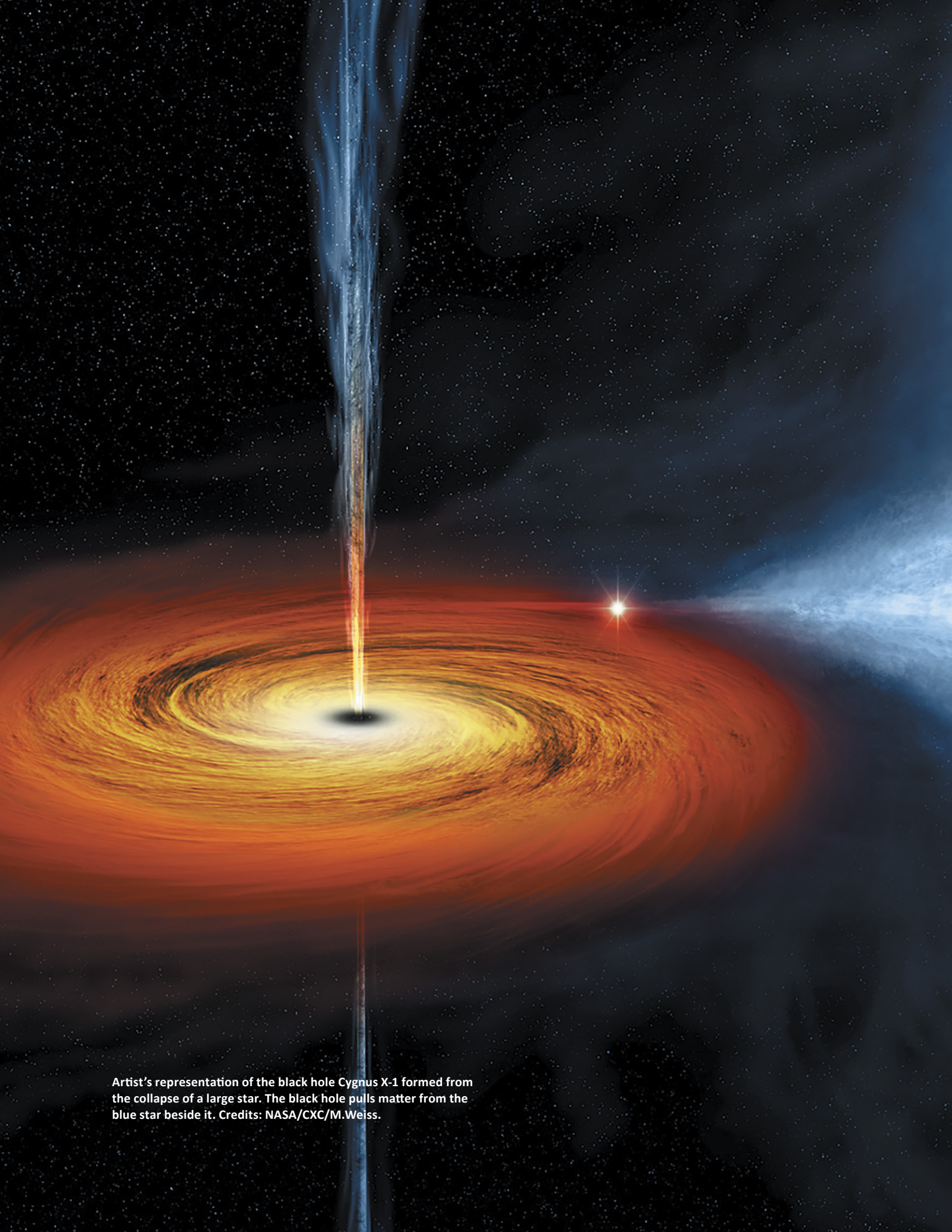
22. Raising the visibility of the basic sciences was a major activity of many partners. The broad theme of light allowed the *European Organization for Nuclear Research* (**CERN**) to carry out awareness-raising activities in the frame of its High Luminosity project to upgrade the large hadron collider, and also to communicate its involvement and support for the *Synchrotron-Light for Experimental Science and Applications in The Middle East* (**SESAME**) light source. CERN also selected light as its theme for the *European Researchers Night* on 25 September 2015, and SESAME was the subject of high profile articles in the *Huffington Post* (15 January 2015) and *Nature Photonics* (September 2015) by former CERN Directors-General.

23. The theme of **light poverty** aimed to raise awareness of the fact that around 1 billion people still do not have access to electricity and reliable lighting infrastructure, severely limiting socio-economic development. IYL 2015 Patron Sponsor Philips Lighting and other partners including social businesses, implemented actions on light poverty in many countries worldwide including: Chile, Guatemala, Kenya, Namibia, Peru, Philippines, South Africa, United Republic of Tanzania, Uganda, Zambia, and Zimbabwe.
24. Many activities from founding partners and national committees promoted **careers in science and engineering for girls and women**. Panel discussions, seminars, prizes, and posters were used to communicate career opportunities for women, and events such as networking receptions served to place university students in contact with prominent role models and mentors. For younger children in Australia, the national program team of the Girl Guides prepared a resource set of suggested activities on the theme of light.
25. Some initiatives focused on **those affected by war and natural disasters**: the *Physics for All* activity from the German Physical Society (DPG) brought the themes of IYL 2015 to newly-arrived refugee communities in Germany; and the Nepalese IYL 2015 National Committee prioritized activities for students and schools in areas impacted by the April 2015 earthquake.
26. The works of **Ibn Al-Haytham** were frequently highlighted during 2015 in events organised by national committees, an international Ibn Al-Haytham Working Group, and Founding Partner 1001 Inventions. A 2-day conference on the *Islamic Golden Age of Science for the Knowledge-Based Society* took place from 14 to 15 September 2015 at UNESCO Headquarters in Paris, and included an exhibition from the Qatar National Library on the preservation of the cultural heritage of Islamic manuscripts. Overall, events on Ibn Al-Haytham took place in 29 countries: Algeria, Bahrain, Brazil, Canada, China, Egypt, Eritrea, France, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Jordan, Kuwait, Lebanon, Malaysia, Mexico, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Senegal, Tunisia, Turkey, United Arab Emirates, United Kingdom, and United States of America.
27. IYL 2015 partners participated in awareness raising actions in the frame of the Climate Change Conference of Parties **COP21** held in Paris from 5 to 12 December 2015. *The Human Energy Project* installation promoted renewable energy sources to light up the Eiffel Tower; the project *Phares* installed an energy-efficient beacon of light sculpture at the Place de la Concorde; the NGO *Liter of Light* promoted ecologically sustainable and cost-free lighting in developing countries, and the *Flowers of Change* installation was a participative artwork linking ideas of light, colour, and ecology.
28. Events promoting astronomy and **dark skies** were carried out worldwide, with International Astronomical Union activities including the *GalileoMobile* outreach project which took place in 20 schools in South America, and the *Globe at Night* citizen science collection of dark sky data in 104 countries. A major open access collection of images and photographs on light themes, *Light: Beyond the Bulb,* was used in 682 exhibits held in 40 countries and translated into 12 languages. Many partners also organised observing events of the 20 March 2015 solar eclipse and the 27 September 2015 lunar eclipse as part of their IYL 2015 programme.
29. The **symbolic power of light** was underlined with illumination of major monuments and buildings worldwide, including: the UNESCO World Heritage Site of the Old Port of Valparíso (Chile), the *Night of Heritage Light* in the United Kingdom that lit 9 UNESCO World Heritage Sites on 1 October 2015, and the celebration of the United Nations' 70th anniversary on 25 October 2015 that saw 300 iconic monuments worldwide lit up in the colours of UN blue.
30. Many events used innovative means to highlight to the general public the importance of light and light-based technologies. In the Netherlands, technology developed for astronomy research was used to project a Rainbow Station arch on the Amsterdam Central Railway Station in a true colour art installation seen by millions during 2015. The theme of light was used to create novel garden displays for IYL 2015 in Poland and the United Kingdom. Light and poetry and literature were combined in activities in Australia, the Russian Federation, and the United Kingdom. Over 100 light-themed videos and documentaries were used for education and outreach during 2015. Seven original musical compositions were also inspired by IYL 2015.

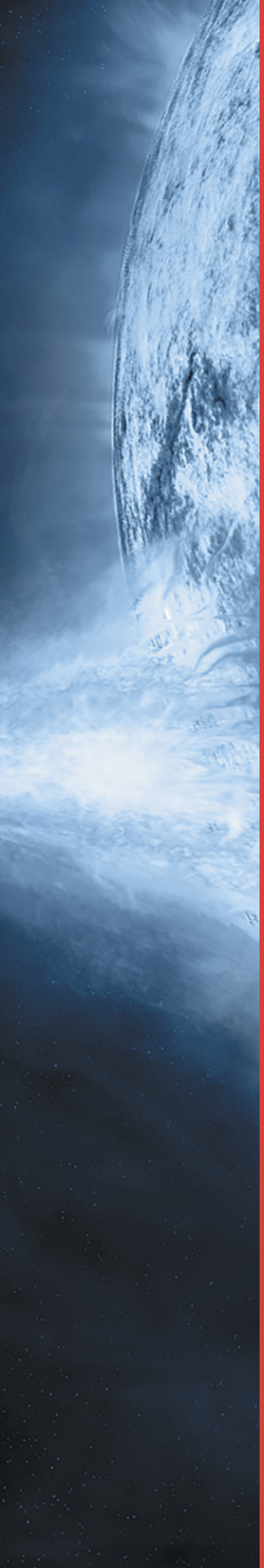
VII. LEGACY AND CONTINUING ACTIONS

31. IYL 2015 forged many new links and collaborations between decision makers, industry leaders, scientists, artists, social businesses, NGOs, and the public at large. **The IYL 2015 partners are committed to working together and continuing initiatives in the future**, and some specific actions are already underway. For example: improved coordination in outreach and science education through expanded regional hubs such as the *European Centres for Outreach in Photonics*, and increased support for the *African Laser Centre* projects and scholarships; continued initiatives promoting the economic importance of light-based technologies such as: *Photonics21* (Europe), the Photonics Initiative of South Africa, and the National Photonics Initiative (United States); increased awareness-raising of the scientific heritage of Ibn Al-Haytham through a wide range of educational materials developed for IYL 2015, and the creation of an *Ibn Al-Haytham International Society*; expansion of UNESCO's *Active Learning in Optics and Photonics* programme; promotion of solar energy solutions and light poverty issues in the multi-partner *Power for All* initiative.

Sunset and fishermen in Croatia.
CREDIT: Darko Hrastovcak.



Artist's representation of the black hole Cygnus X-1 formed from the collapse of a large star. The black hole pulls matter from the blue star beside it. Credits: NASA/CXC/M.Weiss.



Part 1

Origins

The first idea for an International Year of Light dates back to 2009 when John Dudley, IYL 2015 Steering Committee Chair, proposed the idea whilst representing the Quantum Electronics and Optics Division (QEOD) of the European Physical Society (EPS) at a meeting of the International Council of Quantum Electronics (ICQE) in Baltimore, USA. An item that was discussed at this meeting was how to follow up activities that were planned to celebrate the 50th anniversary of the laser (LaserFest[1]) in 2010 with something even more ambitious. The photonics community felt that there was a real opportunity to reach out beyond the scientific sector to raise much broader awareness of the problem-solving potential of light-based science in so many areas of life, and to make a global effort to influence education and policy in both developed and developing countries. The proposal was endorsed by ICQE and thus began the adventure towards IYL 2015.

International Years are part of the United Nations (UN) declared observances that promote awareness of issues relevant to its aims and international programmes. The first step to successfully achieve the proclamation of the International Year was to work through UNESCO to prepare and submit a resolution to the UN General Assembly. But before this, EPS had to construct the proposal in detail and build a consortium amongst the major optics and physics societies. During 2010 and 2011, the main motivations and goals for IYL 2015 were drafted, and it was decided that 2015 would be the target year based on several key scientific anniversaries. With the support of the EPS President Luisa Cifarelli, an important milestone occurred in September 2011 when the Italian Physical Society and EPS organized in Varenna, Italy, the *Passion for Light* launch meeting for IYL 2015, where representatives of UNESCO and the Abdus Salam International Centre for Theoretical Physics (UNESCO-ICTP) were present, both to learn more about our plans and to show their support. This was the essential step that brought the guidance and experience of UNESCO's International Basic Science Programme to the proposal.

With the help of the Institute of Physics (especially Sir Peter Knight who was the president at the time), EPS led a delegation to the International Union of Pure and Applied Physics (IUPAP) General Assembly in London during November 2011 to obtain endorsement, providing an important green light recognizing the international nature of the proposal.

At this point there were many partners involved: in addition to EPS and its own European member societies, the IYL 2015 team included the African Physical Society, the American Physical Society, the Association of Asia Pacific Physical Societies, the Chinese Optical and Physical Societies, the European Optical Society, the International Commission for Optics (ICO), the IEEE Photonics Society, the Optical Society (OSA), the international society for optics and photonics (SPIE), as well as many other partners and societies from Africa, Australia, Canada, the Middle East, New Zealand, South America, and elsewhere.

From March 2012 things moved quickly. With help from the Director of UNESCO's International Basic Science Programme Dr. Maciej Nalecz, a consortium of supporting UNESCO member states was assembled. Much support was needed from a number of international scientific partners at this stage, and it is essential here to acknowledge Francis Allotey (Ghana) and Ana María Cetto (Mexico) for their leading roles. Other assistance was provided by Zsolt Fulop (Hungary), John Harvey and Geoff Austin (New Zealand), Zohra Ben Lakhdar and Mourad Zghal (Tunisia), Joe Niemela (UNESCO-ICTP), Lluis Torner (Spain) and Sergei Bagaev and Victor Zadkov (Russia).

First International Planning Meeting of the IYL 2015 at ICTP on 2013. From left to right: M. L. Calvo, V. Lakshminarayanan, A. M. Guzmán, A T Friberg, F. K. A. Allotey, J. P. Ngome Abiaga, J. M. Dudley, E. A. Rogan, S. Svanberg, J. J. Niemela, G. von Bally, M. Danailov, K. Bailey Mathae, Z. Ben Lakhdar, A. Johnson, R. Ramponi, A. Vacchi, K. Plenkovich, K. Svanberg, M. Bertolotti, A. Wague, A. M. Cetto, C. Watson, M. J. Yzuel, P. K. Buah Bassuah, F. Mendoza, A. Consortini. CREDIT: Joe Niemela, ICTP.

1. http://www.laserfest.org

A resolution supporting IYL 2015 was prepared and was adopted by the UNESCO Executive Board at its 190th session which took place at the UNESCO HQ in Paris, France, 3-18 October 2012. The resolution was placed before the Executive Board by Ghana, Mexico, the Russian Federation (Board Members), and New Zealand (UNESCO Member State). UNESCO delegates from Ghana and Mexico introduced the proposal, and at the initiative of Saudi Arabia, the contributions of Ibn Al-Haytham were included as a key element of the planned celebrations. The resolution was adopted by the Executive Board joined by co-signatories from a further 27 Board Members: Angola, Bangladesh, Brazil, Burkina Faso, China, Congo, Cuba, Djibouti, Ecuador, Ethiopia, Gabon, Gambia, Kenya, Indonesia, Italy, Malawi, Nigeria, Peru, the Republic of Korea, Saudi Arabia, Spain, Thailand, Tunisia, the United Arab Emirates, the United States of America, Venezuela (Bolivarian Republic of), and Zimbabwe. Other Member States of UNESCO who declared support for the initiative were Hungary, Serbia, and South Africa. UNESCO's official support opened the gate to approach the UN General Assembly to officially endorse the International Year.

In early 2013 a meeting amongst the international stakeholders proposed ICTP as the Global Coordination Secretariat. Later in the year, with the help of UNESCO, the IYL 2015 Steering Committee was invited by Mexico to defend the proposal in New York, at an information meeting held at UN Headquarters in May 2013. Ana Maria Cetto and John Dudley led a delegation that also included representatives of the African Physical Society (Yanne Chembo), ICTP and OSA (Anthony Johnson) and SPIE (H. Philip Stahl).

After the May 2013 meeting, Mexico led the political process to draft a resolution for the 68th Session of the UN General Assembly which would begin in September 2013. The second half of 2013 was extremely busy, as the IYL 2015 Steering Committee really did need the declaration to be made before the end of 2013 in order to have a full 12 months to prepare.

The UNESCO Executive Board resolution was endorsed by the UNESCO General Conference at its 37th session on the 19th November, 2013. In parallel, a resolution was submitted to the United Nations Second Committee on 6 November 2013 by the nation of Mexico, with delegates from both Mexico and New Zealand speaking in support. The resolution was adopted with co-sponsorship from 35 countries: Argentina, Australia, Azerbaijan, Bosnia and Herzegovina, Chile, China, Colombia, Cuba, Dominican Republic, Ecuador, France, Ghana, Guinea, Haiti, Honduras, Israel, Italy, Japan, Mauritius, Mexico, Montenegro, Morocco, Nepal, New Zealand, Nicaragua, Palau, Republic of Korea, Russian Federation, Somalia, Spain, Sri Lanka, Tunisia, Turkey, Ukraine, and United States of America.

Finally, the resolution A/RES/68/221 proclaiming the IYL 2015 was adopted on 20 December 2013 during a plenary meeting of the 68th Session of the UN General Assembly.

With the official UN green light, work accelerated during 2014 to put into place all the structures to ensure the success of the year: begin fundraising; enhance the network of organizations supporting the initiative; increase the number of IYL 2015 National Nodes; reach out to non-scientific communities such as artists and architects; set up the IYL 2015 website; produce resources that could be freely available to use, etc. There was no shortage of work to do, but with the help of a fantastic team and the commitment of thousands of volunteers, everything was in place by 2015 to begin.

IYL 2015 Delegation in UN General Assembly.

Light at the focus of 2014 Physics and Chemistry Nobel Prizes

As a fantastic lead-in to the International Year of Light 2015 (IYL 2015), the Nobel Prizes for Physics and Chemistry for 2014 were both awarded to scientists working in fields of light science and technology.

The Nobel Prize for Physics 2014 went to Isamu Akasaki, Hiroshi Amano, and Shuji Nakamura for the development of the blue LED. Blue LEDs are familiar to us all as blinking lights on computers and mobile devices, key components in flat screens, and as the technology underlying the white light sources revolutionizing the lighting industry.

The Nobel Prize for Chemistry 2014 was awarded to Eric Betzig, Stefan W. Hell, and William E. Moerner for the development of super-resolved fluorescence microscopy. The background to this prize is the revolutionary work by the Laureates to overcome the presumed limitation of optical microscopy—that it would never obtain a better resolution than half the wavelength of light. However, using fluorescent molecules Betzig, Hell, and Moerner were able to overcome this limitation and bring optical microscopy into the nanoscale dimension.

UNESCO

Created in 1945, UNESCO (United Nations Educational Scientific and Cultural Organization) strives to build networks among nations in order to establish a lasting peace. Since its creation, UNESCO has consistently worked towards creating a culture of peace and sustainable development through political leadership, scientific cooperation, capacity building, and much more. UNESCO is sometimes known as the "intellectual" agency of the United Nations, and exists to build humanity's creative intelligence in life with the aim of building peace and the conditions for sustainable development.

UNESCO's leadership of IYL 2015 was through its International Basic Sciences Programme (IBSP) that focuses on fostering region-specific actions and networks in the basic sciences. Since the programme was established in 2005, more than 40 projects have been implemented, focusing on capacity building in key areas of physical and biological sciences and on promoting science education. New initiatives for the multidisciplinary programme are continually discussed and implemented between Member States and partner organizations. IBSP's defining role in IYL 2015 has clearly contributed to achieving the goals of the UNESCO in strengthening science, technology, and innovation (STI) systems and policies, as well as in the advancement of science and technology for sustainable development. It also played a major role in harnessing international cooperation of science and technology capacity-building.

UNESCO Assistant Director-General for Natural Sciences at the IYL 2015 Opening Ceremony. Credit: UNESCO/P. Chiang-Joo.

Vision, Goals, and Objectives

The International Year of Light and Light-based Technologies 2015 (IYL 2015) was a yearlong series of events and activities with the aim of highlighting to the citizens of the world the importance of light science and optical technologies in leading to improved quality of life and for the future development of society. A particular objective was to focus on application areas related to sustainable development, and to show how light-based technologies can provide practical solutions to global challenges in areas such as renewable energy, education, agriculture, and healthcare.

MOTIVATION

Light plays a central role in human activities. People throughout the world and across history have always attached great importance to light. We have seen this in cultural symbolism, universal myths and legends, and in the many ways that studying the science of light and applying it in practical applications has shaped the societies in which we live. Light is the means by which human beings see themselves, each other, and their place in the Universe. Light is an essential part of culture and art, and is a unifying symbol for the world.

On the most fundamental level through photosynthesis, light is necessary to the existence of life itself, and the many applications of light have revolutionized society through medicine, communications, entertainment, and culture. Industries based on light are major economic drivers, and light-based technologies directly respond to the needs of humankind by providing access to information, promoting sustainable development, and increasing societal health and well-being.

SCIENCE OF LIGHT

Studying the fundamental scientific properties of light has impacted widely on all fields of science, technology, and engineering. From early attempts to understand the motion of stars and planets, to the appreciation of the importance of light in photosynthesis, efforts to understand the nature and the characteristics of light have led to major revolutions in thought, and have involved virtually all the major figures of science. Light from the Big Bang provides us with a vision of the origin of the Universe. The spectrum of light from X-rays to infrared lasers provides technologies that underpin our lives, and the interaction of light with the human body provides valuable techniques for diagnosis, imaging, and treatment in medicine. Advanced research in areas such as nanophotonics, quantum optics, and ultrafast science are inspiring new fundamental discoveries and opening new scientific frontiers.

LIGHT TECHNOLOGY

The science of light is applied in the technological field known as *photonics*, which has tremendous impact on areas such as medicine, communications, and energy.

Light plays a crucial, yet often unappreciated, role in modern life, in shrinking the modern world through advanced telecommunications. Light pulses and glass optical fibre cables form the backbone of the global internet, and satellite telephones and wireless technologies allow even the most remote areas of the world to have access to communications, information, and even advanced medical care. Light Technology is essential to improve society's energy independence through devices that efficiently convert sunlight to other energy forms, and through innovations in developing other low cost and energy efficient green lighting solutions. In a similar way, understanding the Earth's environment increasingly relies on optical and photonic techniques for sensing and measurement, and such technologies are vital to understand climate change.

These examples are of course state-of-the-art feats of engineering. But at the same time, optical technologies that are simple and that have existed for centuries are tremendously important for our daily lives! Corrective eyeglasses for improved vision are familiar to us all, and simple optical instruments such as microscopes form a cornerstone of modern medical diagnostics.

LIGHT AS AN ECONOMIC DRIVER

With the global photonics market growing at twice the world economic growth rate, from 350 Billion Euros in 2011 to a predicted 615 Billion Euros in 2020[1], photonic technologies have a major impact on the world economy.

Governments around the world have identified the importance of developing large scale plans to help boost a global knowledge-driven economy, and to tackle issues that will make real differences in people's lives. For instance, the European Union has recognised photonics as a *Key Enabling Technology* and has invested over €700 million from the European Commission's Horizon2020 programme for the period 2014-2020; the government of the United States of America announced in 2015 the creation of the Integrated Photonics Institute for Manufacturing Innovation (IP-IMI), supported by the National Photonics Initiative (NPI) which will bring US$610 million in public-private investment to next-generation photonics manufacturing[2]; and China

1. https://ec.europa.eu/research/industrial_technologies/pdf/photonics-ppp-roadmap_en.pdf
2. https://www.whitehouse.gov/the-press-office/2015/07/27/fact-sheet-vice-president-biden-announces-new-integrated-photonics

also sees photonics as an important field for not only advancing its manufacturing capabilities, but also for discovering new disruptive technologies; investment in optics and laser-related programmes has increased 20% and is now at a staggering US$3.2 billion. Light-based technologies are also intimately linked to the ongoing economic growth in Africa. For example, telecommunications generate 5 to 10% of the GDP of most African countries, and can indirectly impact up to 20% of the economic activity.

LIGHT AND DEVELOPMENT

The world today faces many urgent challenges, such as providing food to a growing population; developing clean sources of energy that can promote growth whilst having a low carbon footprint; improving education; reducing poverty and inequality; improving healthcare and quality of life for all. Light science and technologies provide solutions to meet many of these challenges. The importance of light-based technologies to sustainable development is a common thread and a key element of the IYL 2015.

LIGHT AND CULTURE

From the early artists and scientists of Antiquity, to the development of perspective and the understanding of light and shadow during the Renaissance, to impressionism and modern artistic techniques, light has influenced and continues to influence human culture. The continuous links between light and culture throughout history provide valuable insights into the interactions between science and art and the humanities in general.

In a contemporary context, light is being used to improve our appreciation of cultural heritage in ways such as applying optical techniques to the advanced imaging of paintings, the use of modern technology in museums to experience culture in an interactive environment, and the use of natural light and low-pollution lighting to illuminate architecture, monuments, and public spaces.

Light has influenced and continues to influence the visual and performing arts, literature, and human thinking, therefore providing an important bridge between science and culture and aiding in breaking down the boundaries between these fields that are becoming increasingly separated in the modern world.

GOALS OF THE INTERNATIONAL YEAR

The major goals of the International Year of Light 2015 were:

- Improve the public understanding of how light and light-based technologies touch the daily lives of everybody, and are central to the future development of the global society.
- Build worldwide educational capacity through activities targeted on science for young people, addressing issues of gender balance, and focusing especially on developing countries and emerging economies.
- Enhance international cooperation by acting as a central information resource for activities coordinated by learned societies, NGOs, government agencies, educational establishments, industry, and other partners.
- Focus on particular discoveries in the history of science that have shown the fundamental centrality of light in the development of knowledge, and highlight the continuous nature of discovery in different historical and cultural contexts.
- Emphasise the importance of basic research in the fundamental science of light, the need for investment in light-based technology to develop new applications, and the global necessity to promote careers in science and engineering in these fields.
- Promote the importance of lighting technology and the need for access to light and energy infrastructure in sustainable development, and for improving quality of life in the developing world.
- Raise awareness that technologies and design can play an important role in the achievement of greater energy efficiency, in particular by limiting energy waste, and in the reduction of light pollution, which is key to the preservation of dark skies.
- Highlight and explain the intimate link between light and art and culture, enhancing the role of optical technology to preserve cultural heritage.
- Maintain these goals and achievements in the future beyond the International Year of Light.

Light-based Technologies and the Sustainable Development Goals

The International Year of Light (IYL 2015) contributes significantly to fulfilling the missions of UNESCO to the building of peace, the alleviation of poverty, to sustainable development and intercultural dialogue through education, science, culture, and communication. In this context, the goals of IYL 2015 align with the 17 Sustainable Development Goals which were adopted by the United Nations General Assembly in 2015.

The Sustainable Development Goals, officially known as "Transforming our world: the 2030 Agenda for Sustainable Development," are an intergovernmental set of goals and targets developed by the United Nations that cover a broad range of sustainable development issues. We describe below the many fields where light-based technologies can make a fundamental contribution to help accomplish these goals. Communicating these messages was a key component of many activities during the IYL 2015.

United Nations Sustainable Development Goals. CREDIT: United Nations.

1 - NO POVERTY; 2 - ZERO HUNGER; AND 3 - GOOD HEALTH AND WELL-BEING

The food and agriculture sector is essential to sustainable development. Indeed, ending hunger, ensuring food security, and promoting sustainable agriculture are key objectives of the Sustainable Development Goal targets. In many developing countries, agriculture is also the backbone of the economy, and is a key for long-term and inclusive growth due to its strong multiplier impact on other sectors. Good health and well-being are also fundamental for the development of society.

Light-based technologies can play an important role in improving agriculture and farming through the area of agri-photonics. Lasers and imaging sensors on planes can be used to map soils and crop density, and reflectance data from vegetation can be used to determine very specific information such as the amount of nitrogen present in plants. Lasers and telescopes can be used to monitor evaporation and guide decisions on irrigation, and with appropriate lighting, vegetables and fruits can be grown indoors outside of their normal season, opening up possibilities for year-round crop cultivation, even in inhospitable regions.

Optical technologies play a key role in medicine from simple diagnostics and monitoring, to advanced treatment options, and research. Photonics appears

in very simple and widespread devices: clip-on pulse oximeters use the transmission of light from an LED through a finger to measure oxygen saturation and heart rate, and skin thermometers use infrared light detectors to provide a safe and reliable measurement of body temperature. Imaging and surgery have been revolutionized with the use of endoscopy and laparoscopy, and light-based technologies and lasers find important uses in many medical procedures including neurosurgery, dermatology, dentistry, vision correction, heart surgery, and reconstructive procedures. Many light-based therapies have also proven effective for detecting and treating cancer. One example of a light-based technique to treat cancer is photodynamic therapy, where a patient is given a nontoxic photosensitive drug that is absorbed by cancer cells. During surgery, a light beam is positioned at the tumour site, which then activates the drug to become toxic to targeted malignant cells.

Recent years have seen dramatic strides in the field of telemedicine in general, the use of telecommunication and information technologies to provide access to medical services that would often not be consistently available at a distance. The smartphone may well be showing the way towards the democratization of healthcare in developing countries.

Another important issue faced around the world is that worldwide estimates of those who suffer from uncorrected defective eyesight range from the 100s of millions to over a billion adults and children! Far more than just an "inconvenience," the worldwide lack of eyeglasses to correct vision prohibits people from working and taking care of their families and has a negative effect on children's schooling and study.

A number of NGOs and industries are actively working on complementary approaches to solve these problems. One approach uses fluid-filled lenses where a user can self-adjust the eyeglasses, allowing a very convenient way to select the appropriate correction. Another idea uses low cost prefabricated lenses and a compact bending machine to create frames from spring steel; this approach can also encourage the establishment of sustainable businesses producing and selling these glasses in local communities.

4 - QUALITY EDUCATION; 5 - GENDER EQUALITY; AND 10 - REDUCE INEQUALITIES

In addition to the use of light-based technologies to improve educational infrastructure, light science is an ideal subject to stimulate interest in STEM (science, technology, engineering, mathematics) subjects in a classroom context. Teaching material based on light and optics is widely available and can be inexpensive, and is perfectly suited to inquiry-based, or active learning strategies which encourage students to construct the knowledge from their own observations. This is in contrast to the normal classroom scenario in which the teacher lectures and the students passively absorb as much information as they can, which, by itself, is known to be inadequate in developing correct conceptual understanding of the underlying physics.

One of the major issues of our society is to achieve gender equality. In particular, there is a major concern in the scientific community - regardless of geographical location - to improve the gender-balanced representation of scientists at all levels and promote greater involvement of underrepresented minorities in scientific and engineering careers. According to the UNESCO Science Report: towards 2030,[1] which presents a picture of the trends in global research and development, based on a wealth of qualitative and quantitative data for the past five years, women constitute a minority in the research world. Globally, while women achieve parity at early stages of scientific careers, their participation diminishes with career progression such that women represent only 28.4% of the world's active researchers! And there are also very significant national and regional differences, with women playing nearly no role at all in science in some countries.

The photonics community have tried to raise awareness of this issue on different levels, comprising initiatives trying to attract more female students to STEM careers, exhibitions to highlight the important role that female scientists have on the development of photonics technologies, and awards for early career scientists on the field of photonics to give visibility to their achievements.

The importance of communications for development is stressed by the UN Broadband Commission for Digital Development,[2] who have recently stated how access to mobile devices (phones, tablets, and e-readers) with broadband internet connectivity can bring quality education to people everywhere, especially in the world's poorest or most isolated communities. Although it is technology such as fibre to the home (FTTH) that is being emphasized in many developed countries, it is mobile broadband that is perceived as the most practical solution for many developing countries. The International Telecommunications Union (ITU) reports that mobile broadband is the fastest growing technology in history - mobile phone subscriptions now exceed the world's total population, and active mobile broadband subscriptions exceed 2.1 billion! Significantly, most of this progress has taken place in developing countries, which account for 82% of net additions of new internet users globally in the last five years. The UN Broadband Commission and the ITU are pushing hard to ensure that mobile broadband can fulfil its potential to improve education and development.

6 - CLEAN WATER AND SANITATION

Water is essential to human health. Despite impressive gains made over the last decades, billions worldwide still suffer from health problems due to the lack of

1. en.unesco.org/unesco_science_report
2. http://www.broadbandcommission.org/publications/pages/SOB-2015.aspx

clean water. Although much progress has been made in the use of conventional treatment processes, there is a continuous need for the development of new and complementary technologies to produce high quality water, especially in developing areas. Photonics technologies can significantly help in this regard by improving both water quality assessment and access to clean sources of water. For instance, low-cost water treatment systems powered by solar panels can decompose organic pollutants in water, and solar-powered well pumping has proven to be a sustainable, low-cost solution to provide drinking and irrigation water in off-grid locations in drought-prone regions. Research is also ongoing into the development of LED-based portable systems for point-of-use purification.

7 - AFFORDABLE AND CLEAN ENERGY; AND 13 - CLIMATE ACTION

When one thinks of harnessing light-based technologies for sustainable development, renewable energy through solar power would likely be the first thing that came to mind for most people. After all, many developing countries have abundant solar energy resources (insolation), and the use of solar energy is ideally-suited to providing an off-grid energy supply as a sustainable alternative to the diesel generators which would otherwise be used. There remain many challenges to address, but research is advancing rapidly in the underlying physics and materials science, the development of storage technologies, and in optimising and comparing the technologies of photovoltaics and solar thermal collection.

Closely coupled to the availability of energy is the availability of lighting. With no reliable source of light, many people in developing communities depend on kerosene lamps for light, which have been estimated to lead to the death of over a million people every year. Providing clean, efficient forms of lighting to developing communities is not only important for health reasons - it is also vital for productivity. Families in rural communities rely on work to provide for the most basic needs of their family, but working hours can be limited due to scarce lighting after sunset. The majority of children in developing countries are also expected to work during the day to help provide for their family. With no, or inadequate, light at night, children are deprived of an education. Although longer term solutions will require clear policies on renewable energy at the regional level, many industries and NGOs and other associations are working on the ground to promote the use of portable solar-powered high-brightness LED lanterns in regions where there is little or no other reliable source of light.

Developing countries are at the frontline of human-induced climate change over the next century. According to the to the IPCC Fifth Assessment Report, throughout the 21st century climate change is expected to lead to increases in ill-health in many regions, and especially in developing countries with low income. Rural areas are expected to experience major impacts on water availability and supply, food security, infrastructure, and agricultural incomes, including shifts in the production areas of food and non-food crops around the world.

Light-based technologies are critical for monitoring and predicting the consequences of climate change. They are extensively used to map radiation emitted from the Earth’s surface using radiometers, scanners, and sensors placed in satellites orbiting our planet. These measurements are transmitted to ground stations where the data is converted to images that provide information on ocean currents or global carbon-dioxide distribution.

Anniversaries during 2015

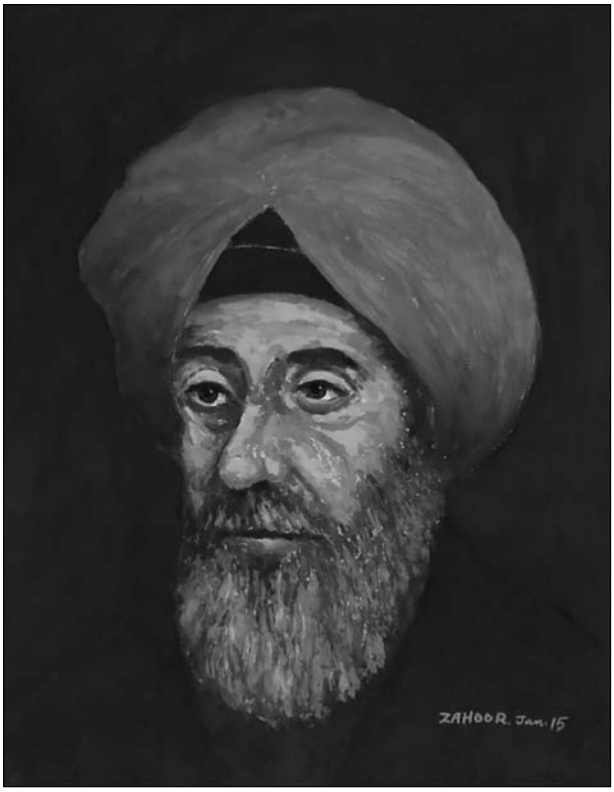
The year 2015 was a natural candidate for the International Year of Light as it represented the remarkable conjunction of a number of important milestones in the history of the science of light.

GREAT WORKS ON OPTICS BY IBN AL-HAYTHAM
OVER 1000 YEARS

The year 2015 marks the 1,000th anniversary since the appearance of the remarkable seven-volume treatise on optics, *Kitab al-Manazir,* written by the Arab scientist Al-Hasan Ibn Al-Haytham. Born around a thousand years ago in present day Iraq, Ibn Al-Haytham was a pioneering scientific thinker who made important contributions to the understanding of vision, optics, and light. Today, many consider him a pivotal figure in the history of optics and the "Father of modern optics."

Ibn Al-Haytham was one of the earliest scientists to study the characteristics of light and the mechanism/process of vision. He sought experimental proof of his theories and ideas. During many years living in Egypt, he composed one of his most celebrated works, *Kitab al-Manazir*, whose title is commonly translated into English as *Book of Optics* but more properly has the broader meaning *Book of Vision*.

Ibn Al-Haytham made significant advances in optics, mathematics, and astronomy. His work on optics was characterised by a strong emphasis on carefully designed experiments to test theories and hypotheses. In that regard he was following a procedure somewhat similar to the modern scientific method.



Portrait of Ibn Al-Haytham. CREDIT: Zargar Zahoor.

FRESNEL AND HIS THEORY OF LIGHT AS A WAVE
1815

Augustin-Jean Fresnel (1788-1827) was a French engineer and physicist who contributed significantly to the establishment of the theory of wave optics, publishing a pioneering memoire on diffraction in 1815.

At the end of the 18th century, physics was dominated by Newton's particle theory of light. Fresnel disliked Newton's theory of light mainly because of its failure to explain such basic optical phenomena as the interference effect. By developing his ideas on the wave nature of light into a comprehensive mathematical theory, Fresnel determined properties that every future theory of light would have to satisfy, and created the groundwork for the later work of James Clerk Maxwell.

The wave view did not immediately displace the ray and particle view, but began to dominate scientific thinking about light in the mid-19th century since it could explain polarization phenomena that the alternatives could not. It was not until the early 20th century that the photoelectric effect introduced firm evidence of a particle nature of light as well, therefore, paving the way for the wave-particle duality of light.

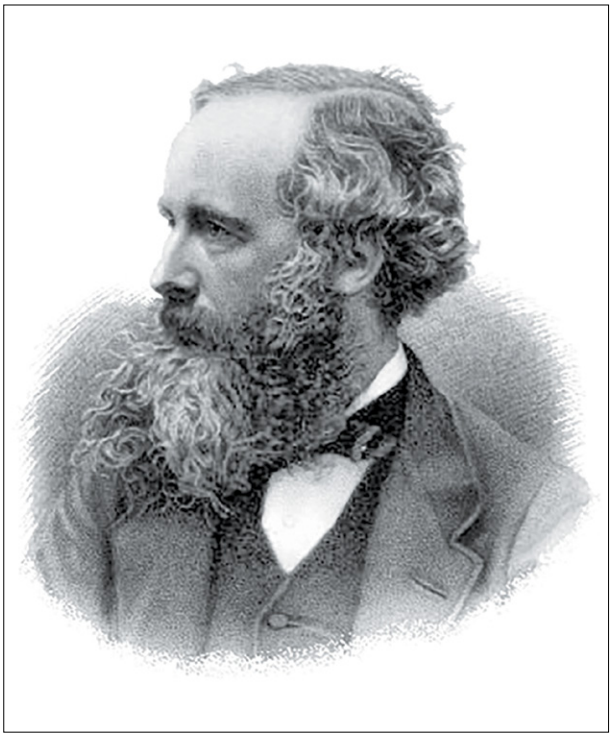
Augustin-Jean Fresnel. CREDIT: Wikimedia Commons.

MAXWELL DESCRIBES HIS THEORY OF LIGHT
1865

Another milestone commemorated in the IYL 2015 is the 150th anniversary of Maxwell's electromagnetic theory of light, a theory that changed the world forever. James Clerk Maxwell (1831-1879), born in Scotland, is considered as one of the most important scientists of all time and one of the greats in the history of physics along with Newton and Einstein. Undoubtedly, his most important scientific contribution is the theory of the electromagnetic field, fundamental not only for the comprehension of natural phenomena, but also for its many current technical applications, particularly in telecommunications.

His 1865 paper, *A Dynamical Theory of the Electromagnetic Field*, provides a complete theoretical basis for the treatment of classical electromagnetic phenomena. He proved that the equations of the electromagnetic field could combine into a wave equation and suggested the existence of electromagnetic waves. Calculating the speed of propagation of these waves, he obtained the value of the speed of light, and concluded that it was an electromagnetic wave.

Maxwell also left us outstanding contributions to colour theory, optics, Saturn's rings, statics, dynamics, solids, instruments, and statistical physics. However, his most important contributions were to electromagnetism.



James Clerk Maxwell. CREDIT: Wikimedia Commons.

EINSTEIN AND THE GENERAL THEORY OF RELATIVITY

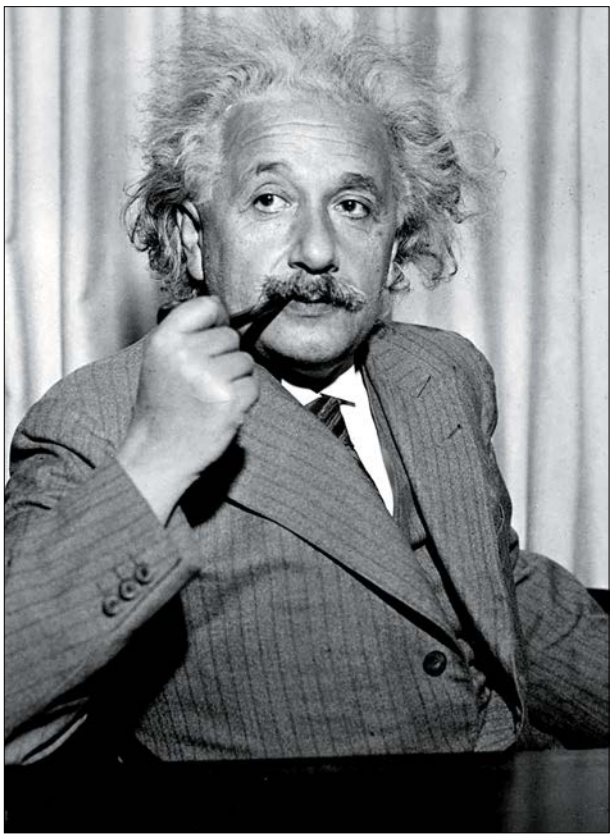
1915

The year 2015 marked the 100th anniversary of Einstein's General Theory of Relativity. Albert Einstein (1879-1955) was a German-born theoretical physicist who revolutionized our understanding of the universe, and who is widely acknowledged as the most important scientist of the 20th Century.

Einstein's General Theory of Relativity fundamentally changed the way we understand gravity and the universe in general. He gave us a way to understand the universe as a whole and created one of the most beautiful theories in the history of science. The General Theory of Relativity gives us the law of gravitation and its relation to the other forces of nature. From Newton we knew about the "strength" of gravity, but his theory did not tell us how gravity pulls on things. In the General Theory of Relativity, the doctrine of space and time no longer figures as a fundamental independent of the rest of physics. Rather, the geometrical behaviour of bodies and the motion of clocks depend on gravitational fields, which in turn are produced by matter.

General Relativity helped to predict the existence of black holes, which are regions of the spacetime exhibiting such strong gravitational effects that nothing—not even light—can escape. The theory also has important implications for cosmology, the study of the structure of the Universe. One of the consequences of the theory is that not only is the universe finite, but should be contracting or expanding, something that was confirmed years later by the US astronomer Edwin Hubble.

One of the most revolutionary predictions of the theory was the existence of gravitational waves, ripples in space-time that propagate in much the same way that ripples spread across the surface of a pond. It was only in 2016 that the LIGO experiment finally confirmed their existence, opening a new window for observing the cosmos that could change our understanding of the universe. It is worth noting here that this experimental confirmation of General Relativity, like that of Special Relativity before it, was based on using an optical instrument—an interferometer. This reveals the power of light-based technologies in not only driving applications but also supporting research into very fundamental physics.



Albert Einstein. CREDIT: Wikimedia Commons.

PENZIAS AND WILSON DISCOVER THE MICROWAVE BACKGROUND
1965

In 1965, the American astronomers Arno Penzias (1933) and Robert Woodrow Wilson (1936) announced the discovery of Cosmic Microwave Background (CMB) Radiation. This radiation is a relic of the light that filled the early cosmos almost 14 billion years ago, that can still be observed today across the sky at much longer wavelengths than visible light, in the domain of microwaves. Finding the CMB represented a triumph for the "Big Bang" description of the Universe. Penzias and Wilson won the Nobel Prize in Physics in 1978 for their discovery.

The detection of the CMB triggered a series of increasingly accurate experiments and detailed theoretical calculations over the past fifty years, searching for more information about the universe in this early cosmic signal. Initially NASA's COBE and WMAP satellites, and in recent years ESA's Planck satellite, have provided precise maps of the CMB that enable astrophysicists to delve into the history of the Universe, constraining its geometry and the properties of its constituents. Together with other observations, these data led to the "standard model" for cosmology: a spatially flat Universe dominated not only by dark matter, but also by the mysterious dark energy, responsible for accelerating the present expansion of the cosmos.

Robert Wilson, left, and Arno Penzias stand in front of the Bell Labs horn radio antenna in Crawford Hill, N.J., where they discovered cosmic background radiation confirming the Big Bang. CREDIT: Wikimedia Commons.

CHARLES KAO DEVELOPS OPTICAL FIBRE COMMUNICATIONS
1965

Charles K. Kao (1933) is a Chinese-born Hong Kong, American, and British electrical engineer and physicist who pioneered the development and use of fiber optics in telecommunications. Kao's research laid the groundwork for high-speed data communication and the Information Age.

When Kao started work, it seemed impossible to use light for transmitting information because the available materials simply had too much loss. But Kao showed that the fibre-manufacturing process was the cause of the absorption problem, and that under better technical conditions, light could travel vast distances before being weakened by absorption. These findings unleashed a series of technological improvements and advancements, launching a new age in the history of telecommunications. For this reason, Charles Kao is regarded as the "father of fiber optic communication."

In 2009, Charles Kao was awarded the Nobel Prize in Physics "for groundbreaking achievements concerning the transmission of light in fibres for optical communication."

Charles K. Kao. CREDIT: Wikimedia Commons.

Organizational Structure

The organisation of any international outreach and education programme is necessarily very complex, and the International Year of Light (IYL 2015) required extremely careful planning to bring together so many different partners from so many different sectors to work together during the same twelve-month period. In this regard, however, the official proclamation of the United Nations General Assembly and the leadership of UNESCO provided unparalleled "convening power" to encourage and stimulate a highly diverse range of partners and organisations to pool resources and coordinate actions for the common good. At the same time, the organisational structure was specifically designed to be flexible and open to bottom-up and spontaneous initiatives taking place worldwide. There was no question of imposing a bureaucratic and top-down governance structure that would stifle the natural enthusiasm of young people in taking part. So whilst clear governance was necessary to put in place resources and an overall framework to guide international actions, once the framework was in place, partners and enthusiastic participants around the world were encouraged to actively engage with the aims of the IYL 2015.

We describe below the various structures in the global organisation that ensured that the IYL 2015 ran smoothly, and which led to effective sharing of resources, ideas, and best practices.

IYL 2015 GOVERNANCE BODIES

The coordination of IYL 2015 was through its Steering Committee that provided overall direction and guidance for IYL 2015 activities. A smaller Executive Board of the Steering Committee was responsible for many operational matters, supported by the IYL 2015 Global Secretariat located at the UNESCO Category I Institute, ICTP in Trieste, Italy. A broader Advisory Board played an important role in allowing us to link with diverse communities worldwide. The governing bodies of IYL 2015 are listed below:

IYL 2015 STEERING COMMITTEE

John Dudley *(Chair),* European Physical Society and Université de Franche-Comté-FEMTO-ST CNRS, France

Ana María Cetto *(Vice Chair),* Universidad Nacional Autónoma de México, Director Museo de la Luz, Mexico

Maciej Nalecz, Director of Science Policy and Capacity Building, UNESCO (2014-2015)

Joseph J. Niemela, Global IYL Coordinator and Head of Office of External Activities, UNESCO-ICTP, USA

Francis K.A. Allotey, President of the African Physical Society IUPAP Vice President at Large; Member of UNESCO National Commission, Ghana

Eugene Arthurs, CEO, SPIE, The International Society for Optics and Photonics, USA

Sergey Bagaev, Russian Academy of Sciences, Russian Physical Society, Institute of Laser Physics of the RAS, Russia

Kenneth Baldwin, Australian National University, Australia

Isabelle Boscaro-Clarke, Vice Chair, Lightsources.org, UK

Azzedine Boudrioua, Coordinator of Ibn Al-Haytham International Working Group, France

Sze-leung Cheung, International Outreach Coordinator of International Astronomical Union; IYL 2015 Cosmic Light Coordinator, China Hong Kong

Luisa Cifarelli, President of the Italian Physical Society; Past-President of the European Physical Society; Professor at the University of Bologna and INFN, Italy

Ndumiso Cingo, Director of the African Laser Center, South Africa

Martial Ducloy, (Initiator of the 2005 International Year of Physics) Past-President of Physics & Society Forum, European Physical Society, France

Paul Hardaker, CEO, Institute of Physics, UK

John Harvey, International Commission for Optics Vice-President, University of Auckland, New Zealand

Christopher Jannuzzi, Executive Director, IEEE Photonics Society, USA

Anthony Johnson, Director, Center for Advanced Studies in Photonics Research (CASPR), University of Maryland Baltimore County (UMBC), USA

Kate Kirby, Executive Officer, American Physical Society, USA

Zohra Ben Lakhdar, 2005 L'Oreal-ESCO Award Laureate, Université de Tunis, Tunisia

Michèle Leduc, Past-President of the Fédération Française de Sociétés Scientifiques; Ecole Normale Supérieure and CNRS, France

David Lee, Secretary General, European Physical Society, USA

Duncan Moore, President, International Commission of Optics; Institute of Optics, USA

Tyler Morgus, Optomechanics Business Unit Leader Thorlabs, USA

Jean-Paul Ngome Abiaga, Assistant Programme Specialist, UNESCO International Basic Sciences Programme, UNESCO

Martha Paterson, The Optical Society of America, USA

Krisinda Plenkovich, Director, Education and Community Services, SPIE, The International Society for Optics and Photonics, USA

Elizabeth A. Rogan, CEO, The Optical Society OSA, USA

Pedro Russo, Leiden University; International Year of Astronomy Coordinator, Portugal

Ahmed Salim, Producer and Director, 1001 Inventions, UK

Lluis Torner, Director, ICFO-Institute of Photonic Sciences; Chair, European Centres for Outreach in Photonics Alliance (ECOP), Spain

Marsha Turner, CEO, International Association of Lighting Designers (IALD), USA

Harry Verhaar, Head of Global Public & Government Affairs, Philips Lighting, The Netherlands

Paul Woafo, University of Yaoundé I, Cameroon

Jason Bardi, American Institute of Physics, USA

IYL 2015 ADVISORY BOARD

Kimberly Arcand, Smithsonian Astrophysical Observatory/Chandra X-ray Center, USA

Katherine Bailey, National Academy of Sciences, Washington, DC, USA

Luc Bergé, Quantum Electronics and Optics Division Chair, EPS, France

Mario Bertolotti, University of Rome "La Sapienza," Italy

Gabriel M. Bilmes, Centro de Investigaciones Ópticas (CONICET-CIC-UNLP), Argentina

Sarah Bucknall, Diamond Light Source, UK

Dan Curticapean, Offenburg University, Germany

Miltcho Danailov, Elettra Sincrotrone, Italy

Andrew Forbes, University of the Witwatersrand, South Africa

Ari Friberg, Territorial Committee for Optics, University of Eastern Finland, Finland

Ángela Guzman, International Commission for Optics Secretary General, CREOL, The College of Optics and Photonics, University of Central Florida, USA

Barbara Horton, President, International Association of Lighting Designers (IALD), USA

Sona Hosseini, Jet Propulsion Laboratory, California Institute of Technology, USA

Vasudevan Lakshminarayanan, University of Waterloo, Canada

Amalia Martinez, Academia Mexicana de Óptica (AMO), Mexico

Antigone Marino, National Research Council, Institute of Applied Sciences and Intelligent Systems, Italy

Romain Murenzi, Executive Director, TWAS, Italy and Director of Science Policy and Capacity Building, UNESCO

Fernando Quevedo, Director, ICTP, Guatemala

Roberta Ramponi, Institute for Photonics and Nanotechnologies (IFN-CNR) and Department of Physics - Politecnico di Milano, Italy

Philip Russell, Max Planck Institute for the Science of Light, Erlangen, Germany; President of OSA (2015), United Kingdom

H. Philip Stahl, President of SPIE (2014), USA

Katarina Svanberg, Lund University Hospital, Sweden

Rebecca Thompson, American Physical Society, USA

Andrea Vacchi, INFN Trieste, Udine University, Italy

Pasi Vahimaa, Institute of Photonics, University of Eastern Finland, Finland

Gert von Bally, University of Muenster, Germany

Tuan Vo-Dinh, Duke University, Fitzpatrick Institute for Photonics, USA

Beth Taylor, Institute of Physics, Chair, IYL 2015 National Committee for the UK and Study after Sunset Liaison, UK

Ahmadou Wagué, President LAM Network; Directeur, Institut de Technologie Nucleaire Appliquee (ITNA); Université Cheikh Anta Diop de Dakar (UCAD), Senegal

Toyohiko Yatagai, Professor, Center for Optical Research and Education, Utsunomiya University, Japan; President of SPIE (2015)

María J. Yzuel, Chair of the Spanish IYL 2015 Committee, Spain

Riche-Mike Wellington, Secretary-General Ghana Commission for UNESCO Ministry of Education, Ghana

Rachel Won, International Editor, Nature Photonics, UK

Victor Zadkov, Institute of Spectroscopy, Russian Academy of Sciences and Lomonosov Moscow State University, Russia

IYL 2015 GLOBAL SECRETARIAT

The central hub for the IYL 2015 was the Global Secretariat located at the Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste, Italy. The Secretariat coordinated activities during the planning, execution, and evaluation of the IYL 2015. The Secretariat liaised continuously with UNESCO, the National Nodes, Partners, the media, and the general public to ensure the progress of the IYL 2015 at all levels.

Joseph Niemela - IYL 2015 Global Coordinator

Dorotea Calligaro – IYL 2015 Assistant

Eleonora Crotta – IYL 2015 Assistant

Jorge Rivero González - IYL 2015 Outreach Officer (EPS)

Vivian Zaccaria – IYL 2015 Assistant

IYL 2015 NATIONAL NODES

The IYL 2015 facilitated the creation of an international network to act at national and local levels. "National Nodes" were formed in different countries to coordinate, promote, and implement IYL 2015 activities taking into account the needs and characteristics of different regions around the world. These nodes established collaborations between major national and local communities involved with IYL 2015 in each country and established a national committee that included a wide range of different partner representatives. In some cases, UNESCO National Commission members played an important role in such committees.

Relying on National Nodes was indispensable for the success of the whole project as they provided local contact points for all those interested in participating in the IYL 2015. They also provided invaluable service in translating the international resources that were developed in English into local languages. This was especially vital in reaching school-age children and the public at large in many countries. Of course, within some countries, activities were not organised centrally via a national node, but events during 2015 still took place through ad hoc local organising committees.

We identified 94 National Nodes that are listed below:

Algeria	France	Philippines
Andorra	Germany	Poland
Argentina	Ghana	Portugal
Armenia	Greece	Puerto Rico
Australia	Honduras	Qatar
Austria	Hungary	Republic of Korea
Bangladesh	Iceland	Republic of Moldova
Belgium	India	Romania
Bolivia (Plurinational State of)	Indonesia	Russia
Bosnia and Herzegovina	Iran (Islamic Republic of)	Saudi Arabia
Brazil	Iraq	Senegal
Bulgaria	Ireland	Serbia
Cameroon	Israel	Singapore
Canada	Italy	Slovakia
Chile	Japan	Slovenia
China	Latvia	South Africa
China, Hong-Kong	Liberia	Spain
Chinese Taipei	Lithuania	Sudan
Colombia	Malaysia	Sweden
Costa Rica	Mauritius	Switzerland
Croatia	Mexico	Thailand
Cuba	Mongolia	Tonga
Cyprus	Morocco	Tunisia
Czech Republic	Nepal	Turkey
Denmark	Netherlands	United Arab Emirates
Dominican Republic	New Zealand	United Kingdom of Great Britain and Northern Ireland
Ecuador	Nigeria	United States
Egypt	Norway	Uruguay
El Salvador	Oman	Venezuela (Bolivarian Republic of)
Estonia	Pakistan	Viet Nam
Fiji	Panama	
Finland	Peru	

We recognized three other Nodes comprising different international organizations that organized IYL 2015 campaigns, activities, and events at international level: the International Astronomical Union (IAU) who launched their own Cosmic Light Programme; the International Commission of Optics (ICO); and the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME).

IYL 2015 SPONSORS

An initiative such as IYL 2015 on a global scale would not have been possible without our many financial sponsors. We are extremely grateful for their support and commitment to the ideals of our mission. The search for sponsors began in January 2014 immediately after the UN General Assembly declaration, and was active until February 2016 at the time of the Closing Ceremony. Any sponsorship model must take into account the particular nature of the community involved, and the diverse nature of potential IYL 2015 participants immediately suggesting a strategy based on "crowdfunding," seeking relatively modest amounts of funding from a large number of sponsors.

The first step of the sponsorship strategy was to contact organisations, institutions, and agencies in the field of optical and photonics technology, culture, development, and education. We employed a multi-tier sponsorship model with Founding Partner, Patron, Gold+, Gold, Silver, and Bronze Associate levels. Founding Partner and Patron Sponsorship opportunities were aimed at major academic and society (Founding Partner) and private sector (Patron) supporters, with packages tailored to individual objectives. Associate Sponsor packages were designed for medium-size organisations such as professional societies, universities, and museums, and small to medium enterprises. Sponsorship contributions ranged from €500 to €50,000 depending on level.

At the end of 2016, IYL 2015 had received financial support from 119 sponsors for a total of €550,000 which was placed in an IYL 2015 Global Fund account held at the ICTP secretariat. An indicative breakdown of expenditure is as follows: Opening and Closing Ceremonies (35%); ALOP programme including expansion planned in 2016 (10%); Topical Meetings at UNESCO HQ including the Ibn Al-Haytham conference (10%); Support for other Worldwide Events (15%); Administration and Communications (10%); Legacy Actions (20%).

Note that we tried extremely hard to ensure that sponsorship was not spent on administrative overheads. ICTP generously provided staff time as in in-kind contribution, and amongst the other partners, EPS and SPIE also devoted considerable staff time at no cost to the Global Fund. Also note that when supporting the Opening and Closing Ceremonies and other events, the vast majority of expenditure was for travel and logistic support for speakers and participants, with a clear policy to prioritise those from developing countries and other underrepresented groups.

Finally, we note that this sponsorship for the global organisation of IYL 2015 is only a very small fraction of the total budget for IYL 2015 raised through national committees and other partners organising activities locally. Estimates provided by partners for fundraising by national committees, as well as in-kind contributions and volunteer time, suggest a total cost of IYL 2015 exceeding €15 million.

MEDIA PARTNERS

To promote as widely as possible the aims of the International Year, the IYL 2015 offered the status of Media Partner to selected print and electronic publications and media outlets. The IYL 2015 Media Partners comprised key journals and magazines from the optics and photonics international community as well as magazines covering lighting, solar technologies, and architecture. In exchange for covering the IYL 2015 initiative throughout the year, these media outlets had priority access to main events and key stakeholders.

A woman at work in Gujarar, India.
CREDIT: Kalu Bharwad.

Butterflies at sunset in Bulgaria.
CREDIT: Krasimir Matarov

Part 2

Communications

Because of the need to reach as broad an international audience as possible, one of most important tasks of the IYL 2015 Global Secretariat was to set up and deploy a wide range of communication tools which are described below. In addition, IYL 2015 offered the status of Media Partner to selected print and electronic publications and media outlets. By the end of 2015, 28 Media Partners were registered, and benefited from regular updates, advance notice of press releases and priority contact with members of the IYL 2015 leadership for comments and interviews etc.

VISUAL IDENTITY

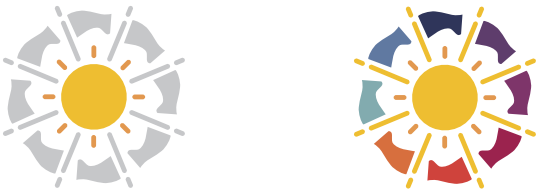
With the cross-cutting theme of light and so many diverse partners and sponsors, it was clear that IYL 2015 required an inclusive and attractive logo and visual identity. This motivated the use of a professional designer and artist (provided from the graphics team of the Founding Partner SPIE) yielding a very clean yet complete and symbolic logo design.

The IYL 2015 logo is made up of three elements: the Sun which is our primary source of light, flags that highlight the international nature of the year, and the different colours of the spectrum that symbolise the scientific study of light. When taken as a whole, the circular and flower-like aspect of the logo add themes of unity and life. The IYL 2015 logo was one of the central pieces of identification of the International Year of Light and was prepared in 27 languages.

Sun:
Light

Flags:
International

Colors:
Spectrum
Representation



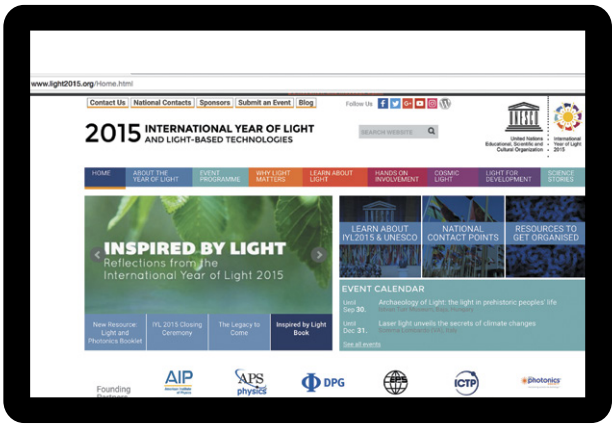
Flower:
Life-producing power of light

Circular composition & design:
Unity, Celebration

International Year of Light logo. CREDIT: Bryan Hintz / SPIE.

WEBSITE

The IYL 2015 website (www.light2015.org) was naturally the main source of information about the various IYL 2015 themes and activities around the world. The website was designed to be simple to use, to be compatible with the fact that many people would access it on mobile devices, and yet complete enough that it could provide all the key information about the different themes of the IYL 2015. It also provided a way to learn about UNESCO and the various IYL 2015 partners and sponsors.



www.light2015.org

As well as providing background information about the goals and objectives of the year, the website also introduced many of IYL 2015's scientific and development themes. A further important feature of the website was that it acted as a repository for a large number of different resources such as videos, dissemination materials, descriptions of educational kits and other hands-on activities. On a practical level, the website also served as a platform to gather information about the various events taking place worldwide via the creation of a dynamic international programme calendar. Organizers of events all over the world could submit information about their activities and, later, could also report on what they had done. An important practical aspect of the website management was its hosting in the Cloud independent of any one unique physical server; this was essential to ensure reliability.

The website regularly issued News Items and Press Releases to highlight activities around the world. A total of 140 News Items were published covering events in 73 different countries. This content was also often replicated by national nodes, media partners, and national sponsors in their own languages. In this context, note although the language of the international website was English, a large number of National Nodes set up websites in their local language to translate resources and to highlight events focusing on national priorities.

Concerning summary statistics, the website welcomed over 2.4 million visits from 600,000 visitors from over 190 countries between 1 October 2014 and 29 February 2016. Interestingly, around half of the visits were made from organic search, meaning that a visitor landed on the site from a search engine. Other visitors came via referrals from other websites, direct access using the website URL and Social Media.

BLOG

A crucial component of IYL 2015 was to allow members of the different communities participating in IYL 2015 to share their different perspectives via the IYL 2015 blog, where volunteers described their personal involvement. The blog (light2015blog.org) ran from April 2014 with near daily posts (Monday to Saturday) during 2015. By the end of February 2016, 350 blog posts had been published with 150,000 unique visitors and 250,000 page-views from 212 countries.

The blog content covered the major themes of the IYL 2015 as well as reports from events around the world. Articles covered topics of science and technology (39%), culture, development, and education (32%), event reporting (21%) and history and anniversaries (8%). The 250 blog authors came from 41 countries writing from all continents. Authors included scientists (58%), science writers (18%), artists (10%), representatives from NGOs and non-profit organizations (9%), other professionals such as physicians, or architects (3%) and students (2%). The blog proved a particular success in highlighting contributions from international organisations such as CERN, Earth Hour, EGU, IAU, IEEE, NASA, the NRC Canada, OSA, and SPIE. An important legacy of the blog is the book *Inspired by Light: Reflections from the International Year of Light 2015,* which collected over 50 representative blog entries for distribution at the IYL 2015 Closing Ceremony.

SOCIAL MEDIA

Social media channels were, of course, a key element of the overall communications strategy. Twitter, Facebook, and YouTube social media accounts and channels were set up early in 2014 and were used to build momentum to promote the IYL 2015 celebrations from a very early stage. Social media was used to complement the website and blog, and each of the social media channels played a well-defined role in terms of the audience it reached and the content it delivered. Over the year and throughout all different channels the hashtag #IYL2015 was used to group the content generated all over the world around the International Year of Light 2015.

TWITTER

During the period October 2014 to February 2016, the IYL 2015 Twitter account @IYL2015 reached over 6,000 followers. Over 6000 tweets from the account resulted in around 4 million impressions, over 10,000 mentions, and around 84,000 profile visits. The Twitter account shared IYL 2015 news, event information, resources, and links to the blog, as well as interacting with and replicating content from National Node Twitter presence. The translation of tweets by national nodes from English into local languages was an extremely effective dissemination strategy. Top content during 2015 that created most engagement with followers related to celebrating IYL 2015 anniversaries (especially Einstein and Maxwell), milestone events such as the Opening and Closing ceremonies, as well as key topics such as light pollution and gender inequality. Particular Twitter highlights during 2015 include the sequential welcoming of all countries of the world as IYL 2015 began on 1 January 2015, and the use of an interactive Twitter Wall prepared by Offenburg University in Germany that allowed live projection of tweets with the #IYL2015 hashtag to be displayed during the Opening Ceremony in France, the Laser World of Photonics Congress in Germany, and the Closing Ceremony in Mexico.

FACEBOOK

The IYL 2015 Facebook Page disseminated content similar to the Twitter feed, but following recommendations to release a maximum of 2 posts per day to optimise user engagement, publishing on Facebook was very selective in comparison with the Twitter account. During the period October 2014 to February 2016, the IYL 2015 Facebook page reached 9,621 Likes. The number of impressions of any content associated with the Facebook page was 3,768,746, leading to a total of 1,599,039 persons reached. Over the period studied 734 posts were published with an average of 1.4 posts per day, leading to 38,345 Likes, 9,227 shares and 1,399 comments. Popular content on Facebook was similar to Twitter.

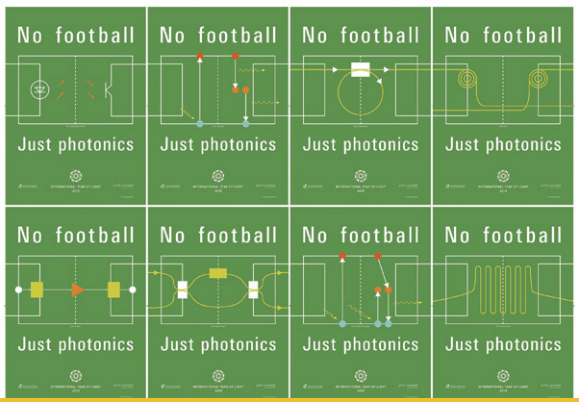
YOUTUBE

The IYL 2015 YouTube Channel hosted videos produced from the IYL 2015 Opening Ceremony and playlists

Reaching out to People Worldwide using Multimedia: Offenburg University's IYL 2015 Activities

POSTER COLLECTION

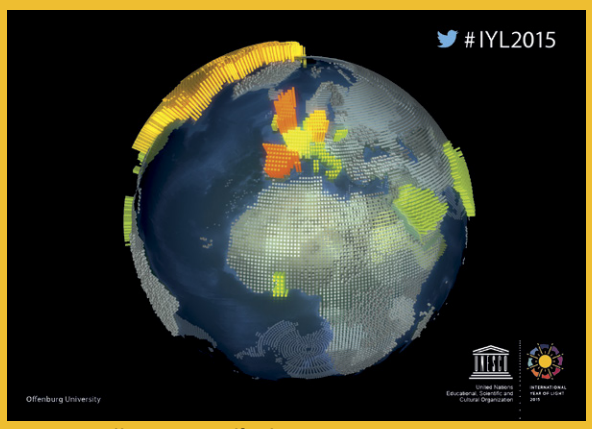
The integration of photonics into the arts was a major component of the IYL 2015. Offenburg University's Department of Media and Information utilized this context and encouraged its students to create their own art posters. Inspired by the IYL 2015, the students designed a wide variety of high-resolution, printable posters to be used for events or as exhibition material, which have been downloaded more than 10,000 times so far. In creating the posters, students brought in their own ideas, and as a result, current events were often incorporated. Most prominently, the 2014 FIFA World Cup was picked up as a topic, which led to the independent poster series, *No football—just photonics*. The core idea of the series was to take optical components and devices into the world of soccer.



No football - just photonics Poster Series. CREDIT: Phillip Hastigsputh / Offenburg University.

TOTAL LUNAR ECLIPSE

On 28 September 2015, a total lunar eclipse occurred, presenting an excellent opportunity to highlight the IYL 2015 at Offenburg University with a live broadcast event. Starting just after midnight, the Offenburg University reported from astronomical observatories around the world, conducted interviews with scientists and covered a range of other astronomical topics. The live broadcast was viewed by over 70,000 people from 143 different countries, totaling more than half a million viewer minutes during four hours of broadcasting.



Twitter Wall. CREDIT: Offenburg University.

TWITTER WALL

Smart Interactive Projection was shown at UNESCO Headquarters' foyer during the IYL 2015 Opening Ceremony, next to works by Picasso and Miró. Tweets placed for the opening ceremony by participants from around the globe were visualized in an interactive projection. Using the hashtag #IYL2015, Twitter messages were placed on a world map showing users' locations and messages. In addition, the projections were streamed onto the IYL 2015 website, so everyone was able to receive feedback and thus actively participate in the opening even if they could not be there.

During the two-day opening ceremony, approximately 15,000 tweets were registered and placed on the map. With the installation, Offenburg University students were able to apply their new knowledge and skills in an exciting project, while contributing to the IYL 2015. Due to the success of the project, Twitter walls were set up at the LASER World of Photonics Congress 2015 in Germany and at the IYL 2015 Closing Ceremony in Mexico.

with videos related to the International Year of Light celebrations. It attracted 10,550 views and 288 subscribers from October 2014 to February 2016. The most viewed video was the video clip for the song *Step into the Light* with 5,906 views. The IYL 2015 YouTube channel will become a legacy hub for all videos produced during the IYL 2015.

OTHER SOCIAL MEDIA CHANNELS

The IYL 2015 also had presence on other social media platforms such as Google+, accounting for over 50,000 visits and 309 followers, and to a lesser extent, on Instagram and Pinterest.

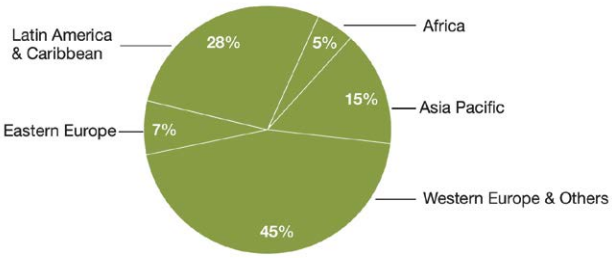
WORLDWIDE MEDIA COVERAGE

IYL 2015 engaged the services of the media monitor company Meltwater (www.meltwater.com) to carry out comprehensive analysis of worldwide media mentions of the International Year of Light. By searching the world's media for mentions of various phrases and keywords in 25 different languages, we were able to obtain a clear picture of the international media impact. In particular, this analysis yielded that there were a total of 23,000 distinct media mentions (newspapers, online, TV) from 120 different countries. The potential audience (Comscore) of these media mentions is 37 billion, with an equivalent value in terms of paid advertising of USD 348 million.

Overview of IYL 2015 Activities

The International Year of Light and Light-based Technologies 2015 (IYL 2015) has been one of the most successful and visible of any of UNESCO's international observances, with 13,168 registered activities involving an estimated more than 100 million people. IYL 2015 was visible in a total of 147 countries worldwide through a combination of: event organisation (129 countries), or political support and commemorative stamps and coins (a further 18 countries). One project even addressed the use of light-based technologies in Antarctica.

Note that the figure of over 13,000 events that took place in 2015 has been compiled from several different sources: organisers who uploaded details to the IYL 2015 website; a detailed search of national websites; keyword searches online; additional details provided for this Final Report; and events found through analysis of media sources. These figures are reliable as of the date of printing, but it is essential to stress that this is almost certainly an underestimate. There are many sectors of IYL 2015 partners and events where it has been very difficult to obtain data. This is especially the case for volunteer-driven events in schools and even some universities where organisation and implementation has been at the local level with no online or media promotion.



Distribution of IYL 2015 activities within the different UN Regional Groups.

IYL 2015 in Antarctica - Optical Coherence Tomography study on Antarctic Krill

Scientists from the University of St. Andrews (United Kingdom) brought the IYL 2015 to the Antarctica by performing Optical Coherence Tomography (OCT) imaging to study Antarctic Krill. The work undertaken has shown that the technology celebrated within the IYL 2015 has a truly global reach and may help to shed new light on important problems that matter both to scientists and the global community as a whole.

CREDIT: Tom Brown.

OCT is an imaging technique developed in the early 1990s that has had real impact—many optometrists now rely on these systems to provide 3D images of the retina and its underlying structure and it provides a unique method of diagnosing many important visual impairments. The technique has also found application in many other medical areas. Scientists at St. Andrews have also sought to develop its application in other fields, most recently in providing high resolution structural imaging of Antarctic Krill (Euphasia superba), one of the most important animals within the Antarctic food chain, which stretches all the way from microscopic algae to the blue whale, the planet's largest animal.

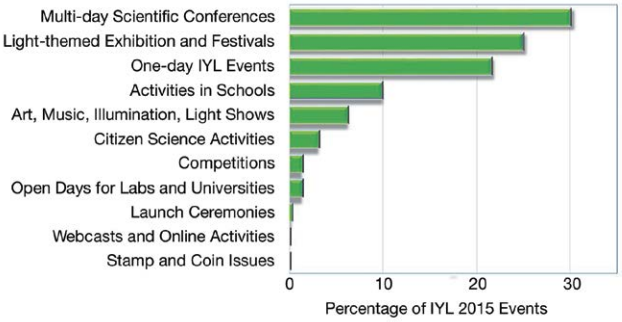
OCT provides imaging of structure by relying on accurate depth measurement of light which is reflected from the boundaries between different tissue types within a sample. The depth can be measured to a thousandths of a mm accuracy by relying on the phenomenon of interference, the effects produced when two waves interact with one another, either causing cancellation of a large growth in the signal. A typical OCT system can give resolution of a few thousandths of a mm or better in three dimensions to depths of a few mm within living tissue.

The studies on Krill started from important biological questions on the effects of ocean acidification on the structural development of the animals. They began by examining preserved lab specimens before shipping the system the Australian Antarctic Division aquarium in Tasmania, Australia to produce the first 3D imaging of living animals.

In 2015, the technology has been taken to the Antarctic by taking part in the Australian Government's K-Axis marine science voyage based on the icebreaker *Aurora Australis* which brought together around 50 scientists from a range of disciplines including physics, biology, oceanography, ecology, and chemistry to study an area of unusual productivity in Eastern Antarctic between the Kerguelen Islands and the Antarctic itself. It was shown that the OCT system, which is normally used within a specifically built optics lab, can be deployed and generate high quality data within the marine science environment. Throughout the marine science programme, our photonics technology performed exceptionally and provided an important compliment to the other imaging and photonics-systems on board that provided both imaging and advanced experiments on plankton development.

An indicative breakdown of the distribution of activities is as follows: Multi-day scientific conferences (31%); Light-themed exhibitions and festivals (28%); One-day conferences and special events (22%); Art and music and light shows (6%); Activities in schools (6%); Citizen Science activities (3%); Other e.g. Light-themed competitions, Open Days, Launch Events, Stamps and Coins etc. (4%).

Gobal distribution of IYL 2015 activities.



Indicative breakdown of IYL 2015 events by category.

SELECTED ACTIVITIES

With so many activities to choose from, it is extremely difficult to make a selection of highlights without leaving out some that were truly exceptional. Nonetheless, it is important to provide some sense of the great diversity of events that took place, and the short descriptions below endeavour to provide a snapshot of the many different actions that took place during 2015. Before describing these selected activities, however, we first review the two high-level events that bracketed the official UNESCO programme of the year.

OPENING CEREMONY 19-20 JANUARY 2015, PARIS, FRANCE

The IYL 2015 Opening Ceremony took place over 19-20 January at the iconic UNESCO Headquarters Fontenoy Building in Paris, France. More than 1,200 participants from more than 86 countries gathered to listen to 55 speakers covering diverse topics in light science and applications. Speakers included diplomats and UNESCO leaders, five Nobel laureates, NGO representatives, and industry CEOs. Subjects addressed themes such as: education and outreach; the basic physics of light; applications to the life sciences and health; energy and climate change; new light technologies; astronomy and light pollution; and culture and art. A panel discussion amongst political leaders addressed challenges for the future, and the speaker programme was complemented by performances from the New Zealand Maori group Ngāti Rānana and the American violinist Joshua Bell.

The Opening Ceremony also featured an extensive exhibition of educational resources from sponsors and partners, art and culture and music displays, and a historical exhibit on “1001 Inventions and the World of Ibn Al-Haytham.” And outside the conference hall, the

Opening Ceremony in Paris. CREDIT: SPIE.

faces of the UNESCO building were lit up for three nights in the colours of the Aurora Borealis in a spectacular large-scale installation, “Light is Here,” by the Finnish Artist Kari Kola.

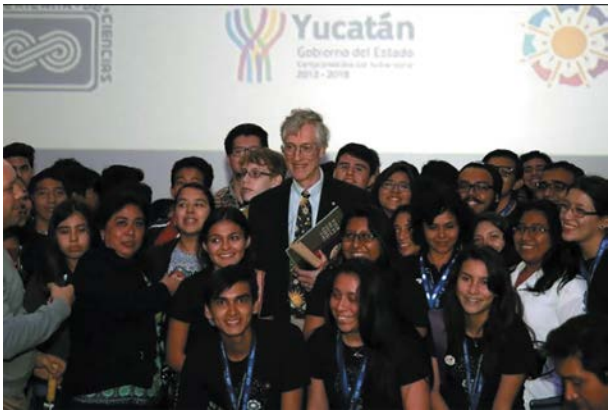
CLOSING CEREMONY 4-6 FEBRUARY 2016, MÉRIDA, MEXICO

The IYL 2015 Closing Ceremony took place over 4-6 February 2016 in the city of Mérida, Mexico. Over 300 participants reviewed the activities and major outcomes of the IYL 2015 and discussed enduring legacies. A message from the Secretary General of United Nations, Ban Ki Moon, stressed the tremendous positive outcome of the year, stating how “IYL 2015 has shown how the science of light, photonics, and related technologies can promote sustainable development in many fields, including climate change and energy, agriculture, health, and education.” Speakers included two Nobel laureates and representatives from many other diverse sectors, and the topics covered in talks included health and life science, architecture and urban environments, new light sources for research, optics and photonics, cultural heritage, light pollution awareness, and science education. An important component of the Closing Ceremony were a series of interactive Panel Discussions which encouraged audience participation in defining follow-up actions for the future, going beyond the IYL 2015.

Cultural and educational activities for the general public in Mérida were also organized to accompany the Closing Ceremony. Events such as a film festival, art installations, and an outreach programme in high schools and universities attracted 14,000 participants.

The ceremony was officially closed with a visit to the archaeological site Chichén Itzá, with lectures on Mayan culture and archeoastronomy, and a light and sound show over the Temple of Kukulcan.

Group Picture IYL 2015 Closing Ceremony. CREDIT: Federico Nájera.



John Mather surrounded by students after his participation in the IYL 2015 Closing Ceremony Outreach Programme. CREDIT: Salvador Gutierrez Niño / DGDC UNAM.

Ana María Cetto at the IYL 2015 Closing Ceremony. CREDIT: Salvador Gutierrez Niño / DGDC UNAM.

The Pyramid of Kukulcan at the archeological site Chichén Itzá. CREDIT: Salvador Gutierrez Niño / DGDC UNAM.

New Data Storage Technology for an Increasingly Connected World

The explosion in growth of the internet is bringing increasing challenges for digital storage, yet it is still difficult to securely store large amounts of information, even for relatively short timescales of 100 years. Recently, however, scientists from Southampton's Optoelectronics Research Centre (ORC), UK, have made a breakthrough. Their pioneering research into "5D" optical storage has for the first time created a way to retain immense quantities of data—up to 360 TB of data on a single CD sized disk—for up to 13.8 billion years. The storage medium works by using a high precision femtosecond laser to create tiny pits within fused silica glass. These pits contain self-assembled nanostructures (nanogratings) that change how light travels through them and consequently convey five "dimensions" of information.

The 5D storage takes advantage of the fact that fused quartz glass is one of the most chemically and thermally durable materials on Earth. The discs can withstand fire and temperatures of up to 1,000°C (1,832°F). The glass can withstand direct impact of up to ½ ton.

The technology has been demonstrated by encoding a copy of the Universal Declaration of Human Rights (UDHR)—the first time this document has been preserved in a storage medium that could well outlast humanity itself. The preserved UDHR was presented to UNESCO at the IYL 2015 closing ceremony in Mexico by Professor Sir David Payne, director of the ORC. He explained, "UNESCO's International Year of Light has increased global public and political understanding of the central role of light in enhancing the human experience. The gift document, encoded using a technology that is the epitome of the messaging for the IYL 2015, promoting sustainable development, education, and communication, is a unique way to enshrine the Declaration and symbolises the legacy of the IYL 2015."

EDUCATION FOCUS

Teaching activities involving light and optics naturally lend themselves to student participation and can serve as a very effective gateway into science for young people. All countries participating in IYL 2015 included a strong focus on education, and indeed in some cases light was chosen as a major theme of centrally coordinated National and Regional Science Weeks. This was the case, for example, in: Australia, Brazil, Czech Republic, Democratic Republic of Congo, France, Germany, and Mexico.

It is worth describing the impact of several of these national initiatives in more detail: activities in Brazil in October–November 2015 included specific events with indigenous communities and visually impaired people; 3,500 people attended the Week of Science in Kinshasa in April 2015 on the theme of Light and Energy in the Democratic Republic of Congo; Mexico's 22nd National Science Week in November 2015 was dedicated to the IYL 2015 reaching out to over 100,000 people; the Czech Academy of Sciences dedicated its annual November science and technology festival to light and held interactive workshops for children; the Canary Islands (Spain) organized its Science Week in November 2015 combining both IYL 2015 and the International Year of Soils 2015 as its theme for the activities.

Many events had special focus on school-age children. In Bangladesh, a hands-on programme *Spark of Light* was conducted in 37 schools in the country reaching 2,500 high-school students; around 1,500 elementary and middle school students in five schools in China participated in a *Seeds of Light* programme; El Salvador and Mongolia organized their National Physics Olympiads around IYL 2015; a particular regional activity in Europe

Participants at the LIGHT talks at University of Dhaka, Bangladesh. CREDIT: SPSB 2015.

was the *eTwinning* initiative which ran a contest for students from 62 classes from 22 different countries who had to design an experiment to explain the properties of light; the Franche-Comté region in France organised a public outreach programme *LUX!* which reached 13,000 young people and members of the public in one weekend; the Children's Museum in Jordan organised an exhibit and storytelling activities on *Colours* for three months in 2015 which was visited by 36,000 children; a three-month programme of the Macedonian Montessori Association implemented children's workshops in art and science of light; a Portuguese programme *Bringing Light to Schools* included teacher training in how to use light-based technologies to stimulate student interest; one event in South Africa was a year-long programme bringing light-based teaching resources to the disadvantaged area of Mamelodi targeting five local schools and 400 pupils; events in Tunisia included hands-on activities in six secondary schools in rural regions of the country.

Children experience the power of light at the LUX! outreach programme in the Franche-Comté region in France. CREDIT: Rémi Meyer.

Reaching out to the community. Outreach in Mamelodi (South Africa) saw unemployed members of the community learn how to make a solar cooker. CREDIT: Andrew Forbes.

Desana indian observing through a telescope in the Brazilian National Week of Science & Technology. CREDIT: FAPEAM.

IYL 2015 Optics and Photonics Kits

Doing experiments in optics and photonics is generally simple and attractive, and provides a fantastic introduction into many areas of science. During IYL 2015, a number of kits were featured, based on their accessibility and educational value:

Teachers at a Photonics Explorer Workshop in Brussels, Belgium. CREDIT: EYESTvzw.

- **Light Blox Kit:** International Year of Light Edition: Designed to introduce young people, age 8 and over, to the science of light, the Optical Society (OSA) distributed over 2,500 kits during IYL 2015 with an estimated impact of 78,000 people.
- **Photonics Explorer:** This kit—designed and developed by EYESTvzw—equips teachers with a class set of experimental materials provided within a supporting didactic framework. In total, EYESTvzw distributed 1,253 kits during the IYL 2015 in 23 different countries.
- **The Galileoscope Educational Telescope Kit:** Originating during the International Year of Astronomy 2009, over 10,000 of these low-cost kits, optimised for both optics education and celestial observation, were distributed globally in 2015 as part of the IYL 2015 outreach effort.
- **Quality Lighting Teaching Kit:** Produced by the Education and Public Outreach (EPO) group at the US National Optical Astronomy Observatory (NOAO), and supported by the International Astronomical Union (IAU) and the Optical Society (OSA) this kit was designed to increase student and public awareness of light pollution issues and quality lighting solutions.

LIGHT POVERTY

Globally, around 1.1 billion people still do not have access to electricity and reliable lighting infrastructure. A central aim of IYL 2015 was to raise awareness of this issue, since eradicating such "light poverty" is clearly a vital step in addressing numerous development goals.

Liter of Light Bangalore. CREDIT: Myshelter Foundation.

Many IYL 2015 partners made this topic a major feature of their activities: the CEO of the IYL 2015 Patron Sponsor Philips Lighting spoke on this subject at the Opening Ceremony held at UNESCO HQ, and indeed the company focused on providing practical solutions in many regions of the world, including an agreement to provide street lighting for 800 villages in Uttar Pradesh in India; IYL 2015 partners also participated in the public-private collective *Power for All* campaign that kicked off during 2015 to promote universal energy access by 2030; the IEEE Photonics Society teamed up with the NGOs SolarAid and Unite-to-Light to donate 3,200 solar lamps to remote regions in Tanzania, Kenya, Uganda, Zambia, Zimbabwe, South Africa, and the Philippines; the *Solar Lights for Learning* project organized educational activities and solar lantern distribution to children from schools in Namibia, Guatemala, Kenya, Chile, and Peru; a multipartner initiative led by the ICTP-linked LAM Network in Senegal delivered solar lamps also used as cell phones chargers, to schools and populations in remote villages; the VELUX Group collaborated with the social business Little Sun to distribute 14,500 solar lamps in Zambia, Zimbabwe, and Sierra Leone. Other organizations focused on raising more general awareness through novel initiatives. For example, CCT-SeeCity ran a night-time artistic and cultural walking tour of cities in Europe (Rome, Madrid, London, Berlin, and Paris) to raise funds for low-cost solar lighting installation at a centre for women and children in a suburban village of Dakar in Senegal.

GENDER, DIVERSITY, AND INCLUSION

Promoting the need for gender parity in science has been a major theme of the IYL 2015, aiming to address the well-known problem of minority participation of women in science, particularly at the highest level. The IYL 2015 has worked hard in addressing this issue from its inception, and achieved 35% participation of high-level women scientists in its governing bodies and as speakers in the official Opening and Closing Ceremonies. Although such gender ratios are superior to those usually associated with the organisation of scientific bodies and conferences, clearly much more still needs to be done.

Many IYL 2015 partners worked on particular initiatives to promote careers in science and engineering for young girls, as well as to improve the gender-balanced representation of scientists at all levels. Such initiatives included hands-on workshops, panels, seminars, competitions, and exhibitions highlighting women in science (see p. 31). Particular partner activities included: the organisation of 64 activities by the IEEE Photonics Society's *Women in Photonics and Young Professionals* initiative, and the *Introduce a Girl to Photonics Week* in October 2015; SPIE organized events such as the annual Women in Optics Presentation during their flagship Photonics West Conference in the USA in February 2015, including a panel discussion amongst women scientists on *The Road Less Travelled: Women in Science & Technology Leadership*; the OSA organized the *Minorities and Women in OSA* program/reception during the Frontiers in Optics conference in October 2015 and was involved with community initiatives such as the Girl Scouts USA/hands-on science demonstrations during the OFC conference in March 2015; the European project LIGHT2015 created a new prize for Early-Career Women in Photonics; ICFO in Spain organised a Girls and Boys and Photonics event and Girls Guide Australia developed specific educational

resources on light for IYL 2015. Other initiatives reached out to tackle problems such as the violence against women. The Woman Scream International Poetry and Arts Festival 2015—organized from the Dominican Republic—used the theme of *Women of Light* in over 160 events in 36 countries during March 2015 to honour women and create a conscious call against violence to women through artistic expressions. A number of IYL 2015 initiatives focused especially on those affected by war and natural disasters: the *Physics for All* activity from the German Physical Society (DPG) brought the themes of IYL 2015 to newly arrived refugee communities within Germany (see p. 58), and the Nepalese IYL 2015 committee focused mainly on activities and support for students and schools in areas impacted by the severe April 2015 earthquake.

IYL 2015 also supported the other inclusion challenges faced by society. In Thailand, UNESCO Bangkok and many other partners cooperated to light the façade of the Bangkok Art and Culture Centre with a rainbow-coloured display on 17 May 2015 to commemorate the International Day against Homophobia, Transphobia, and Biphobia. In another initiative, iconic landmarks and buildings throughout the Ireland were lit orange to commemorate World Suicide Prevention Day on 10 September 2015.

The Bangkok Art & Culture Centre lit up in rainbow lights for the International Day against Homophobia, Transphobia, and Biphobia. CREDIT: UNESCO / W.Field.

Women in Optics presentation and reception at SPIE Photonics West 2015. From left to right: Halina Rubinsztein-Dunlop (University of Queensland), Sona Hosseini (University of California, Davis), Laura Tobin (University College Dublin) and Anne-Sophie Poulin-Girard (Université Laval). CREDIT: SPIE.

Exhibition Women in Light Science Poster. CREDIT: The Spanish Society of Optics (SEDOPTICA) and the Women in Physics Group of the Royal Spanish Society of Physics (RSEF).

Women in Light Science

The Spanish Society of Optics (SEDOPTICA) and the Women in Physics Group of the Royal Spanish Society of Physics (RSEF) designed an exhibition to highlight 12 outstanding women researchers and their scientific contributions in optics and photonics. The main objective was to create female models to motivate future generations of female students.

The exhibition included: Madame de Chatelet for her translation of Newton's Principia Mathematica; Martha Coston for her signaling device on the sea that helped save lives; Henrietta Swan Leavitt for calculating the size of our galaxy and the scale of the universe; Hedwig Kohn for her meticulous work in pyrometry and spectrometry, both regarded as standard lighting nowadays; Katherine Burr Blodgett for inventing the low reflectance "invisible" glass; Yvette Cauchois for her X-ray spectrograph which helped discovered new elements of the periodic system; Maria Goeppert Mayer for understanding the physics of photons; Marie Luise Spaeth for inventing the dye-laser and the development of the laser rangefinder; Rosalind Franklin for her famous Photo 51, which identifies the helical DNA structure; Martha Jane Bergin Thomas for improvements in lighting sources (lamps and fluorescent tubes); Jean Mcpherson Bennet for her precise methods for measuring optical surfaces; and Jocelyn Bell Burnell for her discovery of pulsars.

Light Solutions for the Society Challenges of our World—LASER World of Photonics Congress and Trade Fair Opening Ceremony

The LASER World of Photonics Congress and Trade Fair was officially opened on 22 June 2015 with the *Light Solutions for the Society Challenges of our World* event, where high-level speakers addressed how light-based technologies can help to promote sustainable development and provides solutions to worldwide challenges in areas such as energy, education, communications, health, and sustainability.

In her opening address, Flavia Schlegel—Assistant Director-General for Natural Sciences, UNESCO—stressed that "the sciences of light may provide many solutions for the challenges that we face in our society." Dr. Schlegel also highlighted the great opportunity that IYL 2015 brings to tackle issues of great importance, especially in education. Wolfgang Boch—Head of the Photonics Unit of the European Commission—gave an overview of the European perspective of photonics. "Photonics has given us internet, lasers, smartphones, these are just three examples to see importance of photonics in our economy," said W. Boch. "Twenty per cent of world photonics production is made in Europe. The European Commission is convinced that photonics will shape the future of industry and society." Lawrence S. Goldberg—Senior Engineering Advisor in the Division of Electrical, Communications, and Cyber Systems; Directorate for Engineering at the National Science Foundation—gave a speech focused on the IYL 2015 efforts in the United States of America. He stressed "optics and photonics are also fields where breakthrough discoveries can be turned into technological advances."

The event was attended by science advisors and attachés from selected member states of UNESCO, Nobel Prize Laureates and scientific dignitaries, conference attendees, CEOs from photonics companies, Presidents and CEOs of relevant associations and CEOs and Presidents of IYL 2015 Founding Partners / Patron Sponsors that also had the opportunity to follow a guided tour around the LASER World of PHOTONICS Trade Fair.

Flavia Schlegel, UNESCO Assistant Director-General for Natural Sciences, speaking at the World of Photonics Congress. CREDIT: Laser World of Photonics Congress.

HIGH-LEVEL SUPPORT

UNESCO Director-General Irina Bokova giving her opening speech at the Islamic Golden Age of Science for the Knowledge-based Society. CREDIT: UNESCO/Pilar Chiang-Joo.

The IYL 2015 partners and national committees worked very hard to reach out towards high-level decision makers through targeted events during the year. Although certainly one aim of outreach is towards the public at large, initiatives that brought together scientific and political partners were considered essential to ensure that IYL 2015 initiatives would have a lasting impact well beyond the international year itself.

One approach to this was to seek high level patronage from figures of state. Such support included: Queen Letizia of Spain chairing the Spanish Committee of Honor of the International Year of Light; Prince Andrew, Duke of York, was the patron of IYL 2015 in the UK; the President of Ireland, Michael D. Higgins, acted as patron of IYL 2015 in Ireland; President Francois Hollande was patron of the launch of the International Year of Light in France. In addition, President Mahama of Ghana provided a message for the African Regional Conference and Exhibition on Harnessing Light and Light-based Technologies for Africa's Development.

Governments also recognized the IYL 2015 at the highest levels: The National Assembly of Korea passed a resolution in support on 16 February 2015; the Puerto Rico House of Representatives passed a resolution in support on 1 June 2015; and the International Year of Light was highlighted in the United States Senate with a statement that appears in the US Congressional Record for 17 December 2015. Other official events also commemorated IYL 2015. In the UK, two events were organised by the Parliamentary and Scientific Committee to raise awareness of the photonics sector; the closure of the IYL 2015 in Andorra was celebrated at the headquarters of the Parliament of Andorra; Member of the Duma and Nobel Laureate Zhores Alferov spoke on the IYL 2015 and topics of light technology at the Russian Parliament.

In addition to the Opening and Closing Ceremonies, high-level events with participation of UNESCO leadership included: two events at UNESCO HQ as part of the UNESCO Executive Board "Future Prospects" initiative

Special session on IYL 2015 held at the World Science Forum in Budapest on 6 November 2015. CREDIT: WSF - SCIFORUM.HU. MTA.HU.

Professor John Dudley (left), Mr. Mohamed Sameh Amr (center) and Professor Hiroshi Amano (right). CREDIT: UNESCO/ N. Hougenade.

The Duke of York, patron of IYL 2015 in the UK, speaking at the closing ceremony in London on 27 January 2016. CREDIT: IOP.

IYL 2015 African Regional Conference

The Government of Ghana, conscious of the critical role of the sciences in transforming lives and reducing poverty, led the process for the proclamation of IYL 2015 at the UNESCO Executive Board in 2013 with the view to promote light science towards advancing, in particular, the objectives and targets of the SDGs and the African Union Vision 2063 (The Africa We Want).

This vision influenced the various activities observed in Ghana, including the hosting of the Africa Regional Conference and Exhibition, celebrating IYL 2015, which took place in September 2015. The conference sought to achieve four main outcomes that could serve to strengthen the manpower base on the African continent, which would take advantage of the current era of light-based technologies. These outcomes were:

- To upgrade the Laser and Fibre Optics Centre at the University of Cape Coast into a full-fledged Institute for capacity-building in the Sub-Region.
- To establish a Regional Solar Technology Research Centre to enhance the study and promotion of solar science and the use of alternative energy.
- To establish a sub-regional Laser Medical Application Laboratory (LMAL) to train medical personnel towards improved healthcare delivery.
- To establish a Museum of Light and Light-based Technologies as part of solutions to emerging needs in the post-2015 development agenda.

with the participation of Nobel Laureates William D. Phillips (21 January 2015) and Hiroshi Amano (8 June 2015); the participation of the UNESCO Director General at the launch of IYL 2015 in Algeria (11 April 2015); the participation of the UNESCO Assistant Director General at the world's largest combined academic-industry photonics conference in Germany on 22 June 2015 (see p. 32) and at the opening of *The Islamic Golden Age of Science for the Knowledge-Based Society* conference at UNESCO HQ on 14 September 2015. Other significant events of this type also included: the UNESCO National Commission of Ghana organised the African Regional Conference and Exhibition on *Harnessing Light and Light-based Technologies for Africa's Development in Accra* from 14-16 September 2015 (see p. 33); a special session on IYL 2015 held at the UNESCO co-organised *World Science Forum* in Budapest on 6 November 2015; a side event to the *2016 ECOSOC Youth Forum* held at the UN HQ in New York on 2 February 2016 organised by Founding Partner 1001 Inventions.

IYL 2015 also stimulated many national and regional initiatives to promote light science and technology. The European Commission provided strong support through its Photonics Unit and the Photonics21 Public Private Partnership (see box below); an event organised at the National Academy of Sciences on 12 September 2015 brought together high-level partners within the USA; many other countries such as Canada, Singapore, and the UK developed new networks and/or reports promoting the impact of photonics and the need for continued investment.

France hosted the highly significant COP21 climate change conference from 5-12 December 2015, which included the participation of IYL 2015 Partner Liter of Light that promoted ecologically sustainable and cost-free lighting in developing countries.

SCIENTIFIC CONFERENCES

Nearly all optics conferences on the regular scientific calendar for 2015 made some special effort to promote the broader goals of the IYL 2015. A description of some particular events organised especially for 2015 follows.

In addition to the African Regional Conference and Exhibition in Accra, Ghana, major conferences were held elsewhere in Africa. In Cameroon, an international workshop from 24-27 November 2015 in Yaoundé attracted 100 students and young professionals from Africa and internationally. The IEEE AFRICON 2015 conference in Addis-Ababa Ethiopia from 14-17 September 2015 included a workshop focused on photonics research for African Development. In South Africa, the University of Fort Hare together with ICTP organized a workshop in Alice, Eastern Cape, South Africa from 28 September-1 October 2015 that was attended by 80 delegates from over 25 countries.

A major scientific conference in South America was *Colombia in the International Year of Light 2015* that was held in the cities of Bogotá and Medellín on 16-19 June 2015 attracting over 2,000 participants. In Ecuador, the *OptoAndina 2015* event in Quito from 11-13 November 2015 attracted students from Ecuador, Peru, Bolivia (Plurinational State of), Colombia, and Mexico. In El Salvador, an international workshop on optical spectroscopy from 25-30 March 2015 brought together academic and governmental institutions from Mexico and El Salvador, with a focus on concerns related to using optical techniques to detect dangerous materials and narcotics.

Elsewhere, a three-day international symposium on *Light and Life* was organized in Islamabad, Pakistan,

CREDIT: GoPhoton! / LIGHT2015 / Photonics4All.

European Commission Photonics Outreach Actions during the International Year of Light 2015

The European Commission through the Photonics21 Public Private Partnership invested €2.85 million in three outreach projects for the IYL 2015: GoPhoton!, LIGHT2015, and Photonics4ALL.

Under the umbrella of the European Commission's Photonics Unit, these three projects promoted the importance of photonics to young people, entrepreneurs, industry, and the general public in Europe during the IYL 2015, reaching out to more than 3 million people with over 400 events in 30 countries in Europe.

The events organized varied from large public events to small workshops:

- Photonics Splashes: large public events
- Targeted events aimed at students, entrepreneurs, and industry
- First EU-scale Citizen Science experiment in photonics (iSPEX-EU)
- 50 teacher-training workshops in 10 countries
- Over 2,000 teachers trained with impact on 100,000 children
- 263 Photonics Explorer kits sponsored to schools around Europe
- New prizes for Early-Career Women and Entrepreneurs in Photonics
- Videos and resources in 24 EU languages
- 4000+ mentions in European media (press, TV, radio).

Several Researcher and Student Participants of the African Light Source meeting in Grenoble, France. CREDIT: ESRF.

from 14-16 October 2015; events in Europe during 2015 included the LASER World of Photonics congress from June 22-25 2015 in Germany, and a workshop on an African synchrotron facility held at the European Synchrotron Radiation Facility in Grenoble, France from 16-20 November 2015. In the US, the 2015 Fitzpatrick Institute for Photonics Annual Meeting from 9-10 March 2015 in Raleigh, North Carolina included Nobel Laureate speakers and many panel discussions covering themes in science and development. In the Republic of Korea, the Optical Society of Korea meeting in Gyeongju included a panel discussion on the future of light science and technologies.

Worldwide, many laboratories and photonics institutes worldwide held open days for students and the public to learn about the work of research and optical science. One coordinated event in particular was the *International Illumination Commission (CIE) Gold Open Lab* where over 50 laboratories in 19 countries held open days in the period from 9-25 May 2015.

Projection of the IYL 2015 logo on the Globe of Science and Innovation, one of CERN's symbols. CREDIT: Maximilien Brice©CERN.

CERN - Raising the Visibility of Basic Sciences in the Framework of IYL 2015

Raising the visibility of the basic sciences was a major activity of many IYL 2015 Partners. The broad theme of light allowed CERN to carry out awareness-raising activities in the frame of its *High Luminosity* project to upgrade the large hadron collider, and also to communicate its involvement and support for the SESAME (Synchrotron-light for Experimental Science and Applications in The Middle East) light source. CERN also selected light as its theme for the European Researcher's Night on 25 September 2015, and SESAME was the subject of high profile articles in the Huffington Post (15 January 2015) and Nature Photonics (September 2015) by the former CERN Directors-General Rolf-Dieter Heuer and Chris Llewellyn Smith.

IYL 2015 FESTIVALS AND EVENTS RUNNING OVER MULTIPLE DAYS

Many science festivals and other public events running over multiple days placed particular emphasis on the theme of light during 2015. Such large scale visibility brought the important messages of the year to millions. A selection of highlights gives a flavour of the diversity of such events, and illustrates also how the international aspects of IYL 2015 could be sometimes effectively linked with national themes.

In New Zealand, for example, the *Illuminating NZ* celebration began in mid-winter to coincide with the Māori New Year Matariki (heralded by the appearance of the Pleiades on the horizon) and closed with a 9-day celebration of the coming of spring: Te Kōanga. The event programme involved thousands of participants of all ages and included art, music, and science activities. In the Philippines, a two-day public symposium *IlumiNASYON* on 9 and 16 March 2015 highlighted optics in the arts, science, and in Philippine history and culture. And in Mozambique, events in Maputo celebrating IYL 2015 were held on 10 November 2015 to coincide with celebrations of the city's founding.

Many large scale events took place in Europe during 2015. An exhibition *Discover the power of Light!* organised by the Vrije Universiteit Brussel attracted 270,000 visitors to the iconic Atomium Centre in Brussels. The European Researchers' Night on 25 September 2015 in 24 countries attracted over 1.1 million visitors, and many activities used the theme of light to align with IYL 2015. One notable example is CERN's activities on light and poetry. The art festival *Nuit Blanche* was organized in Bratislava on 10 October 2015, and together with the *Festival of Light* (10-12 October 2015) attracted 100,000 people to the streets of the Slovak capital. The science festival organised by the German Physical Society (DPG) and the Federal Ministry of Research in Jena, attracted more than 53,000 visitors from 27 September-1 October 2015. The *Athens Science Festival* celebrated from 17-22 March 2015, chose as its main theme light and its applications, and attracted 33,000 participants, including 8,000 students.

Getting the audience involved through a "Mexican wave: to illustrate the concept of a wave during the Discover the Power of Light Festival in Brussels, Belgium. CREDIT: B-PHOT.

Elsewhere, the *TECNOPOLIS* exhibition in Argentina from July-November 2015 attracted more than 700,000 visitors, and included prominent stands with experiments and art performances on the theme of light. The *Light Fest* event organized in Concepción (Chile) on 11 October 2015 combined the science of light, art, photography, and dance, attracting 25,000 people. In Hong Kong, the K11 art and shopping mall displayed an exhibition *Supernova Xmas Luminastic* from 3 November 2015 to 3 January 2016 during the crowded Christmas season.

International Working Group Ibn Al-Haytham

The International Working Group (IWG) Ibn Al-Haytham was set up during IYL 2015 to highlight the contributions of Arab scholars during the Islamic golden age of optics, in particular the work of Ibn Al-Haytham. They also emphasized the importance of linking the work of Ibn Al-Haytham to key issues of importance to policy makers and to matters of importance to the general public, particularly in developing countries. This IWG includes leading optics and photonics scientists as well as history and philosophy of science scholars from Africa, Europe, North America, and Asia.

The IWG designed specific sessions included in domestic programs in different Islamic and Arab countries. In addition, the IWG organized prominent regional events and produced resources related to the contributions of Arab scholars to optics in the Islamic golden age. For instance, the IWG co-organized the international conference on Ibn Al-Haytham's legacy at UNESCO HQ on September 2015.

Due to the success of these actions, the IWG decided to continue its activities beyond 2015 through the creation of the Ibn Al-Haytham International Light, Science, History, and Applications (LHiSA) Society.

Astonishment on the faces of children watching a children's theatres Highlights Show for children in Jena, Germany. CREDIT: Highlights der Physik/Offer und Offer.

IYL 2015 ANNIVERSARIES AND HISTORY OF SCIENCE

Many activities highlighted milestones in the history of science during 2015 (see pages 10-13).

The lives and works of Ibn Al-Haytham were the focus of the majority of such events, with activities in 27 countries. As well as individual events from IYL 2015 partners, coordinated programmes were run by 1001 Inventions in partnership with UNESCO (see page 54) and by the Ibn Al-Haytham International Working Group (see p. 36). An important two-day conference on the *Islamic Golden Age of Science for the Knowledge-Based Society* ran 14-15 September 2015 at UNESCO HQ in Paris, which included an exhibition from the Qatar National Library on efforts to preserve Islamic archives and manuscripts.

Many events on 25 November 2015 celebrated the 100th anniversary of Einstein's General Theory of

Galileoscope Workshop in New Zealand. CREDIT: John Hearnshaw.

Relativity (see page 12). Articles in major newspapers on TV and in other media appeared around the world, and there many dedicated scientific conferences, including a three-day conference in the Philippines, *Project Einstein 2015: An International Conference Celebrating 100 Years of General Relativity.* During the week of May 29 2015, events were held on the island of Principe to celebrate the 96th anniversary of the experimental confirmation of the theory during the total solar eclipse of 1919.

Maxwell and his theory of electromagnetism (see p. 11) were a particular focus in Scotland. As well as many lectures and special events throughout the year, *Maxwell's Torch,* an illuminated mobile artwork created by the Institute of Physics in Scotland was used to accompany many activities, and there was a special musical composition *In Time of Light* created by PJ Moore.

The work of Augustin Fresnel was showcased in a special *Fresnel Lecture* on 10 March 2015 held at the Royal Institution in London and organised by the Society of Light and Lighting. The event attracted 400 people and was attended by the Duke of York. Possible links between Fresnel and the development of links between art and science were discussed in a multidisciplinary event *Au Prisme d'Augustin Fresnel* held at the Louvre in Paris on 2 November 2015.

IYL 2015 AND ASTRONOMY

The International Astronomical Union (IAU) organized activities under the *Cosmic Light* banner, recognizing both the importance of light to astronomy as well as promoting the preservation of dark skies. The latter theme focuses on raising awareness of and reducing light pollution that results in more than 80% of the world's population living under light-polluted skies.

Dark Sky awareness was raised through many local events, as well as the citizen-science *Globe at Night* programme (globeatnight.org), an international citizen scientist project to measure the degree of light pollution all around the world using the human eye, and through the development of the Quality Lighting Teaching Kit.

Light: Beyond the Bulb exhibit at Museo Laberinto de las Ciencias y las Artes, in San Luis Potosí, S.L.P. Mexico. CREDIT: Leslie Jui.

Light: Beyond the Bulb Exhibitions around the World

Light: Beyond the Bulb (LBTB) is a free, open-access, international exhibition program containing materials that were crowd-sourced, expert-curated, and translated into multiple languages. LBTB showcases materials from microbiology to astronomy, and creates connections with physics, optics, photonics, atmospheric and earth sciences, astrophysics, and more. The project was developed by the Chandra X-ray Center, with major support and funding from SPIE and the International Astronomical Union.

LBTB was organized and hosted by an extensive network of local volunteers and was/can be found in parks, airports, cafes, galleries, and many other kinds of public spaces throughout 2015 and into 2016. There have been 685 LBTB exhibit events in 40 countries translated in a dozen languages. Examples of locations include exhibits at the O'Hare Airport in Chicago, USA; the Village Baykal in Dolna Mitropolia, Bulgaria; the St. Ignatius College Siggiewi Primary School in Siggiewi, Malta; the K11 Art Mall in Shanghai, China; and the Galway Astronomy Festival in Ireland.

Thousands of people around the world also participated in astronomical observation, especially during the solar eclipse on 20 March 2015 and the total lunar eclipse on 28 September 2015. One very prominent observing event in the US was the *White House Astronomy Night* hosted by President Obama on 19 October 2015 which had national impact stimulating many other satellite events nationwide on the same day. Many countries and institutions held similar events under the banner of the *Night of the Stars* for public observing, and one such programme on 28 November 2015 in Latin America attracted 200,000 participants.

The IAU also supported over 20 national or regional outreach efforts as part of *Cosmic Light* during 2015. Building on developments during the 2009 International Year of Astronomy, over 10,000 Galileoscopes were distributed during 2015 to science educators in the US, Puerto Rico, and Guam, and the *GalileoMobile* astronomy outreach project worked with a network of 20 schools in Argentina, Brazil, Chile, Colombia, Ecuador, and Peru.

In addition to the IAU-coordinated activities to recognize the start of IYL 2015 in January 2015, the Chandra X-ray Center released a set of images that combined data from telescopes tuned to different wavelengths of light. In addition to these images, the Chandra X-ray Center created the *Light: Beyond the Bulb* image bank (see page 37).

LIGHTING AND ARCHITECTURE

The year 2015 also saw many examples of the symbolic power of light with illumination of major monuments and buildings worldwide. The opening of IYL 2015 saw the Fontenoy building at UNESCO HQ in Paris illuminated from 19-20 January 2015, and on 24 January 2015, the UNESCO World Heritage Site of the old port of Valparaíso (Chile) saw a public event *Post Tenebras Lux* attracting 50,000 people. The launch of the IYL 2015 in Ireland on 13 March 2015 saw the first ever illumination in green of the Dublin Spire, and the *Night of Heritage Light* organised by the Society of Light & Lighting illuminated nine UNESCO World Heritage Sites across the UK on 1 October 2015. On the truly global level, the celebration of the UN's 70th anniversary on 25 October 2015 saw 300 iconic monuments worldwide lit up in the colours of UN blue. A number of other international lighting events took place 2015. The *Circle of Light Moscow International Festival* from 26 September-4 October 2015 saw 10 million visitors experience lighting and projection mapping of iconic building such as the Bolshoi Theatre. Similar mapping displays included the *Legenda Aurea* show on 11 October 2015 on the Colosseum in Rome, and the Brandenburg Gate from 9-18 October 2015 as part of Berlin's *Festival of Lights.*

Amongst other events, the *Lantern Festival in Taipei, China,* ran from 5-15 March 2015, included a special lantern featuring Einstein, and attracted more than 10 million visitors. A winter light festival *Montréal en lumière* in Canada presented an array of free outdoor light-based activities integrating digital arts and interactive initiatives. To close the IYL 2015 in South Africa, two laser projection

CREDIT: Society of Light and Lighting.

The Night of Heritage Light

The Society of Light and Lighting (SLL) celebrated IYL 2015 by illuminating nine UNESCO World Heritage Sites across the UK on 1 October 2015. The goal of the project was to reach out to a wider, public audience and inspire a new generation of light designers. Some of the sites were open to the public and thousands of people viewed the spectacle up and down the country.

Starting at William the Conqueror's Tower of London, the Night of Heritage Light worked its way up the country as the natural light faded.

The other heritage sites were Edinburgh Old and New Towns, Fountains Abbey, Liverpool Maritime, Ironbridge Gorge, Blenheim Palace, Blaenavon, Jurassic Coast, and Giant's Causeway.

Special Lantern featuring Einstein at the Lantern Festival in Taipei, China. CREDIT: Chung Chern Sung at TPS.

shows were shown at the V&A Waterfront site in Cape Town, where members of the public were encouraged to "follow the light" to the source where they found an IYL 2015 stand. Running from 16-31 December 2015, an estimated 150,000 people passed through the V&A site on New Year's Eve.

Promoting light in the built environment was a special focus of the International Association of Lighting Designers (IALD). As well as hosting a special event during the *LightFair* conference in New York on 5 May 2015 that included UNESCO representation, the IALD regional chapters hosted over 100 other events in 2015. Another event on this themes was the *Light Middle East* conference in Dubai (United Arab Emirates) from 6-8 October 2015 that saw over 6,000 visitors from 85 different countries. IYL 2015 also saw the launch of the International VELUX Award for students of architecture to encourage and challenge students to explore the theme of daylight which by March 2016 had attracted more than 5,000 student registrations from 97 countries.

Other themes involving different aspects of light and architecture linked light and gardens. The *Gardens of Light* project aimed to promote historic gardens and museums around the world and was part of the *Festival of Light* from 2-30 August 2015 at the Royal Łazienki Park in Warsaw (Poland) receiving around 70,000 visitors. In the UK, a Garden of Light celebrating the IYL 2015 designed by the University of Southampton won the People's' Choice Award at the RHS Tatton Park Flower Show, which was held from 22-26 July, and was featured on the BBC Two channel. Also in the UK, the *e-Luminate Wine Tasting Light Experiment* took place in Cambridge on 17 February 2016 to examine the effect of lighting on the perception of the taste and aroma of wine (with red and blue light seen to have a more beneficial effect).

Garden of Light, a photonics garden by the University of Southampton (UK). CREDIT: Optoelectronics Research Centre (ORC) and Physics and Astronomy at the University of Southampton.

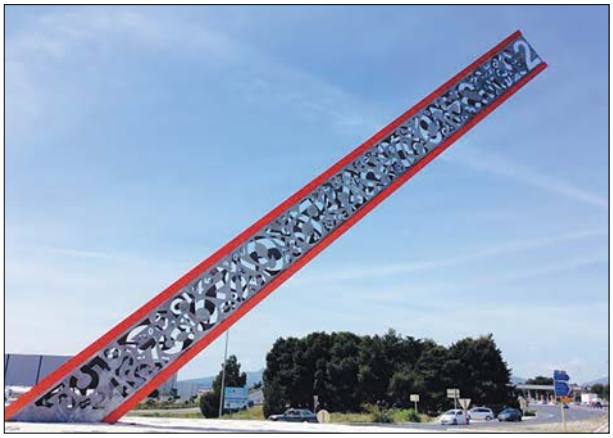
ART AND MUSEUMS

Many artists and museums worldwide embraced IYL 2015, both through drawing attention to the International Year in the frame of their exhibits and displays, or through participation in activities organised with other partners that created new synergies between different communities.

A major event in the Netherlands used technology developed for exoplanet research to project a rainbow arch on the Amsterdam Centraal railway station. Developed by Studio Roosegaarde, Leiden University, and North Carolina State University, the *Rainbow Station* projection ran every day in 2015 and was seen by an estimated 50 million people.

In the frame of COP21 and IYL 2015, the *Human Energy* project allowed participants to generate power through running, dance, and cycling etc. to light up the Eiffel Tower. Another project during COP21 was *Phares*, a beacon of light sculpture installed at the Place de La Concorde. Elsewhere in France, the largest artistic sundial in Europe was inaugurated on 21 June 2015 to mark the Summer Solstice during IYL 2015

In Germany, the Centre for International Light Art in Unna awarded the first International Light Art Award on January 22 2015. The event also included a scientific introduction



Giant artistic Solart2 Sundial in Perpignan, France. CREDIT: Marc-André 2 Figueres.

to the main themes of IYL 2015. An exhibition *Sorolla: The Art of Light* ran in Madrid from 14 July 2015 to 18 January 2016 displaying works by the Spanish painter Joaquín Sorolla, analysing his techniques that gave him the reputation of "the painter of light." During the year, the Prado Museum in Madrid also hosted a documentary where researchers linked the themes of IYL 2015 to the museum displays. In France, *Au Prisme d'Augustin Fresnel* was a one-day event at the Louvre in Paris on 2 November 2015 on art and the development of impressionism in the 19th Century. *Light and Dark Matters* was a series

Rainbow Station projection at Amsterdam Central Station in the Netherlands. CREDIT: Studio Roosegaarde.

Exhibition Sorolla. The art of light in Madrid, Spain. CREDIT: Museo Sorolla.

of events organised by the Tate Modern art gallery and Founding Partner IOP in London from 20-21 November 2015, bringing together artists, scientists, philosophers and the public to share experiences on light.

The Museum of Light in Mexico City ran many events in 2015, including lectures and displays, outreach for children and teachers, and the *Beyond Light* exhibit prepared for the National Science Week that took place from 7-13 November 2015. The Museum of Contemporary Art Australia in Sydney ran the *Light Show* exhibition from 16 April-5 July 2015 and developed accompanying events for IYL 2015 including public lectures and interactive exhibits. An overlapping exhibit, *Luminous*, featured works by indigenous artists. A feature of events in South Africa was the inclusion of a strong art and science programme in remote regions of the country, derelict buildings, and construction sites.

SPIE IYL 2015 Photo Contest

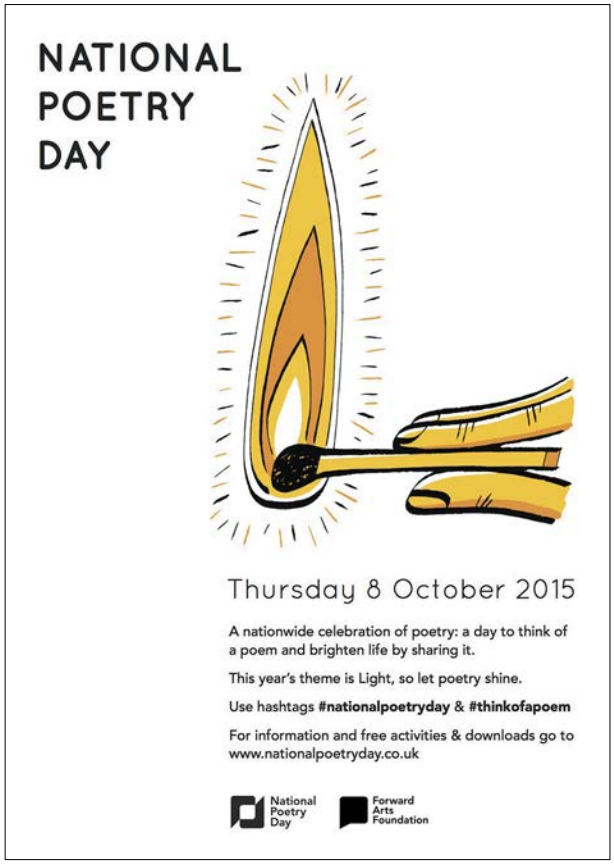
The SPIE IYL 2015 Photo Contest was held to raise awareness about the IYL 2015 celebration and the vital role that light and light-based technologies play in daily life by promoting sustainable development and providing solutions to global challenges in energy, education, agriculture, and health. Eight hundred submissions were submitted; winning entries received cash prizes and were featured on four different covers of *SPIE Professional* magazine.

The winner of the contest was Paul Reiffer's 35-second-exposure image of traffic and other lights on and around the Nanpu Bridge in Shanghai (China). The People's Choice Award for the contest went to Handi Laksono, a travel and landscape photographer from East Java, who photographed a 5-year-old boy studying in a dark hut, with only natural light streaming through a small window.

Over the Rainbow—Winner of the IYL 2015 SPIE Photo Contest. CREDIT: Paul Reiffer.

LITERATURE

Light has always been a theme of inspiration for literature, and events linking light and the written word were also frequent during 2015. The UK's National Poetry Day on 8 October 2015 adopted the theme of light with the sharing of publicly submitted poems and a free book, *LIGHT—A National Poetry Day Anthology*. Australia's National Science Channel RiAus organized a scientific haiku contest to reflect the National Science Week theme *Making waves—the science of light.* IYL 2015 activities in Rio de Janeiro were closed with the *Light for Poets* series of public conferences. In the Russian Federation, the Words & Light Anthology received entries from more than 400 authors from 19 countries (see page 42).



UK National Poetry Day 2015 Poster. CREDIT: Forward Arts Foundation.

THEATRE AND FILM

Several partners developed special theatrical shows for IYL 2015. *The Amazing Theatre of Physics* in the Czech Republic visited many schools with their play explaining the physics behind light. *Looking for Ibn Al-Haytham* was the title of a musical performed in Toledo by the IES Princesa Galiana, a Spanish high school. The student theatre group of the Université de Franche-Comté in France ran a series of outreach events all year, including *Eclats* a specially written performance on light and its properties.

Words & Light poster. CREDIT: Lyudmila Finogenova Lyudmila.

International Year of Light 2015 Literary competition Words and Light

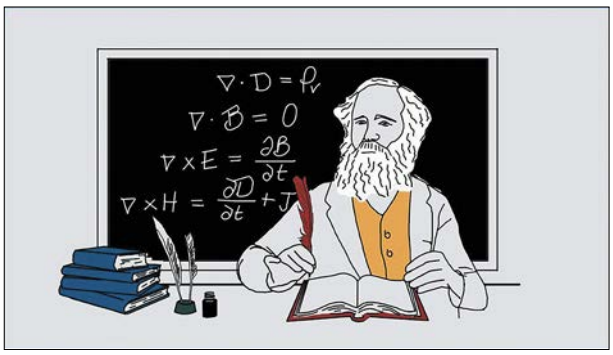
More than 400 authors from 19 countries took part in a tribute to writers inspired by light—the international competition *Words and Light,* organised in the Russian Federation. Participants were invited to write about what light means to them and works could be submitted in Russian, English, German, or Portuguese. By emphasizing the connections between light, science, and literature, the ultimate goals of Words and Light were to attract the attention of as many people as possible to the significance and aims of the IYL 2015 and promote dialogue and peace by underlining the universal and all-embracing character of light and the sense of togetherness it entails. The best entries were published in an online anthology.

1001 Inventions and the World of Ibn Al-Haytham short film. CREDIT: 1001 Inventions.

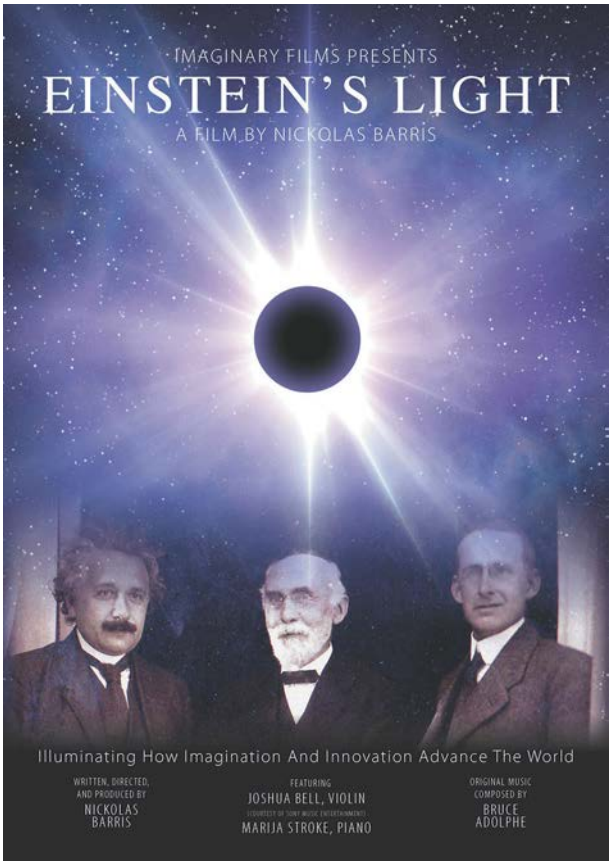
Over 100 short videos and/or documentaries related to the theme of light or especially commissioned for IYL 2015 were released during 2015. The short film, *1001 Inventions and the World of Ibn Al-Haytham,* premiered at the 12th Dubai Film Festival in December 2015 and represented the last film of the late renowned Egyptian actor Omar Sharif. *Einstein's Light,* by film maker Nickolas Barris and Leiden University described the innovative spirits of Albert Einstein and Hendrik Lorentz. Excerpts served as the official trailer for the IYL 2015 worldwide, and the premiere was held on 2 November 2015 during the Leiden International Film Festival. The French-German television channel ARTE developed a series of ten episodes called *Avatars de Lumière* dedicated to light-based technologies. A film series commissioned by Physics World (IOP), *Light in our Lives,* covered applications of light and light-based technologies, with an international dimension reflecting the countries where they were produced—the UK, India, France, Mexico, and the USA. Also in the UK, The Open University, the South East Physics Network and the Royal Astronomical Society created an animation to celebrate the anniversaries commemorated during IYL 2015.

Cinema Festivals around the world also decided to align their themes with the IYL 2015, including the Science Film Festival (see page 43) and the IYL 2015 Film Festival. Other Festivals included: the *VerCiência International Festival of Science TV* in Brazil, the *2nd Ethnografilm Festival in Paris,* and the *CINEMISTICA 2015 Film Festival* in Spain.

Links to a selection of these videos are available from the IYL 2015 YouTube Channel and from the IYL 2015 website.



James Clerk Maxwell - What's the go o' that? short animated film. CREDIT: Glasgow Science Centre.



Einstein's Light documentary poster. CREDIT: Imaginary Films.

MUSIC

Seven original compositions have been inspired by the IYL 2015 and have been featured in events ranging from the Opening Ceremony at UNESCO HQ to local conferences in events in over 50 countries worldwide.

Bruce Adolphe composed the score for the Nickolas Barris film *Einstein's Light*. The violinist for the soundtrack was Joshua Bell, performing with pianist Marija Stroke. The École Polytechnique and composer Jérôme Musiani released *Step into the Light* performed by Vince McClenny. *Rainbow of Light* was written by Linda Lamon and sung by soprano Katerina Mina. *Shine* is a dedication to Ibn Al-Haytham, and features on Sami Yusuf's score for Ahmed Salim's film *1001 Inventions and the World of Ibn Al-Haytham* starring Omar Sharif. *Faro de Estrellas* was a song composed and arranged by the Italian duo Jalisse based on lyrics by Sandra von Borries in Spanish submitted as part of the IYL 2015 Light Song Contest. *In Time of Light* with words and music from PJ Moore was an electronic oratorio in celebration of James C. Maxwell. The song *C'è Luce* was released as part of an IYL 2015 project in Italy by the Andare oltre si può association which promotes societal inclusion for people with Down syndrome.

Links to videos of these songs are available from the IYL 2015 YouTube Channel and from the IYL 2015 website.

Children attending Science Film Festival in Indonesia. CREDIT: Science Film Festival.

Science Film Festival 2015

In 2015, the Science Film Festival joined the IYL 2015 as a Collaborating Partner. During the festival, 52 international films on the science of light and light-based technologies entertained and informed audiences in Burkina Faso, Cambodia, Indonesia, Jordan, Lao People's Democratic Republic, Malaysia, Myanmar, Oman, Palestine, the Philippines, Qatar, Russia, Sudan, Thailand, the United Arab Emirates, and Viet Nam. The event reached over 750,000 participants in the 16 participating countries.

Elim School pupils (Zambia) performing at the school assembly. CREDIT: SkyLight Opera.

SkyLight: a Global Science Opera

Skylight—a Global Science Opera was the first-ever opera to be written and performed simultaneously by a global community. It was also the first production of the Global Science Opera, a legacy of IYL 2015, which will realize annual global art-and-science productions in collaboration with international scientific research organizations and projects. In *Skylight,* a network of schools, universities, art institutions, and volunteers in 35 countries collaborated to create and perform a science opera inspired by the IAU's Cosmic Light themes, providing a platform for creative science learning as well as cross-border friendship and cooperation. It was performed via live-streaming and video during World Space Week and the CREAT-IT conference (October 2015) as a collaboration with Global Hands on Universe, the Galileo Teacher Training Programme, the European Network for Opera & Dance Education (RESEO), the CREAT-IT project, and Lunar Mission One.

PJ Moore (keyboard) and friends performing his electronic oratorio for James Clerk Maxwell. CREDIT: Nick Bramhall.

Massive LPWA LightHouse collaboration in Dorum, Germany, December 2015. CREDIT: Dirk Schütze, Eike Henning, Frank Upmeier, Gunnar Heilmann, Holger Kneifel, Jannes Bauer, Jenja Ospanov, Jenny Kretschmer, Jörg Miedza, Jörg Schmidt, Leonie Hoppe, Liela-Paulin Krause, Marc Krug, Norbert Götz, Olaf Schieche, Oliver Schnepper, Ralf-Martin Tauer, Timo Kretschmer, Werner Heisenberg, David Brams and Jan Teunis, Maarten Takens, Leonardo Lopez, and Sergey Churkin.

The Light Painting World Alliance

The Light Painting World Alliance (LPWA) is non-profit organization that unites a large community of light artists for better sharing their passion for light. In support of the IYL 2015, LPWA managed an exhibition for the IYL 2015 Opening Ceremony and a few exhibitions and special events around the globe: Oviedo (Spain), Aubervilliers (France), Stuttgart, Koblenz and Dorum (Germany), and Astana (Kazakhstan). In addition, LPWA organized the global contest Light Painted World to present fascinating artworks to the public.

PUBLICATIONS

Print and online publications ranging from scientific journals to newspapers and in-flight magazines released special content on the IYL 2015, permitting an extremely wide reach to the wider public.

In the scientific community, IYL 2015 learned society partners released a number of special publications throughout the year to raise awareness of IYL 2015 themes and topics (e.g. APS, DPG, EPS, IOP, OSA, SFO, SFP, SPIE, and others). Other special issues include the Cuban *Journal of Physics* and the leading Russian journal *Optics and Spectroscopy*.

Publishers such as Elsevier, Springer, and Wiley also published special IYL 2015 issues or editorials. Nature Publishing Group and the *Nature* journals released articles and content that was updated throughout the IYL 2015. *Nature Middle East* published an interesting editorial at the end of 2015 discussing how Ibn Al-Haytham's legacy of scientific skepticism should be emulated across the Arab World. The IYL 2015 Media Partners published many special publications over the IYL 2015. The most prominent were featured in *IYL 2015 Optics Bookshelf* on the IYL 2015 website.

Several books were released on the themes of IYL 2015; *Celebrating Light and Inspired by Light: Reflections from the International Year of Light 2015* from SPIE (see page 23); a children's book on Ibn Al-Haytham from 1001 Inventions and National Geographic; Kim Arcand and Megan Watzke—*Light: Beyond the Bulb,* coordinators—presented a visual exploration of the power and behavior of light in *Light: The Visible Spectrum and Beyond*; and *The Wonders of Light*—from Marta García-Matos and Lluís Torner also depicts the spectacular power of light.

OTHER COMMEMORATIONS

The IYL 2015 was also celebrated in many other ways combining art, science, and innovative approaches to raising awareness with the general public. The IYL 2015 logo was projected widely, including on The Globe of Science and Innovation at CERN, and was also the subject of large scale light painting by the Light Painting World Alliance in Oviedo, Spain and on the North Sea in Germany. On a different scale altogether, a micron-scale logo was fabricated using advanced plasmonic colour laser printing technology at the Technical University of Denmark. Other innovative ways in which the IYL 2015 logo appeared was as a hologram prepared for laser pointers, inside cakes, drawn with machine vision-robotic control, and included in a special design for a reindeer-themed Christmas decoration that was placed on the Christmas Tree outside the UK Prime Minister's residence at 10 Downing Street.

The IYL 2015 was celebrated in philately with stamps from 26 different countries: Algeria, Antigua and Barbuda,

**LPWA builds a giant IYL 2015 logo on the North Sea.
CREDIT: LPWA.**

Bosnia and Herzegovina, Central African Republic, Equatorial Guinea, Gambia, Grenada, Guyana, Israel, Italy, Kyrgyzstan, Liechtenstein, Maldives, Malta, Mexico, Moldova (Republic of), Montserrat, Portugal, Saint Kitts and Nevis, Sao Tome and Principe, Serbia, Sierra Leone, Spain, The United Kingdom, Uruguay, and The Holy See. The stamps depicted key IYL 2015 themes such as Cosmic Light (Sierra Leone), light pollution awareness (Gambia), optical phenomena (Sierra Leone), and light-based technologies (UK). The stamp from Liechtenstein included features that allowed hands-on experiments on light to be performed, and received the prestigious Red Dot design award in 2015. Other countries such as Romania issued special postmarks whilst stamps from countries such as Ghana and the Netherlands included related topics in science and lighting. San Marino and Spain also issued commemorative coins, the latter being the first official Spanish coin minted in colour.

In other unexpected domains, national lottery tickets in Spain and Mexico included the IYL 2015 logo, and the International Year of Light was an inspiration to design a series of limited edition Art Label bottles for Campari.

POLITICAL SUPPORT AT UNITED NATIONS

A few countries did not focus on specific activities in 2015 but were very inportant in helping pass the proclamation of the International Year of Light and Light-based Technologies 2015 by the United Nations. Countries such as Angola, Djibouti, Gabon, Gambia, and Malawi, among others, were co-signatories of the resolution that was placed before of the UNESCO Executive Board at its 190th session, which took place at the UNESCO HQ in Paris, France, from 3-18 October 2012. Furthermore, among the 35 countries that co-sponsored the resolution that was submitted to the United Nations Second Committee on 6 November 2013, we also have Palau and Somalia.

Holy See's IYL 2015 Commemorative Stamp.

**Spanish National Lottery ticket on August 15th featuring the IYL 2015 logo.
CREDIT: National Spanish Lottery.**

IYL 2015 was also part of the inspiration to design a series of limited edition Art Label bottles for Campari.

Liechtenstein's IYL 2015 Commemorative Stamp.

San Marino joined the IYL 2015 celebrations by issuing 17,000 commemorative €5 silver coins.

UNESCO Activities and Actions

UNESCO was designated as the lead agency of The International Year of Light (IYL 2015) by the UN General Assembly. The purpose of the Year was to promote the scientific, educational and cultural values of light, as well as the rich cross-cutting approach such a theme offers for science advocacy and beyond. A bright spectrum of novel activities, under the coordination of the International Basic Sciences Programme (IBSP) of UNESCO, was shown across UNESCO's five sectors during the Year, and established activities knew new impetus, following the theme of light and light-based technologies and innovation.

Connecting humanity on a global scale, IYL 2015 provided a unique opportunity to sow seeds of inspiration and renew educational approaches. Advocacy for basic sciences was also ensured throughout IYL 2015, by means of workshops, conferences, exhibitions, and events commemorating milestones in the field of light science and related discoveries. These and many more various happenings, brought the topic of light to life, demonstrating how light-based technologies effectively support the sustainable development of societies and the environment. Most urgently, such technologies provide various solutions to global challenges, as all societies turn to implement the 2030 Agenda for Sustainable Development and the Paris Climate Change Agreement. For the citizens of the world, this was an opportunity to look towards the future and possible developments through Science, technology and innovation (STI), and cross-cutting disciplines in science which are carrying central innovations in the 21st Century in education, energy, water, agriculture, health.

As a catalyst for the International Year, the IYL 2015 Opening Ceremony aimed to gather impetus for the successful unfolding of the IYL 2015. This main launch event was held on 19 and 20 January 2015 at UNESCO Headquarters in Paris. A major success in international science advocacy, providing high visibility to the importance of light in education, science, culture and communication, and in its multiple scales and spheres of application, the 2-day ceremony gathered at UNESCO Headquarters in Paris more than 1,200 participants from more than 86 countries. Fifty-five speakers from different walks in life presented the relevance of the theme and the stakes at the heart of it. Among the illustrious speakers were influential scientists, including five Nobel Prize winners, decision and policy makers, representatives of NGOs, as well as industry and private sector partners. A vast array of topics—including *Light and Life; Energy and Climate Change: Challenges and Opportunities; Light on Development; The International Community of Light and Light-based Technology; Lighting the Future; The Future of Light; Einstein, Light and Time; Light for Humanity and Culture; Light and the Quantum; Efficient Light Conversion and Generation; Light at the Limits; Light Solutions*– were covered, introducing the Year's extensive approach in relation to light. This encouraged activities to come in 2015 and beyond that furthered awareness among citizens of the world on the impact of light-based technologies to respond to the world's pressing challenges. The lasting impact of science on society was discussed during the leading science policy panel to which participated the South African Minister of Science and Technology, Ms. Naledi Pandor; the former Portuguese Minister of Science and Technology, the late Mr. José Mariano Gago; the former Deputy Director-General of IAEA, Ms. Ana María Cetto; Director of Communications Networks, Content & Technology at the European Commission, Mr. Khalil Rouhana; and the former Director of the Science Policy and Capacity Building Division at UNESCO, Mr. Maciej Nalecz.

UNESCO Executive Board Future Prospects initiative with the participation of Professor William D. Philips. CREDIT: UNESCO/ Pilar Chiang-Joo.

IYL 2015 Opening Ceremony. CREDIT: UNESCO / P. Chiang-Joo.

Framing IYL 2015 symbolically, the Opening Ceremony to the Year provided an opportunity to ensure the IYL 2015's visibility among UNESCO's 195 Member States, and presented an opportunity for stakeholders to sense an inclusive bond in relation to the Year. It is worth mentioning that many activities were organized along with highly visible awareness campaigns.

Concomitantly ownership of IYL 2015 by UNESCO Member States was encouraged throughout the Year, with input being valued.

The UNESCO Executive Board Information meetings were pivotal moments to consolidate the implementation of the Year in keeping with United Nations objectives. IYL-related sessions were conducted as part of the series of meetings which considered UNESCO's role and prospects in bridging the gap between science and policy under the heading *UNESCO 70 years and Future Prospects*. The interaction between country representatives and high-profile scientists and international policy actors was essential in order to better grasps the possibilities the IYL 2015 could carry within its scope of pertinence.

Two such IYL 2015-related meetings were themed *Science for Development and International Cooperation,* held on 21 January 2015 with Professor William D. Philips and *Future Prospects with Professor Hiroshi Amano,* on 8 June 2015, during which the 2014 Nobel Laureate in Physics (for the discovery of blue LEDs) presented on I*nnovation as a driving force for development*. Both meetings sought to consider the central role of light science for development of resilient and sustainable societies.

On 11 April 2015, UNESCO Director-General Irina Bokova participated in the national ceremony to launch the International Year of Light 2015 in Algeria. The event took place at the Palace of Culture in Algiers in the presence of the Minister of Higher Education and Scientific Research and the Minister of Culture.

A specific landmark for the Year was commemorated with the two-day conference, *The Islamic Golden Age of Science for today's knowledge-based society: The Ibn Al-Haytham example,* which took place on 14 and 15 September 2015 in UNESCO premises. This conference highlighted the contribution of the Islamic civilization to the development of Light Science, and most prominently Ibn Al-Haytham—a 10th-11th century erudite—who wrote the first ever published book on optics, *Kitab-al-manazir,* a thousand years ago. The conference honored the contribution—often unsuspected by the general public—of polymaths from the Islamic Golden Age, extending from the 7th to the 13th centuries, which contributed to the foundation of modern science. Historical insights and nurtured debates on education and research challenges in Arab and Islamic countries, as well as other regions in the world, were shared. International experts and science historians exchanged ideas during the symposium, enriching perspectives for stakeholders, while facsimiles and replicas of works by scholars from the Islamic Golden Age were exhibited. A unique 17th century microscope, of esteemed scientific and historical value, built by Leeuwenhoek, was shown for the first time to the public at UNESCO House.

Efforts are being made by UNESCO for the impact of the Year to extend well beyond 2015. Indeed, the IYL 2015 also provided an auspicious occasion to increase awareness in relation to physics education in the service of light science. A significant example is the IBSP's Active Learning in Optics and Photonics (ALOP) teacher training workshops of UNESCO which promote an innovative learning and teaching methodology in physics by giving educators innovative teaching strategies to ignite interest and develop skills in science.

As ALOP demonstrates, the IYL 2015 provided an ideal frame to develop educational opportunities and research capacities worldwide, especially in Africa in keeping with UNESCO's priority for Africa. A focus on making the basic sciences accessible to all, boys and girls equally, through quality education is a central consideration for UNESCO's IBSP. The ALOP workshops in regions lacking educational and human resources, provided developing countries with the means to train physics teachers to pass on their skills to younger generations of their respective regions, teachers and students alike. In between March 2015 and December 2015, such teachers' training was conducted in Indonesia, Mauritius, South Africa, Bolivia (Plurinational State of), and Pakistan.

Throughout IYL 2015, UNESCO contributed to bringing together key stakeholders including civil society actors, scientific societies, academies and unions, educational institutions, technology platforms, non-profit organizations, public and private sector partners, which it will continue to do. Where there is Light, there are no limits. Though the IYL 2015 officially came to an end in early 2016, with the Closing Ceremony, which took place in Merida (Mexico) on 4–6 February 2016, only the cusp of the Year has been revealed. The IYL 2015 activities continue beyond the launching phase of 2015 and many initiatives are yet to be conceived and sustained, advocating for light technologies to improve the quality of life in developed and developing countries of the world.

Let there be light…let's keep the light on!

Workshops during IYL 2015

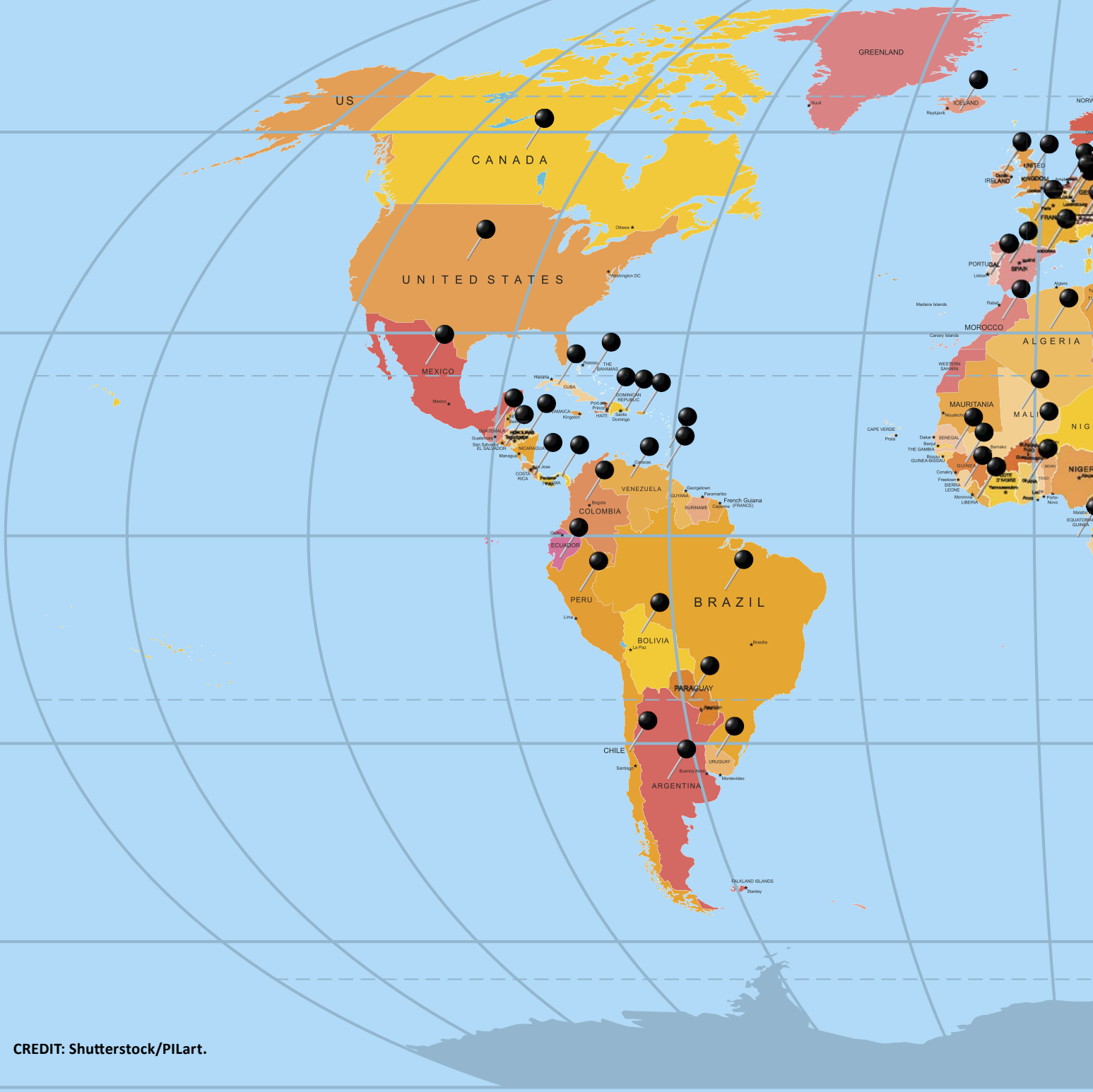
The Active Learning in Optics and Photonics program (ALOP)—a UNESCO International Basic Sciences Programme (IBSP) flagship activity, that is part of the IYL 2015 global outreach effort—trains educators to use more productive, inquiry-based methods of teaching optics and photonics at the high school/first year undergraduate level. Since 2004, ALOP workshops have reached over 1,000 teachers from 55 developing countries in Africa, Asia, and Latin America. During 2015, ALOP Workshops were conducted in Indonesia, Mauritius, South Africa, Bolivia (Plurinational State of), Panama, and Pakistan.

Night over Baredenas, Spain.
CREDIT: Inigo Cia

Landing lights are lights used on aircraft to illuminate the terrain and runway ahead during landing in Hong Kong. CREDIT: Huie Leka

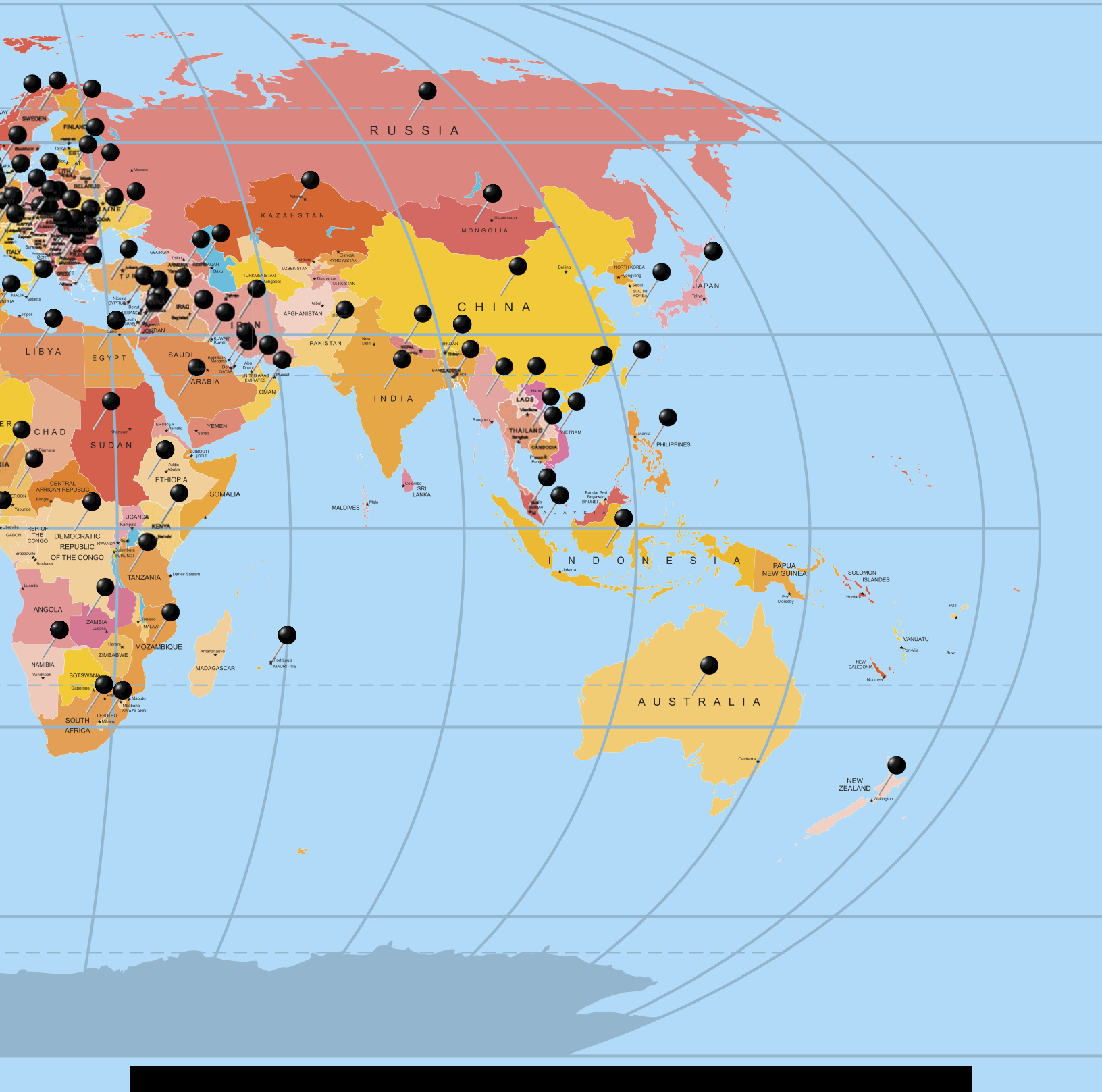
Part 3

INTERNATIONAL YEAR OF LIGHT 2015



CREDIT: Shutterstock/PILart.

ACTIVITIES SPANNED THE GLOBE.



1001 Inventions

Estimated number of IYL 2015 activities organized:
15 events

Number of people reached by IYL 2015 Activities:
More than 25 million people engaged through events and festivals organised around the world, online campaigns, and social media as well as those reached through films, workshops, books, and music.

General overview of IYL 2015 Activities

The year 2015 marks 1,000 years since the ground-breaking work of Ibn Al-Haytham, the *Book of Optics* (*Kitab al-Manazir*).

1001 Inventions, a British not-for-profit educational organisation, is a Founding Partner of the International Year of Light 2015 (IYL 2015). 1001 Inventions creates international educational campaigns to raise awareness of contributions to science, technology, and culture from the Golden Age of Muslim civilisation. Over the last decade, 1001 Inventions has engaged over 250 million people across the globe.

Inspired by Ibn Al-Haytham, 1001 Inventions launched a global educational campaign in partnership with UNESCO and the IYL 2015. Titled, *1001 Inventions and the World of Ibn Al-Haytham,* the educational campaign celebrates the legacy of this remarkable scientist using experiential learning to incite curiosity and encourage young people to study STEM subjects and pursue careers in science. Through interactive exhibits, hands-on workshops, digital content, short films, and educational resources, the campaign helps link the science of the past to contemporary issues, demonstrating how light and light technologies offer solutions to many global challenges. The campaign also aims to promote social cohesion and cross-cultural understanding. The educational campaign was launched during the IYL 2015 Opening Ceremony at UNESCO HQ in Paris with a high profile interactive exhibition, including a giant fully functioning Camera Obscura. The campaign then rolled out in different countries engaging millions of people around the world.

The events organised by 1001 Inventions to celebrate IYL 2015 and honour Ibn Al-Haytham included the following.

1001 Inventions team at the China Science Festival with the I-Scura used to explain theories of light and vision. CREDIT: 1001 Inventions.

Participants at Maker Faire Cairo watching the Ibn Al-Haytham film. CREDIT: 1001 Inventions.

MIDDLE EAST

In Kuwait and Bahrain, the IYL 2015 and Ibn Al-Haytham celebrations included weekend activities with hands-on light and visual demonstrations and workshops for children as well as screening of the *1001 Inventions and the World of Ibn Al-Haytham* film. The celebrations also included mesmerising dance and theatrical performances depicting the story of Ibn Al-Haytham and his scientific journey of discovery.

In the United Arab Emirates, Ibn Al-Haytham was celebrated at two events, the film red carpet world premiere at the 12th Dubai International Film Festival (DIFF) in December 2015, as well activities organized at the Abu Dhabi International Book Fair (ADIBF).

In Oman, the Ibn Al-Haytham educational campaign was an anchor event at the Muscat Festival. This show featured exhibits, interactive games, and the screening of the Ibn Al-Haytham short film.

1001 Inventions celebrated IYL 2015 by paying tribute to Ibn Al-Haytham during several events in Egypt in both Cairo and Alexandria. The Library of Alexandria hosted an IYL 2015 celebration in November 2015 in partnership with 1001 Inventions and the Egyptian Academy of Scientific Research and Technology. Attended by school and university students, the activities included hands-on workshops demonstrating the role of light and its applications, science performances, and a small exhibition with one of Ibn Al-Haytham's rarest manuscripts.

In Cairo, a series of events including seminars, talks, and film screening were organised by Cairo University. A highlight event in Cairo was the celebration of the

1001 Inventions and the World of Ibn Al-Haytham Film Poster. CREDIT: 1001 Inventions.

1001 Inventions and the World of Ibn Al-Haytham Film Poster. CREDIT: 1001 Inventions.

Children at the Royal Society event in London learning about light and vision through the camera obscura they built at 1001 Inventions hands-on workshops. CREDIT: 1001 Inventions.

IYL 2015 at the Cairo Maker Faire attended by about 8,000 people of all ages from across Egypt. The event held at the GrEEK Campus, in the heart of downtown Cairo, included a special screening of the *1001 Inventions and the World of Ibn Al-Haytham* short film. 1001 Inventions also organised exciting educational hands-on workshops introducing children to Ibn Al-Haytham and his groundbreaking contributions to the understanding of vision, optics, and light.

CHINA

In July 2015, China's largest science festival launched *1001 Inventions and the World of Ibn Al-Haytham* as an anchor exhibition receiving over 500,000 visitors in three weeks. Ibn Al-Haytham was also unveiled as the official mascot of the 2015 China Science Festival that was themed *Light and Colour*. The Ibn Al-Haytham-themed zone at the Festival brought to life the inspiring story of the remarkable scientist by introducing his contributions to early light science during the Golden Age of Muslim civilisation.

UNITED KINGDOM

1001 Inventions, the Royal Society, and the Institute of Physics partnered to organise a full day of educational events and celebrations in London to mark the IYL 2015 UK closure, which included a special tribute to Ibn Al-Haytham. In the morning, more than 350 primary school students participated in hands-on workshops themed on optics, light, and vision and watched the Ibn Al-Haytham film. An evening gala event was honoured with the presence of the Duke of York, the UK Patron of the IYL 2015.

CANADA, USA, AND MEXICO

1001 Inventions organised a high profile session at the Annual Conference of the Association of Science and Technology Centers (ASTC) in Montreal, Canada. The session aimed to share knowledge and experience with science centers in support of their efforts to proclaim an International Year for Science Centres.

1001 Inventions organised an event at the UN headquarters in New York marking the end of the IYL 2015 with a special tribute to the remarkable 11th century scientist. The celebration was organised as a side event to the 2016 ECOSOC Youth Forum held at the UN headquarters on 1-2 February 2016. Distinguished representatives of UN delegations and international organisations addressed the nearly 300 event participants. Those included the UN Secretary-General's Envoy on Youth, Director of UNESCO Office in New York, and the Chief of Cabinet and Spokesperson for the High-Representative of the United Nations Alliance of Civilizations.

1001 Inventions participated at the IYL 2015 Closing Ceremony in Mérida, Mexico, presenting John Dudley, Chair of the IYL 2015 Steering Committee, with the "Ibn Al-Haytham Award for Public Engagement with Science" on behalf of the International Year of Light community. A talk by 1001 Inventions highlighted how the Ibn Al-Haytham campaign engaged young people globally and how it will continue its efforts over the next few years. Also the Ibn Al-Haytham short film was screened as part of the IYL 2015 Film Festival to engage young people in Mexico with our campaign.

In June 2016, 1001 Inventions celebrated Ibn al-Haytham and IYL 2015 at the National Maker Faire in Washington DC as part of President's Obama's National Week of Making.

1001 INVENTIONS AND THE WORLD OF IBN AL-HAYTHAM ASSETS

In addition to the organised activities, 1001 Inventions produced a Children's book in partnership with National Geographic titled: *Ibn al-Haytham: The Man Who Discovered How We See,* the *1001 Inventions and the World of Ibn Al-Haytham* short film starring legendary actor Omar Sharif, the Music Album by renowned musician Sami Yusuf, the website www.IbnAlhaytham.com, as well as diverse educational material.

With such enduring assets and continued interest to organise Ibn al-Haytham events around the world, 1001 Inventions will continue to engage the public in 2016 and beyond sustaining the legacy of the International Year of Light.

Deutsche Physikalische Gesellschaft e. V.

(German Physical Society)

German Closing Ceremony of IYL in Berlin. CREDIT: DPG/ZAB/EFRE/Marschalsky 2015.

Estimated number of IYL 2015 activities organized:
33 events

Number of people reached by IYL 2015 Activities:
Around 1.5 million people directly reached by IYL 2015 activities.

General overview of IYL 2015 Activities

The German Physical Society (DPG) is one of 12 International Year of Light (IYL 2015) Founding Partners and coordinated this global initiative in Germany as a National Node in cooperation with the German Commission for UNESCO.

In 2014, a committee for the IYL 2015 in Germany was established under the leadership of Professor Andreas Buchleitner and the DPG. At the same time, a national IYL 2015 website[1] with an implemented event calendar for all German activities was set up. By the end of 2015, this calendar contained about 700 events that took place all over the country.

As the National Node of Germany, the DPG organized some central events. For instance, on 27 February 2015 the IYL 2015 in Germany was officially opened during a ceremony at the Deutsches Museum in Munich. The ceremony was attended by around 300 high-level guests from business, research, and culture who paid tribute to light as the basis of life and a catalyst for science and technology. Some well-known speakers, such as Nobel Prize Laureate Stefan Hell, illuminated the different sides of light and light-based technologies. Afterwards, the new planetarium of the museum was reopened.

To raise awareness in the run-up to IYL 2015, a competition to collect event ideas was carried out together with ZEISS corporation. The best contributions were awarded with financial resources to host the proposed event. The first prize went to Solidarity Initiative Ilmenau. Over 1,500 people of all ages were astonished by the lit campus of the University Ilmenau and the colourful performances.

One of the main goals of DPG is to motivate young people to aim for a scientific career. For this reason, there were a lot of activities for younger children during the IYL 2015. One successful project was *PiA—Physics in*

1. www.jahr-des-lichts.de

Deutsches Museum in Munich during the German Opening Ceremony. CREDIT: DPG/Vetter 2015.

A volunteer and refugee children experiment with plastic films and smartphones. CREDIT: DPG / Melanie Lambertz.

IYL 2015 inclusive activities with refugees

Physics for All—a project organized by the German Physical Society and the Georg-August-University Göttingen, and financially supported by the Federal Ministry of Education and Research—brought the themes of IYL 2015 to newly arrived refugee communities in Germany in December 2015. During the project more than 500 volunteers became active and engaged with 7,000 refugees in 20 preliminary reception centers nationwide.

The volunteers performed hands-on experiments about light and photonics with children and young people during the activities. Even if not a single refugee were to become a scientist, the project will convey a positive attitude towards knowledge and education. The project aims for every participant to get a better opportunity to be integrated.

The great success of the pilot project encouraged the organizers to continue the project *Physics for All* in 2016.

Advent—an advent calendar with a physics theme that DPG has organized since 2013. Young scientists are introduced to 24 simple yet ingenious experiments and physics puzzles—in 2015 all were related to light, optics, and photonics. This project reached a lot more than the 23,400 registered participants per day, more than 1 million visitors in total. Furthermore, a video competition was announced together with the German Aerospace Centre (DLR). School children could make a film of a self-constructed chain reaction related to light. Moreover, 800 students from almost 200 schools submitted several impressive video clips. The best team won two excursions to the Aviation and Aerospace Day in Cologne and to the scientific festival *Highlights of Physics* in Jena. Through appearances at educational trade shows such as IdeenExpo (351,000 visitors, mostly students) or Didacta (72,000 visitors, mostly teachers), DPG was able to reach even more pupils and teachers.

Another main concern for DPG is to open physics and natural sciences to the public. To achieve this purpose, DPG organized some social events; for instance, the festival *Highlights of Physics* and the project *Physics for All*.

Every year since 2000, a different city in Germany has hosted the scientific festival Highlights of Physics organised by DPG and the Federal Ministry of Education and Research. In 2015, this festival was dedicated to light and took place in Jena, reaching a new record for visitor numbers—more than 53,000 visitors in five days.

In contrast, *Physics for All* is a recently devised project to support refugees coming to Germany and to integrate them into our society. The aim is to distract young refugees from everyday life in preliminary reception

Deutsches Museum in Munich during the German Opening Ceremony. CREDIT: DPG/Vetter 2015.

centres with some exciting physics experiments. In 2015, the experiments of *PiA—Physics in Advent* were used so that every experiment was related to optics and light. In December 2015, DPG motivated over 500 volunteers to carry out the projects at 20 locations nationwide.

To celebrate the IYL 2015 in an international consortium, DPG also participated in some worldwide activities, such as the IAPS International School Day on 10 November 2015 or the LIGHTtalk series from the EC-funded *LIGHT2015* project. Furthermore, DPG organized one special "best practice/legacy" event on 9 October 2015 inviting guests from all over the world to the DPG's Magnus-Haus Berlin. The IYL 2015 leaders from Spain, UK, and India exchanged experiences they had in organizing the IYL 2015 in their countries. Afterwards, all guests attended the opening of the famous Festival of Lights in front of the Brandenburg Gate. This was one of so many impressive moments related to IYL 2015 in Germany.

On 27 November 2015, the IYL 2015 was officially closed at the federal state representation Brandenburg and Mecklenburg-Vorpommern in Berlin. The guests celebrated the high range of the IYL 2015 and established future networking that will outlive this global initiative. Some highlights of the event were the interactive exhibits and the exhibition of various competition entries.

European Physical Society

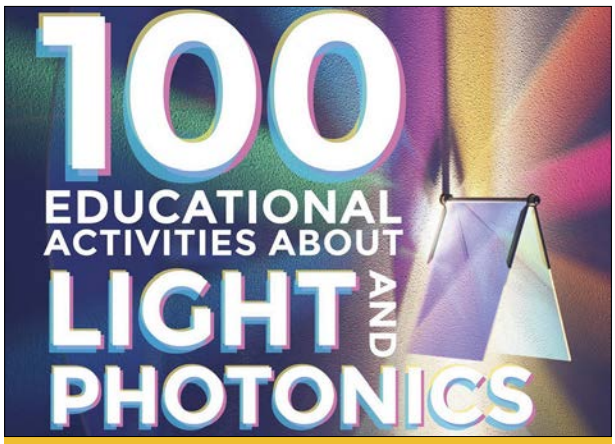
Estimated number of IYL 2015 activities organized:
150 events

Number of people reached by IYL 2015 Activities:
Over a million people

General overview of IYL 2015 Activities

The European Physical Society (EPS) is a non-profit organization whose purpose is to promote physics and physicists in Europe through methods such as physics outreach. Formally established in 1968, its membership includes the national physical societies of 42 countries, and some 3500 individual members.

The success of The International Year of Light (IYL 2015) crowns six years of hard work by EPS since the first discussions of the idea in 2009, when John Dudley, IYL 2015 Steering Committee Chair, proposed the idea whilst representing the EPS Quantum Electronics and Optics Division at a meeting of the International Council of Quantum Electronics. EPS was fundamental in the early stages towards the proclamation by United Nations of 2015 as the International Year of Light. EPS was a key stakeholder to construct the proposal for the International Year of Light in detail and for building a consortium amongst the major optics and physics societies. Over six years, the IYL 2015 involved efforts of six EPS Presidents and several members of the EPS community towards the successful proclamation of the IYL. In addition, for the logistics organization of key events such as the IYL 2015 Opening Ceremony as well as the support of the IYL 2015 Global Secretariat activities to oversee the implementation of worldwide activities, EPS devoted considerable staff time.



100 Educational Activities about Light and Photonics. CREDIT: LIGHT2015 / Universe Awareness.

IYL 2015 Educational Resources

During the IYL 2015, several IYL 2015 National Nodes, IYL 2015 Partners and different organizations developed educational resources related to light and light-based technologies. Most notably, the LIGHT2015 Project, together with Universe Awareness, released the e-book *100 Educational Activities about Light and Photonics.* This e-book comprises a list of 100 educational activities about the wonders of light and photonics, curated for the IYL 2015. All IYL 2015 educational resources can be found on the IYL 2015 website.

The main activity of EPS during the IYL 2015 was the coordination of the *LIGHT2015* project[1], a European project funded through the European Union's Horizon 2020 research and innovation programme of the European Commission. It aimed to promote the importance of photonics to young people, entrepreneurs, members of the optics and photonics industry, and the general public around Europe during the IYL 2015. Running from January 2015 until June 2016, the project had a total budget of around €1 million and brought together a multi-stakeholder partnership, including the European Physical Society (EPS), the European Optical Society (EOS), the Institute of Photonics Sciences (ICFO) (Spain), the Politecnico di Milano (POLIMI) (Italy), the National University of Ireland Galway (Ireland), Universiteit Leiden (the Netherlands), and EYESTvzw (Belgium).

The LIGHT2015 project organized around 150 activities in 29 European countries including:

- **LIGHTtalks**: a series of inspirational events, which took place throughout Europe for the whole duration of the project in order to bring photonics closer to students, entrepreneurs, and members of the industry. These activities have been possible thanks to the vast networks of EPS and EOS, directly involving several EPS Member Societies as well as Young Minds Sections.
- **iSPEX-EU campaign**: this was the 1st pan-European citizen science campaign where thousands of European citizens carried out optical measurements of the sky using smartphones to yield information related to air pollution in 11 European cities.
- **Photonics Explorer**: to aid teachers and inspire students, over 250 Photonics Explorer kits were distributed to schools in 11 European countries together with teacher training to around 500 teachers to support scientific education at secondary schools.
- **Flagship Photonics Events**: the organization and support of several Flagship events involving high-level participants—such as the IYL 2015 Opening and Closing Ceremonies and the Opening Ceremony of the World of Photonics Congress.

1. www.europe.light2015.org
2. http://www.epsyoungminds.org

- **Videos and Educational Resources**: the production of two videos that depict the endless power of photonics have been produced and are freely available for use in 24 official EU languages.
- **LIGHT2015 Awards**: The organization of the LIGHT2015 Awards to highlight early-career women researchers and entrepreneurs in photonics was a great success and attracted applications from many outstanding young scientists.

The *LIGHT2015* project was officially closed with a lecture from Nobel Laureate Serge Haroche on 10 June 2016 in Mulhouse, France.

Other important initiatives from EPS included the publication of an special issue of *Europhysics News* (EPN)—a magazine owned by the European Physical Society and produced in cooperation with EDP Sciences—devoted to light as a tribute to the IYL 2015. This special issue featured outstanding and world-famous authors who wrote articles offering a broad view of state of the art in optics to give the readers different outlooks on the promising applications of light in modern branches of optics.

The EPS Young Minds Project[2] took part in the IYL 2015 in all its section throughout Europe. More than 15 events were organized, including seminars and workshops oriented to light professionals; educational activities for schools and common public; and networking events aimed implementing collaborations through different communities.

iSPEX-EU measurements in Milan, Italy. CREDIT: iSPEX-EU.

iSPEX-EU: A Citizen-Science Photonics Experiment to Measure Air Pollution

The iSPEX and LIGHT2015 projects organized the first Europe-wide citizen-science photonics experiment to measure air pollution using smartphones from 1 September to 21 October 2015. With the iSPEX add-on and app, around 5,000 citizens in several European cities including, Athens, Barcelona, Bari, Belgrade, Berlin, Copenhagen, London, Manchester, Milan, Rome, and cities from the Netherlands—transformed their smartphones into a scientific tool to check the air quality in their cities.

Abdus Salam International Centre for Theoretical Physics (ICTP)

General overview of IYL 2015 Activities

The Abdus Salam International Centre for Theoretical Physics (ICTP) played a central role in the organization of the IYL 2015 by hosting the IYL 2015 Global Secretariat, and co-sponsoring many of the Active Learning in Optics and Photonics (ALOP) teacher training programs supported also by the International Year of Light (IYL 2015) Steering Committee. In addition, ICTP also organized a number of special activities for 2015 to help celebrate the IYL 2015.

A COMMEMORATIVE POSTAGE STAMP

The ICTP successfully applied to the Italian government for an IYL 2015 commemorative postage stamp. The official background information for the stamp was prepared by Joe Niemela, representing ICTP, and Luisa Cifarelli, representing the Italian Physical Society, and the stamp was issued on 26 January 2015, the date of the Official Italian IYL 2015 Opening Ceremony in Torino (Turin).

GENOVA SCIENCE FESTIVAL

On behalf of the Italian Ministry of Foreign Affairs, ICTP organized a special session on *Light for Humanity* in Genova, Italy, on 30 October 2015 that was attended by a couple hundred people from the general public. The session featured a roundtable discussion on how photonics have evolved over the past century to become indispensable to daily life. Roundtable participants included i) Dame Jocelyn Bell Burnell, the first female president of the Royal Society of Edinburgh, Scotland's National Academy, and the discoverer of pulsars; ii) Alessandro Farini, lead researcher at the Laboratory of Visual Ergonomics, National Institute of Optics-CNR in Florence and professor at the University of Florence; iii) Emilia Giorgetti, senior researcher at the Institute for Physics of Complex Systems, CNR. Since March 2015, she has been Scientific Attaché at the Italian Embassy in Mexico City; iv) ICTP Director Fernando Quevedo; v) Linda Wamune, director of SunnyMoney Kenya and the founder and CEO of Brighter Life Kenya, and

Participants in the ICTP Fiber Optics School and Workshop in South Africa. CREDIT: ICTP.

Participants of the 2015 ICTP Winter College on Optics. CREDIT: ICTP.

representative of SolarAid at the UN Climate Summit in New York in September 2015.

SOUTH AFRICAN OPTICS WORKSHOP

The ICTP also organized an advanced school and workshop on fiber optics: *Light in Action from Science and Technology,* held 28 September–1 October 2015 in Alice, Eastern Cape, South Africa. Organizers were Andrew Forbes, Mourad Zghal, Golden Makaka, and Joe Niemela. The activity brought together about a hundred participants, mainly from the African continent for technical training. They also enjoyed activities combining science and art.

ICTP SCHOOL IN TRIESTE, ITALY

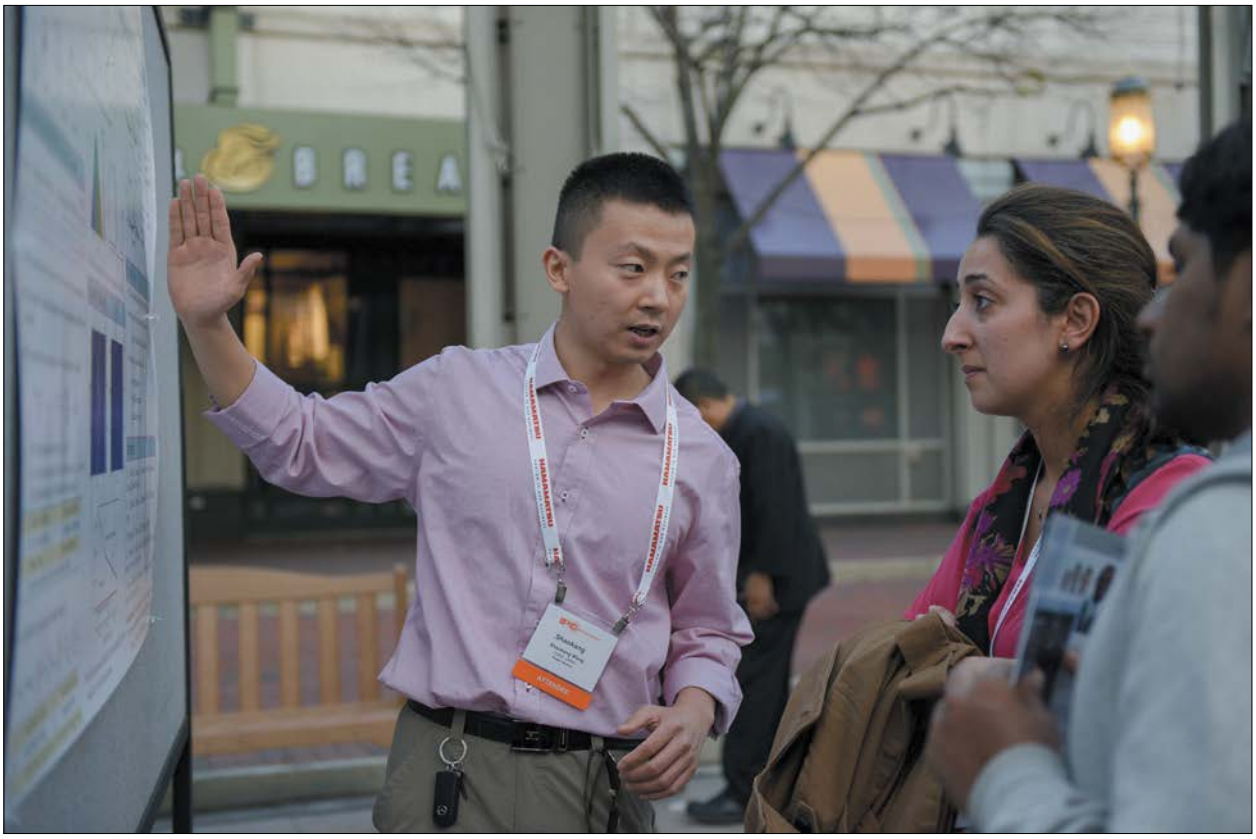
The ICTP also supported a Winter College on Optics: *A Bridge between Earth and Space* from 9-20 February 2015 with about 130 participants from around the world. Besides the lectures, there were special sessions on hands-on experimental work. Organizers were Angela Piegari (Optical Coatings Laboratory-ENEA, Italy), Errico Armandillo (European Space Agency, The Netherlands), Weibiao Chen, (Shanghai Institute of Optics and Fine Mechanics, China), while local organizes were Joseph Niemela (ICTP, Italy) and Miltcho Danailov (Elettra, Italy).

Expert panel at the Genova Science Festival. CREDIT: ICTP.

SCIENCE EDUCATION WITH LEDS

From 25 January to 30 January 2015, ICTP, together with the International Commission on Physics Education (ICPE) organized a special workshop for teacher-training called *PHYSWARE*, held at the ICTP campus in Trieste, Italy. The training was based on use of light emitting diodes (LED). The organizers were Gorazd Planinšič (University of Ljubljana, Slovenia), Eugenia Etkina (Rutgers University, USA), Robert Lambourne (The Open University, UK), with local organizer Joseph Niemela (ICTP, Italy).

IEEE Photonics Society



At IEEE Photonics Conferences and chapter events, volunteers organized various programs emphasizing light research and its applications. CREDIT: IEEE Photonics Society.

Estimated number of IYL 2015 activities organized:
305 events

Number of people reached by IYL 2015 Activities:
81,385 persons

General overview of IYL 2015 Activities

The IEEE Photonics Society, a proud International Year of Light 2015 (IYL 2015) Founding Partner, supported 300+ coordinated activities at national, regional, and international levels to demonstrate how photonic technologies improve the quality of life for all around the world. Additionally, the proclamation was incorporated into each of the Society's major conferences, i.e. IEEE Photonics Conference, OFC, CLEO, Group IV Photonics, IEEE Summer Topicals, Optical Interconnects, AVFOP, etc.

To further its reach, the IEEE Photonics Society decided to center its IYL 2015 outreach on three themes:

- Humanitarian Activities: collaborations to bring critical lighting resources to the developing world and increase the demand for intelligent, sustainable environments and products that reduce environmental impact.
- Educational Initiatives: programs that introduce young minds to light-based sciences and careers in photonics, plus provide opportunities to sustain their interests and talents.
- Community Outreach: public awareness, issues of gender balance in STEM, and expanding the understanding of the role light-based technologies play in the daily lives of all citizens.

As the advocates representing the IEEE Photonics Society around the world, the Society's volunteers and chapters played a key role in IYL 2015 by reinforcing the importance of education and retention within the photonics community, as well as instructing the public about light's overarching capabilities. The Society leadership held an IYL 2015 Chapter Challenge and

During IYL 2015, the IEEE Photonics Society was dedicated to introducing young minds to the light sciences and providing programs to sustain their interests. CREDIT: IEEE Photonics Society.

The IEEE Photonics Society worked with charities to replace costly, dangerous kerosene lamps in remote regions of the world with energy-efficient solar lights. CREDIT: SolarAid.

awarded 39 chapters with grants to help fund over 78 innovative, grassroots programs emphasizing light research and its applications. Additional chapters devised events focused on diversity and inclusion, an outreach goal of the IEEE Photonics Society.

Outreach program examples included: international academic exchanges between China, South Africa, and France; short course workshops on silicon photonics; a School Kids Challenge at VIVID Sydney; sesquicentennial celebrations of James Clerk Maxwell; tutorials at Photonics North; postgraduate conferences; solar modeling competitions; lectures on *Photonics: From Basics to Advanced Applications*; National Science Day events; student branch lectures; a Photonics Meets Biology summer school; humanitarian technology conferences; and SXSW IEEE Technology for Humanity series.

Throughout 2015, international volunteers organized 115+ light-focused, hands-on activities, i.e. science fairs, in-classroom presentations, summer schools and Young Scientist workshops, for pre-university students to illustrate the principles of optics and photonics. An event of mention was, *Introduce a Girl to Photonics Week*, in conjunction with IEEE Day 2015. The goal was to coordinate events and activities worldwide to show young women how photonics impacts the world around them and encourage girls to become interested in future light-based STEM careers.

The IEEE Photonic Society's Women in Photonics and Young Professionals initiatives organized 64 instructive activities, such as soft skill seminars, summer schools, networking mixers, meetups, and online webexs, in 2015. Each supported the participation, engagement, and advancement of women and recent graduates entering the photonics and optics fields.

To demonstrate of how light contributes to sustainable development, a cross-cutting theme of the UN's proclamation, the IEEE Photonics Society proudly sponsored Stevens Institute of Technology's design in the US Department of Energy's Solar Decathlon to help increase the demand for intelligent, sustainable environments. The Stevens' entry, the SURE HOUSE, was based on the need students saw for sustainable and resilient coastal houses in the aftermath of Hurricane Sandy. The house, which went on to win first place overall in the competition, was based on three principles: use less energy through smart design, generate all energy needed through renewable solar electric, and be capable of providing power during electrical outages.

To provide members with an additional opportunity to give back, the IEEE Photonics Society teamed up with SolarAid and Unite-to-Light, not-for-profit and non-profit organizations providing clean solar lighting to developing nations around the world. Together, the IEEE Photonics Society and SolarAid developed a brand new social way of giving, called *Speed of Light*, which connects light donors with friends through an online community and donation platform. By year end, members and the general public donated 3,200+ solar lamps and raised $21K USD for remote regions in Tanzania, Kenya, Uganda, Zambia, Zimbabwe, South Africa, and the Philippines.

Above all, the IEEE Photonics Society was proud to be a part of the IYL 2015. Not only did it present a chance for the Society to partner with other societies around the globe and showcase the critical role light plays in nearly every aspect of modern life, it was an opportunity for IEEE Photonics, and its thousands of members, to highlight the Society's contributions to the field.

Institute of Physics (IOP)

Estimated number of IYL 2015 activities organized: 70 activities around the United Kingdom. The IOP took the lead in coordinating activities in the UK for the International Year of Light 2015 (IYL 2015). In this coordinating role, IOP played a part in supporting all 400 events estimated to have taken place across the UK to celebrate IYL 2015.

Number of people reached by IYL 2015 Activities: In its coordinating role, IOP played a part in supporting events and activities which engaged almost 2 million people across the UK. Events directly organised by IOP itself are estimated to have engaged over 60,000 individuals, with many thousands more engaged online.

General overview of IYL 2015 Activities

IOP organised a number of events on a national basis, as well as many more which were supported by IOP staff and members across the UK.

At national level, events included:

- In December 2014, IOP sponsored a project by the Society of Light and Lighting to herald IYL 2015 through the display of specially designed lights on the Christmas Tree outside the UK Prime Minister's residence, 10 Downing Street. The lights were switched on in the presence of the Prime Minister, David Cameron.
- IOP organised the UK opening and closing ceremonies for IYL 2015, in January 2015 and January 2016 respectively. The opening ceremony took place in St. James' Palace, hosted by UK royal patron The Duke of York. The closing ceremony took place in the Royal Society with a workshop on Ibn Al-Haytham for primary school children organised jointly with 1001 Inventions, a lecture for senior school children and a reception for all our stakeholders, including a laser display widely visible in the local area.
- The *Light in our Lives* film series featured films about the applications of light and light-based technologies commissioned by IOP's member magazine and IYL 2015 Media Partner, Physics World. Video was seen as an excellent medium to tell personal stories connected with the core themes of the year. The videos also embraced the international and collaborative aspects of IYL 2015. The six films reflect the culture and geography of the countries where they were produced—the UK, India, France, Mexico, and the USA.
- Alongside the University of Manchester, the Institute of Physics worked with *iSPEX-EU* to help distribute devices in London and Manchester during September and October 2015. *iSPEX-EU* is a citizen science project that allowed participants to measure tiny particles in the atmosphere, called aerosols, using smartphones, in 11 European cities. The aims of the project were to use *iSPEX-EU* as a way to energise audiences about a science topic involving light and to raise awareness of how physics can be used to better understand the environment.
- *Light and Dark Matters* was a series of events organised collaboratively between the Tate Modern Art Gallery and IOP in London. Taking place from 20–21 November 2015, leading artists, scientists, philosophers, theorists, and the public came together at Tate Modern to debate, share, and uncover our contemporary experience of light, darkness, and dark matter. A total of seven events were delivered, including talks, workshops, and guided walks.

Measuring air pollution as part of the iSPEX citizen science experiment, outside IOP HQ in September 2015. CREDIT: IOP.

IYL 2015 lights on the Christmas tree outside 10 Downing Street, December 2014, with UK Prime Minister David Cameron. CREDIT: IOP

- A workshop on elimination of the kerosene lamp was held at IOP in February 2016, jointly with the Society of Light and Lighting and sponsored by the *LIGHT2015* project, to highlight the work of NGOs in distributing solar lighting in the developing world.

Across the UK, IOP staff and members were involved in organising over 60 events. The following examples illustrate the range of activities involved:

- IOP sponsored three lectures on light-related topics at the British Science Festival in Bradford, England, in September 2015.
- In Scotland, IOP supported the tour of the Maxwell Torch, an illuminated mobile artwork created by the Institute of Physics in Scotland with funding from the Scottish Government, and an exhibition at the Scottish Parliament on the Incredible Power of Light.
- In the Northwest of England, IOP organised a careers event for schools, themed around IYL 2015, jointly with the Institute of Engineering Technology.
- In Wales, IOP participated in the annual cultural festival, the Urdd Eisteddfod, with solar viewing equipment and astronomy-themed activities.

Maxwell's Torch, an illuminated mobile artwork created by the Institute of Physics in Scotland with funding from the Scottish Government. CREDIT: IOP.

- In East Anglia, England, IOP delivered a physics fest in Chelmsford, celebrating IYL 2015.
- In the Southwest of England, a school lecture tour on light reached some 2,000 students aged 12 to 18.
- In the Midlands, England, physics buskers at the *Next-Gen Innovators and Malvern Innovation* festival used light-related activities and handed out IYL 2015-themed cards to over 1,000 school students and members of the public.
- The many events supported by IOP in Ireland included light painting activities at the BT Young Scientist fair in Dublin in January and, during the Northern Ireland Science Festival in Belfast in February 2015, the STFC Laser Roadshow and the Royal Photographic Society outdoor exhibition Light Works.

IOP was also responsible for identifying UK speakers who took part in the IYL 2015 Closing Ceremony: Professor Sir John Pendry on the Science of the Invisibility Cloak, Professor Sir Peter Knight on Quantum Technology for a Networked World, Professor Sir David Payne on linking industry with academia and Dr. Beth Taylor, who moderated a discussion on *Light for All*.

Light: Science & Applications

Participants of the Seed of Light Programme.

Estimated number of IYL 2015 activities organized: 30 events

Number of people reached by IYL 2015 activities: 10,000 persons

General overview of IYL 2015 activities

To celebrate The International Year of Light 2015 (IYL 2015), Light: Science & Applications (LSA) organized multiple light-themed activities throughout China. A major goal of IYL 2015 was to improve the understanding of the general public and politicians regarding the central role of light in the modern world.

As part of the IYL 2015 celebrations, we organized four categories of light-themed activities: publishing journal issues, hosting the *Light Conference*, conducting academic lectures, and facilitating public events for the promotion of optical science. All the activities were highly successful involving a total of approximately 10,000 people in China. In addition to scientific research personnel, the general public, including elementary and middle school students, were also involved in these activities.

In 2015, four issues of *Light: Science & Applications* were published, which contained a total of 70 excellent articles contributed by authors from 18 countries—USA, UK, Germany, The Netherlands, Switzerland, Spain, Italy, Japan, Israel, Republic of Korea, Russia, Poland, Singapore, Denmark, Finland, Australia, Czech Republic, and China. These articles covered numerous optics-related topics, such as small-scale optics, organic optoelectronics, optical materials, optics in life science and the environment, special optics, manufacture of optical elements, guided light, and others. Tens of thousands of readers accessed these issues from the LSA website,[1] where they were able to read and download papers of interest. There were a total of more than 1,600 citations to LSA papers from all papers published in 2015. Additionally, tens of thousands of print copies were distributed globally. Furthermore, the publication

1. http://www.nature.com/lsa

entitled *Optics and Photonics: Essential Technologies for Our Nation* was successfully translated into Chinese by LSA and published.

Light Conference hosted by LSA.

In July, the *International Conference on Micro/Nano Optical Engineering* was hosted by LSA in Changchun. Additionally, the Global Vision Conference was held consecutively in Taipei, China. Forty-one world-renowned optical experts from the USA, UK, France, Germany, Canada, Italy, the Netherlands, Japan, Singapore, and 10 other countries were invited to attend the conference, as well as 200 domestically based scientists and scholars. The *Light Conference* is among the most popular of high-end summits for researchers around the world to share ideas and advancements in the field of optics. In addition to the regular international conference programme, the conference was also the venue for exciting symposiums and events, such as the *Young Scientists Forum, the Forum of Optics and Fine Mechanics,* LSA Editorial Board meetings, and Nature master classes hosted by *Nature* editors. Approximately 250 experts and scholars from 53 universities and research institutes attended these activities. Some examples of the "hot topics" for discussion were high-powered lasers, laser films, graphene photonics, and optical functional materials. During the conference, many landmarks in Changchun (China) were illuminated with the IYL 2015 logo as part of the celebrations.

In 2015, dozens of lectures were given by LSA Editorial Board members at universities and research institutes. One of the highlights was the Rose in Science lecture, which aims at promoting female researchers and has had a favorable reception in China. Hitherto, the Rose in Science lecture has been hosted by the Changchun Institute of Optics, Fine Mechanics, and Physics; Shanghai Institute of Microsystem and Information Technology; and other institutes.

To include the general public in the celebrations of IYL 2015, a program called *Seed of Light* was organized. *Seed of Light* was aimed at engaging, exciting, and educating children, giving them more knowledge of optics and its potential in their lives. This program was held in five different schools in China involving nearly 1,500 elementary and middle school students. In conjunction with *Seed of Light*, 2,000 booklets were distributed to the children. The booklets contained information on optical knowledge, optical phenomena and explanations, optical instruments, basic principles, and so forth.

Photonics Societies student chapters and volunteers

At the heart of the IYL 2015 was a large nimber of early career scientists and students as well as volunteers of all ages. This was fundamental to bringing IYL 2015 to life in many regions around the world, including the most disadvantaged.

- IEEE Photonics Society: 39 chapters received grants to help fund over 78 innovative, grassroots programs emphasizing light research and its applications, as well as events focused on diversity and inclusion.
- OSA: OSA and the OSA Foundation provided IYL 2015 Youth Education Grants to 75 chapters in 30 countries.
- SPIE: 27 IYL 2015 activities were funded with micro-grants for a total of $60,000 USD. Grants were used to build a laser maze at Washington State University, get school children excited about the potential of science in Cameroon and to teach technician skills that will translate into jobs in the solar and telecom industries in Tunisia and South Africa.
- The International Association of Physics Students (IAPS): IAPS organized The IAPS School Day on 10 November 2015, providing an opportunity for schoolchildren to be part of the IYL 2015. More than six countries participated, including Germany, Italy, Canada, Denmark, Turkey, and Macedonia. IAPS members also participated as volunteers on the IYL 2015 Opening and Closing Ceremonies.
- EPS Young Minds: Thanks to the efforts of all of its sections around Europe, more than 15 events were organized by EPS Young Minds, reaching out to 200,000 people. The activities included seminars and workshops, educational activities for schools and general public, and networking aimed at helping to establish collaborations through different communities.

Lightsources.org

Estimated number of IYL 2015 activities organized:
1 activity

Number of people reached by IYL 2015 Activities:
Around 600,000 visitors to the IYL 2015 website

General overview of IYL 2015 Activities

Lightsources.org is the result of collaboration between communicators from light source facilities around the world. The lightsources.org website is a regularly updated global resource, providing information and updates about light sources and opportunities for international collaboration.

Lightsources.org aims to promote transnational funding, access, and research between some of the world's leading facilities. It aims to make use of each facility's particular capabilities and to enhance the effectiveness of science at its member facilities.

As a Founding Partner of the International Year of Light 2015 (IYL 2015), Lightsources.org made an in-kind contribution as follows:

- Provision of a design for the IYL 2015 website.
- Creation of an IYL 2015 website that was easily edited by UNESCO's International Steering Committee and which supported the range of activities undertaken by the international partners in 2015.
- Maintenance of the IYL 2015 website for a period of 24 months (commencing in September 2014 and specifically including staff to support the website).

On behalf of Lightsources.org, Diamond Light Source carried out the following as part of its IYL 2015 activities:

- Set up and hosted a holding site whilst full website was under construction.
- Set up full website, (see page 22) for full description and statistics of the website.
- Attended the IYL 2015 opening ceremony with ALBA CEO as guest speaker.
- Provided a submission to the IYL 2015 blog about light sources and their applications.

In addition to the joint activities detailed above, many light source facilities highlighted the IYL 2015 during their regular annual programme of outreach and educational activities throughout 2015. For example, Diamond Light Source took part in a large, campus-wide public open day at the Harwell Campus, Oxfordshire, UK, which referenced the IYL 2015 and was officially opened by its UK patron, HRH the Duke of York, and which saw 16,000 members of the UK public take part.

CREDIT: Jason Bardi. AIP.

Wonders of Light: Family Science Fun

The event *Wonders of Light: Family Science Fun*—organized by the National Science Foundation (NSF) in conjunction with the American Institute of Physics, American Physical Society, IEEE Photonics Society, National Academy of Sciences, Optical Society, and SPIE—was held at the Smithsonian National Museum of the American Indian, in Washington, DC, USA on 12 September 2015. It provided educational activities demonstrating the science of light for more than 500 school-age children and parents. Hands-on activities included the LED-lighted Radiance Orb provided by Light at Play that changed color with music, an interactive video game using sensors, and a green screen to be a science reporter for a day.

The Optical Society (OSA)

CEO Elizabeth Rogan and 2015 OSA President Philip Russell, with students at the Stuttgart IYL 2015 Scientific Symposium. CREDIT: OSA.

Estimated number of IYL 2015 activities organized:
75 events

Number of people reached by IYL 2015 Activities:
135,000 persons

General overview of IYL 2015 Activities

Founded in 1916, The Optical Society[1] (OSA) is the leading professional Society in optics and photonics, home to accomplished science, engineering, and business leaders from all over the world. Through world-renowned, peer-reviewed publications and meetings, outreach and member programs, and its advocacy and industry events, OSA provides quality information and inspiring interactions that power achievements in the science of light.

As an International Year of Light 2015 (IYL 2015) Founding Partner, OSA's involvement began in 2009 and ran throughout the planning and execution of the IYL 2015 celebration. OSA sought to inform and educate the citizens of the world on the significance of light and optical technologies in their lives, for their futures, and for the development of society. Through its extensive network and partners, OSA supported the IYL 2015 goals by leveraging its reach and resources.

OSA committed $500,000 USD, plus managed and

Educational outreach event using Light Blox kit. CREDIT: OSA.

organized thousands of hours of volunteer time to support this global initiative. OSA hosted events for the community through its 350 global student chapters, its International OSA Network of Students (IONS) meetings, and its international conferences. Attendees at these events participated through invited talks on light from a number of Nobel Laureates and thought leaders in the field, had access to on-site resource centers offering ways to engage in the celebration, free content on light through its publications, and fun promotional gifts.

A notable example was OSA's collaboration with other US-based optics and photonics societies organized, *Light for a Better World: A Celebration of US Innovation Symposium,* held at the US National Academy of Sciences in Washington DC and was supported by the US National

1. www.osa.org

Science Foundation (NSF). The symposium, open to the general public, featured talks by Nobel Prize winners Shuji Nakamura and Eric Betzig and was hosted by NSF Director, France Córdova. The NSF also helped support an educational outreach activity, *Wonders of Light: Family Day* at the Smithsonian Museum of the American Indian, for which OSA was instrumental in managing and promoting to the local community. The outreach event included hands-on demonstrations to 500 attendees.

OSA has always recognized that through the work of the OSA Foundation, its Youth Education Outreach, and Student Chapter and Young Professional Programs, it possesses a mechanism to promote science education to a large number of young people around the world. To support IYL 2015 goals, OSA and the OSA Foundation provided IYL 2015 Youth Education Grants to 75 chapters in 30 countries, distributed 2,500 Light Blox educational kits in 60 countries, developed the OSA Educational Poster Series with a distribution of 19,000 posters translated into five languages, and coordinated community outreach events. Each Light Blox kit included a guidebook to assist teachers and parents with hands-on activities that introduce young people to the science of light, and the 2,500 kits distributed had an estimated impact of 78,000 people.

OSA leveraged its communication network of over 275,000 professionals to promote the goals of the celebration via a number of press releases that reached an audience of 15,000 and through the use its social media channels with a Twitter contest, regular posts on Twitter and Facebook, with a reach of 247,000.

Also, the Society's publications highlighted IYL 2015 events and added IYL 2015 content throughout the year and dedicated its January 2015 issue of *Optics and Photonics News* to IYL 2015. The eleven IYL 2015 articles published in 2015 resulted in an additional 7,400 page views and 3,326 page views of the January issue's Table of Contents.

But more important than OSA's dissemination of more than 25,000 IYL 2015 promotional items and $52,000 USD in IYL 2015 grants, were the OSA volunteers who served as IYL 2015 Champions and were instrumental in raising awareness of IYL 2015 and emphasizing the importance of optics and photonics research and innovations. Over the course of the year, these champions were exceedingly generous with their time. Leading the way was 2015 OSA President Philip Russell of the Max-Planck-Institute for the Science of Light, who spoke at more than 35 global events during IYL 2015. Other OSA volunteers were engaged by organizing IYL 2015 activities in their local areas, such as symposia, conferences, and community outreach events.

Other supporters of IYL 2015 included US Senator Chris Coons, a Democrat from the state of Delaware, whom the OSA Government Affairs team worked with to highlight the IYL 2015 in the United States Senate. His remarks on IYL 2015 appeared in the *Congressional Record,* the official transcript of US Congressional proceedings.

OSA was honored with the opportunity to participate with the many partners in this celebration.

SPIE, the international society for optics and photonics

SPIE.

Estimated number of IYL 2015 activities organized:
56 events

Number of people reached by IYL 2015 Activities:
265,000 people

General overview of IYL 2015 Activities

SPIE was committed to establishing a strong foundation for the optics and photonics community to shine during the International Year of Light and Light-based Technologies 2015 (IYL 2015), investing $1.7 million USD in the project over a three-year period. SPIE led the effort to build content for the IYL 2015 website, designed the IYL 2015 logo, launched the IYL 2015 blog and created and shared IYL 2015 resources with groups interested in promoting the IYL 2015. SPIE actively advocated for IYL 2015, served on the Steering Committee, led a national node, joined as a Founding Partner and Media Partner and participated in planning both the opening and closing ceremonies. We were pleased to have the opportunity to collaborate with so many passionate, resourceful, and inspiring people during IYL 2015 and look forward to continuing to share the potential of light with the world.

Robert Lieberman, Toyohiko Yatagai, and Steven Chu.
CREDIT: SPIE.

PROJECTS AND RESOURCES

Our IYL 2015 activities were launched with a global photo contest in 2014 designed to engage the general public. Eight hundred submissions were submitted; winning entries received cash prizes and were featured on four covers of our member magazine *SPIE Professional*.

During 2015, IYL 2015 was featured at all SPIE conferences and symposia,[1] and included talks by Nobel Laureates, IYL 2015 booths, give-a-ways including 35,000 books, tens of thousands of educational posters, 100,000 IYL pins, and inspirational displays reaching over 37,000 people.

Grassroots IYL 2015 activities were encouraged with micro-grants to our members; 27 activities were funded for a total of $60,000 USD. Grants were used to build a laser maze at Washington State University, get school children excited about the potential of science in Cameroon and to teach technical skills that will translate into jobs in the solar and telecom industries in Tunisia and South Africa.

SPIE provided $35,000 USD in seed funding for the development of the open access *Light: Beyond the Bulb* (LBTB) exhibition, which featured dramatic images and descriptive captions showcasing light and its properties, and created a display that was used by over 100 organizations. Display locations included the IYL 2015 Opening Ceremony, O'Hare International Airport in Chicago, European Southern Observatory, Czech National Academy of Science, and the US Senate Rotunda, reaching approximately 5 million people. Our LBTB display, luminary panels, educational light poster

CREDIT: SPIE.

Celebrating Light: 50 Ways Light-based Technologies Enrich Our World

SPIE produced and published the book *Celebrating Light: 50 Ways Light-based Technologies Enrich Our World* that features a selection of 50 applications of light that have made the world a better place. A central message of this iconic book is that light science and photonics technologies provide a remarkable range of solutions to the challenges that the world faces today. Over 25,000 copies of *Celebrating Light* were given away during the IYL 2015.

1. www.spie.org

Outreach activity by McGill University SPIE Student Chapter. CREDIT: SPIE.

series, and IYL 2015 promotional video were produced many languages including French, Spanish, Portuguese, Farsi, Czech, Mandarin, and English.

Over 25,000 copies of the iconic book *Celebrating Light* produced by SPIE were given away, 100,000 people received our IYL 2015 lapel pins and the distinctive IYL 2015 spectrum tie and scarf were worn by speakers across the globe. For student and educator posters, Light Blox kits, diffraction glasses, stickers, and bookmarks were produced and shared at events like the Intel Science Fair and US National Science Teachers Association (NSTA) conferences. SPIE also produced a book of select IYL 2015 blog posts for distribution at the Closing Ceremony. In total, SPIE contributed $440,000 USD in give-a-way materials.

As a Founding Partner of the IYL 2015, SPIE and our members played an important role in spreading the word about the beauty and power of light. The resources that SPIE was able to share with the community supported thousands of IYL 2015 activities involving millions of people in more than 140 countries worldwide.

Bosca

Bosca, based in Canelli, Italy, specializes in the production of spumante and is known throughout the world for its specialties Verdi, Sparkletini, Toselli, and Asti.

With a history dating back to 1831, Bosca is synonymous with strong Italian family values of unity and stability, distinguishing features that help carry on a centuries-old tradition. Today, like in the old days, the company's efforts are directed towards the constant research for newness and originality, continuously striving to redefine the Italian sparkling experience, thanks to its inspirational and ever-present heritage.

Bosca produces over 75 million bottles per year—in Italy and in other factories in Lithuania, Russia, and Switzerland—to service more than 40 markets around the world, with about more than 85% of its production sold outside Italy.

Following the prestigious nomination by UNESCO of its cellars as a World Heritage Site in 2014, Bosca decided to share with UNESCO its interest in one of the most essential elements of the whole producing process – light – by participating as a Patron Sponsor for the International Year of Light 2015 (IYL 2015).

It is thanks to sunlight that the vines grow and produce their golden grapes, that very treasure that has enabled Bosca to be proud producers of spumante for six generations.

Throughout Bosca's history, light has been used in all possible manners, including the use of candles in the production of its signature spumante, the *Riserva del Nonno,* a very precious, traditional method of making spumante, still entirely carried out by hand. The cellar master cannot do without his candle to wisely guide the yeast into bubbles of perfection. Light is also used to power the Italian bottling factory where one in every four bottles is produced thanks to sunlight.

Maintaining the awareness of how light-based technologies help Bosca keep its traditions alive and developing new solutions for assuring a more sustainable future, is one of the achievements in Bosca's daily accomplishments, designed to ensure product quality and continuity of tradition.

Being a Patron of the IYL 2015 has been a most exciting project that allowed Bosca to participate in many IYL 2015 events while learning a lot about light technologies that were eventually applied in the underground cathedrals, and to liven up many IYL 2015 functions around the world such as Paris (France), London (UK), Turin (Italy), Cambridge (UK), and Mérida (Mexico) with its spumantes.

Bosca Cellars. CREDIT: Bosca.

The International Association of Lighting Designers (IALD)

INTERNATIONAL ASSOCIATION OF LIGHTING DESIGNERS IALD

The International Association of Lighting Designers (IALD) was honored to support the International Year of Light (IYL 2015) as a Patron sponsor. The IALD developed its plan of work for 2015 to draw further attention to light in the built environment, emphasizing the relationship between the lighting design profession and high-quality lighting that is best for people and the environment.

Practitioners of architectural lighting design bridge the gap between technical regulations, functional requirements, and aesthetic considerations. A lighting designer understands the role of lighting in both architecture and interior design, and relies on their extensive knowledge of lighting equipment and systems to ensure high-quality design in the built environment.

The lighting created by an architectural lighting designer:

- Makes a positive impact on the health and well-being of people using the space
- Is cost-effective and energy-efficient
- Reduces light pollution and incorporates daylighting solutions

This message about a lighting designer's role in delivering high-quality lighting permeates the work of the IALD, and was the focus of the events and activities for IYL 2015.

IALD ENLIGHTEN AMERICAS 2015: THE INTERNATIONAL YEAR OF LIGHT

The 2015 edition of IALD's annual conference for the Americas was themed entirely around IYL 2015, and featured 21 educational seminars and 28 speakers from seven countries, showcasing a broad range of perspectives on the art, science, and business aspects of lighting design.

Held near the end of the year, the conference was also a chance for members to reflect on the events of IYL 2015, with a review from IALD President Barbara Horton,

IALD Regional and Chapter coordinators at IALD Enlighten '15. CREDIT: IALD.

FIALD, on the year's activities. More than 375 lighting designers, lighting manufacturers, educators, students, architects, and interior designers from 16 countries attended the three-day conference.

CHASE THE DARK: A LIGHTING EVENT UNITING THE GLOBE

IALD promoted IYL 2015 to its worldwide audiences in part through a unique global event called *Chase the Dark.* This international lighting movement engaged participants in more than 30 cities, and asked people all over the world to create lighting displays and share them via social media.

As the sun set westward across the globe from Sydney and Melbourne, Australia to the West Coast of the United States and Canada, more than 500 images were shared and more than 1,400 tweets were sent, resulting in over 2 million impressions on social media timelines across the globe.

A RECORD NUMBER OF LIGHTING ACTIVITIES FROM IALD REGIONS AND CHAPTERS

Inspired by the IYL 2015, IALD's regions and chapters hosted a total of 101 events in 2015. The array of programs was specifically planned to reflect and recognize IYL 2015, and IALD ensured that its regions and chapters utilized IYL 2015 imagery and branding wherever possible.

Light is Here installation at UNESCO Headquarters. CREDIT: Kari Kola.

Light is Here Installation

Finnish artist Kari Kola presented the installation *Light is Here* at the IYL 2015 Opening Ceremony. This large installation used as a target the entire iconic UNESCO HQ Fontenoy building in 360 degrees. The themes of the piece were the Aurora Borealis and Sunrise.

Inspired by this project and all the feedback received, the artist presented multiple works in large scale during the IYL 2015, with 10 different light-art works in six different countries that were seen by more than 2 million people.

Philips Lighting

CREDIT: Philips.

At Philips Lighting we are honored to having been a Patron Sponsor of the UNESCO-led International Year of Light (IYL 2015). When we contemplated the crucial relevance of light in the evolution of mankind and life on Earth, as well as on the revolutionary developments in "light" and the lighting sector, we decided that our central theme for the IYL 2015 would be on "Eradicating Light Poverty."

At Philips, we do amazing things with light—our lighting can connect to services on the internet, be controlled by your smartphone, help crops grow better to increase yields, help patients recover faster, help school children focus, transmit information to smartphones, as well as transform entire cities. Yet 1 in 5 people on the planet rely on wood fires, kerosene, and candles with 1.5 million people each year dying from respiratory problems and fires.

Light is fundamental to life. Current OECD (Organisation for Economic Co-operation and Development) countries developed with the support of grid-connected electricity and with the artificial light provided by incandescent light bulbs, which was the first mass electric appliance as well as the product on which our company was founded.

In 2015, as we celebrated what light can do, it was fitting that we committed to ending light poverty and contribute to lifting 1.1 billion people out of light poverty while stimulating global GDP over the course of the next 15 years by leapfrogging to solar-LED lighting solutions for (rural) residential and community applications as well as for the vast new urban infrastructure that will be built in emerging and developing countries.

Thus the IYL 2015 started with our contribution to the IYL 2015 Opening Ceremony on 19 January 2015 at the UNESCO headquarters in Paris by the Philips Lighting CEO, Eric Rondolat. We also contributed to eradicating light poverty as an off-grid lighting sector through our membership of the Global Off-Grid Lighting Association and spoke on behalf of the industry association at the Opening Ceremony.

During the year, we intertwined communication and messaging in several blogs, events, and meetings, with the aim to raise awareness as well as ambition and momentum on the mission to eradicate light poverty.

In November, this was followed by a global *Lighting: from Evolution to Revolution webinar*[1] that covered the

history and insights on the role of lighting from (human) evolution to (sustainable) revolution, also honoring the relevance of the IYL 2015. In the webinar, we also highlighted what solar-LED products and systems had been developed and were being applied by our dedicated solar-LED incubator, covering a widening portfolio of products and systems of solar-LED lanterns for residential applications in rural environments[2], so-called "Community Light Centers" (CLCs) for entire rural communities, where we are engaged in a 3-year partnership with the Dutch soccer association (KNVB) aimed at lighting up communities through football as an inspiring precursor.[3]

CREDIT: Philips.

With reference to the vast amount of urban infrastructure that will be built in the coming decades, we have also dedicated significant attention to solar-LED street-lighting, which can be applied in urban environments as well as in smaller rural villages. A great example was realized in December 2015 by an agreement to provide such solutions for 800 villages in Uttar Pradesh.[4]

The year concluded—as for many of us—with COP21, where in a way combined efforts on energy efficiency and sustainable development contributed to the Paris Agreement.

In conclusion, the IYL 2015 helped us significantly in raising the awareness of the critical primary development challenge to eradicate light poverty by 2030. Some good steps have been made throughout the year, people have become more inspired and ambitions have been defined. It is now time to further step up our collective efforts so that the aims are achieved and the entire global population can enjoy the broad spectrum of lighting and "photonic" benefits and the aspirations of the IYL 2015 become reality in a 21st Century of Light!

1. http://www.lighting.philips.com/main/education/lighting-university/lighting-university-browser/webinar/the-evolution-of-lighting.html
2. http://www.philips.com/a-w/about/news/archive/standard/news/press/2015/20150319-Solar-powered-LED-luminaires-from-Philips-can-brighten-the-homes-of-millions.html
3. http://www.worldcoaches.nl/en/sub/news/And-the-lights-of-the-Community-Light-Center-in-Pa/
4. http://www.philips.com/a-w/about/news/archive/standard/news/press/2015/20151203-Philips-Lighting-to-Provide-LED-solar-street-lighting-for-UPNEDA-and-MANIREDA.html

UL

As Patron Sponsor of the International Year of Light 2015 (IYL 2015), among other activities, UL gave life to one main event, the *Full of Light Experience,* a special night in the city center of Milan, Italy, on 15 April 2015, that gathered international architects, lighting designers, associations, and manufacturers, all together in the name of light and light-based technologies.

The event was an occasion to discuss the positive effects of light in our daily life. Optical fibers, laser, LED, microprocessors, and all the new applications of photonic technology have a more important role today in our working and life environments.

During the evening, it was possible to admire large hanging pictures: photos of lighting projects created using products tested and verified by UL. Amazing images of beautiful and international lighting projects and installations, realized by Italian and international companies.

UL, a global independent safety science company, wanted to highlight the importance of having a dialogue between science and industry for technological progress which could have concrete consequences on everybody's health and wellbeing.

The importance of light and of lighting technologies facing the big challenges of our planet's development was reinforced during the speeches of Joseph Niemela, senior research scientist at ICTP and coordinator of the IYL 2015 Global Secretariat and of Jeff Smidt, 2015 UL Vice President and General Manager, Appliances, HVAC & Lighting Division.

One month later, again in the name of light and of IYL 2015, on 15 May 2015, the UL Burago Lab opened its doors to some special guests, the children from the Burago school A. Manzoni. The UL lighting Lab shared the meaning of the UNESCO initiative with the very young guests; the meaning of light and its technologies today and the positive impact that quality light can have on our everyday lives. During the tour of the lab, the 80 little and very curious guests were involved in tests, light measurements, and plays to see how white light can be composed and decomposed.

For UL, it is important to highlight the role that light also has in the lives of our children. These initiatives are important to let society be more and more involved in the mission of UL, working for a safer world since 1894, and sensitize everyone from childhood up to the different meanings of the word safety.

UL Lighting Lab. CREDIT: UL.

International Astronomical Union (IAU)

Number of IYL activities organized: around 1,000 events

Estimated number of people reached by IYL activities: over 2.5 million people

Overview of IYL 2015 activities

The International Year of Light 2015 (IYL 2015) Steering Committee invited the IAU to organize activities under the Cosmic Light theme recognizing the importance of light to astronomy and the preservation of dark skies. Following a public call, the IAU through its working group identified several key projects for IYL 2015. The top 5 projects were funded as cornerstone projects.

The Quality Lighting Teaching Kit with six activities that use quality lighting to solve realistic cases on how light pollution affects wildlife, the night sky, our eyes, energy consumption, safety, and light trespass into buildings. CREDIT: NOAO.

Galileoscope is a high-quality, low-cost telescope kit, optimised for both optics education and celestial observation. Ten thousand of these kits went to US K–12 teachers via the special promotion funded by Ric and Jean Edelman (more than 1,600 teachers received one case of six kits each). The remaining 6,000 kits went to individuals who ordered online or to educators or outreach professionals who made bulk purchases of anywhere from 72 to 600 kits.

Light: Beyond the Bulb finished in 2015 with 685 exhibit sites around the world—in over 40 countries, with more than a dozen language translations. Examples of exhibit locations include the O'Hare Airport in Chicago, USA; the Village Baykal in Dolna Mitropolia, Bulgaria; the St. Ignatius College Siggiewi Primary School in Siggiewi, Malta; the K11 Art Mall in Shanghai, China; and the Galway Astronomy Festival in Ireland. Exhibits continue into 2016 and well beyond. The project has greatly rejuvenated and expanded the volunteer base of organisers created in 2009 for the International Year of Astronomy, and we look forward to continuing to work with so many excellent partners.

The Cosmic Light EDU kit reached over 40 countries in more than 120 events. The kit was distributed to all organisers, teachers were trained and brought the program back to school. In particular, many of the kits were sent to developing regions where internet connections were not easily accessible.

The Dark Sky Meter IYL 2015 Edition is a free app for smartphones to measure the night sky brightness with the press of a button. There were 3,442 downloads for this app in 2015. With this app, 7,290 measurements were contributed to the citizen science project *Globe at Night* database.

The Quality Lighting Teaching Kit was produced by the Education and Public Outreach (EPO) group at the US National Optical Astronomy Observatory (NOAO), and received support from the International Astronomical Union (IAU) and the Optical Society of America (OSA). The goal is to increase student and public awareness of light pollution issues and quality lighting solutions. One hundred Quality Lighting Teaching Kits were shipped around the world, to SPIE student chapters, OSA, International Dark-Skies Association, and regional nodes for the IAU Office of Astronomy for Development.

Besides the cornerstones, 22 other national or regional outreach efforts were endorsed. The astronomy projects of IYL 2015 reached millions of people through different networks, empowering students, teachers, and the general public from both developed and developing countries.

International Commission for Optics (ICO)

Overview of IYL 2015 activities

The International Commission for Optics (ICO) is a world body founded in 1947 now consisting of 53 territories and 7 international member societies devoted to the promotion of optics and photonics research and education worldwide. The ICO supported the International Year of Light 2015 (IYL 2015) initiative since its inception in 2009 in its capacity as a member of the International Union of Pure and Applied Physics (IUPAP) and the International Council of Science (ICSU).

ICO representatives attending the IYL 2015 Opening Ceremony. CREDIT: ICO.

ICO actively promoted the application of IYL 2015 through IUPAP and ICSU, essential steps on the way to securing the support of the UNESCO Executive Board. In the final stage ICO asked its Territorial Representatives to seek the support of their ambassadors to the United Nations for IYL 2015. More than half of the ICO Bureau and over 30 other members of the ICO family attended the opening ceremony of the IYL 2015.

The ICO provided more than a dozen national contacts for the IYL 2015 Secretariat, and created an ICO Award for the promotion of optics and photonics for young people in the ICO Territories. Particular emphasis was given to activities that were sustainable beyond 2015, and that were replicable in other territories. The main award of $5000 USD was awarded to the Spanish Optical Society (SEDOPTICA) for secondary school outreach activities using the European Commission-funded Photonics Explorer kit. The Cuban ICO Territory was awarded a prize for optics and photonics trainees—scientists of the future in Havana. Their initiative taught young people how to operate five telescopes and understand how to localize the brightest celestial objects such as planets, satellites constellations, and comets and to learn practical methods of orientation using the most important stars and the main rules of the Earth´s movement. Another award went to the IIS Cavazzi sez. Liceo Scientifico, Pavullo, a secondary school in Italy. They organized a one-day science fair called *Amazing Light* open to middle and high schools students.

The legacy of the IYL 2015 by ICO is the commencement of the process to create an International Union of Optics and Photonics within ICSU.

Algeria

Primary National Organiser:
Optics Photonics Algeria Society (OPALS)

Other National Partners: Ministry of Higher Education and Scientific Research, ATRST (Agence Thématique de Recherche en Sciences & Technologie), USTHB University, Sirius Astronomy Association and CRAAG, Guelma University and Jijel University

Sponsors: DGRSDT, ATRST, LPCQ, CERIST, ANVREDET, LPCM, LPM, SlimRed, H2B, Computer ABBI, MESRS, Djezzy, and the Directorate of Scientific Research and technological Development (DG-RSDT)

Estimated number of IYL 2015 activities organised:
320 events

Number of people reached by IYL 2015 activities:
20,000 directly, and hundreds of thousands reached through the media

General overview of IYL 2015 activities in Algeria

A rich spectrum of activities took place in Algeria during the International Year of Light and Light-based Technologies 2015 (IYL 2015), with over 320 IYL 2015 events held throughout the country. There were around 20 well-publicized and well-attended events at large institutions such as universities, as well as a myriad of local activities at schools and associations. This report does not focus on the latter activities because they were not well documented, i.e., they were not coordinated by the national node and thus did not feature an official IYL 2015 label.

Regardless, they represent in absolute terms the core of the celebrations: conferences, exhibitions, workshops, and even an evening of sounds and lights in the downtown of the capital city. This flurry of activities shows the vivacity of the scientific and educational community who capitalised on this opportunity to discuss science with the public. A dedicated website[1] was established to account for all of the events.

On 11 April, UNESCO Director-General, Irina Bokova, participated in the national ceremony to launch the IYL 2015 in Algeria. The event took place at the Palace of Culture in Algiers in the presence of the Minister of Higher Education and Scientific Research and the Minister of Culture.

Another highlight of IYL 2015 was the organisation of a special day dedicated to light and optical telecommunication under the aegis of the General Directorate of Scientific Research and Technological Development (DG-RSDT) at the University of Guelma and the Photonics Day at the University of Jijel (both located on the east coast of Algeria), in partnership with the *Ibn Al-Haytham International Working Group,* and with the support of the Optical and Photonics Algerian Society (OPALS).

UNESCO Director-General Irina Bokova at the Algerian IYL 2015 Opening Ceremony. CREDIT: Sirius Algeria.

Children at IYL 2015 Opening Ceremony in Algeria. CREDIT: Sirius Algeria.

The OPALS, in collaboration with the university USTHB and the laboratory LPCQ (Tizi Ouzou), also organized the first international OPAL Conference 2015 in Algiers 14-15 December 2015. This conference was dedicated to the celebration of the International Year of Light.

We note also the creation of a central structure within the Ministry of Higher Education to coordinate and support the events organized at the university level. This central structure helped organise the various scientific manifestations, in particular at Constantine, Bab-Ezzouar, Guelma, Oran, Chlef, and Biskra. In this context, we mention the establishment of a unique *Caravan of Light* by UROP-CDTA at Setif, featuring 40 experiments in optics and 12 dedicated young scientists who participated with displays and hands-on experiments for the public at many of the big events held by the various universities.

1. http://www.light2015.dz

Andorra

Primary National Organiser: Andorran National Commission for UNESCO

Estimated number of IYL 2015 activities organised: 10 events

General overview of IYL 2015 activities in Andorra

The Andorran National Commission for UNESCO organised ten events during the International Year of Light (IYL 2015) in Andorra.

The exhibition *Light: Beyond the Bulb* comprised the work of photographers, scientists and citizens around the world and invited people on a journey from the insides of cells to distant places of the Earth, guided by light. This exhibition toured schools from March to December 2015.

On the occasion of the National Day of Andorra, 14 March, the Casa de la Vall was lit with many colours. The project was organised by the Parliament of Andorra to commemorate the International Year of Light with the support of FEDA.

Andorra also participated during the Earth Hour on 28 March 2015 as a sign of their commitment to the planet. Buildings that contributed to the lights-off event were Mora Banc, the City Councils, the Consell General (Parliament), Andorran University, and the Feda and CaldeaInúu buildings.

On 23 April and 12 August 2015, there were Astronomy Nights at Engolasters, including a night tour of the hydroelectric path of Engolasters; astronomical observations with telescopes were organised by FEDA and conducted by scientists from the Astronomical Montsec Park.

The Fête des Lumières event, on 30 July 2015, was a dinner dedicated to the International Year of Light in the tradition of the Summer Evenings of Inúu.

The IYL 2015 was part of the celebration of the IX Andorra Moth Night, on 1 October 2015. This activity was organized by CENMA and the Catalan Society of Lepidopterology and was divided into two parts: a theoretical session to learn about the moths and a practical session to identify the countryside at night.

The workshop entitled *A More Sustainable Christmas,* invited participants to prepare electronic Christmas greeting cards with light paintings. This photographic technique consists of drawing items, such as letters, in the dark with a spotlight and then taking a picture of the scene at a low speed. This process creates static and very spectacular images based on the movement that can be used for greeting cards and shared directly through email, Facebook, cell phones, or any other electronic device.

The closing ceremony of the International Year of Light in Andorra was celebrated on 4 February 2016 at the headquarters of the Consell General. It included a conference by Dr. Jose Luis Costa Krämer, *From the Stone Age to Nanotechnology*; the photographic exhibition *Landscapes and Andorra Athletes,* by Jaume Riba and Ana Arce; and a performance by the violinist Arajol Alex.

IYL 2015 Closing Ceremony in Andorra. CREDIT: Foto digital Eduard Comellas.

Argentina

Primary National Organiser: Comité Argentino para la Celebración del Año Internacional de la Luz (CAIL)

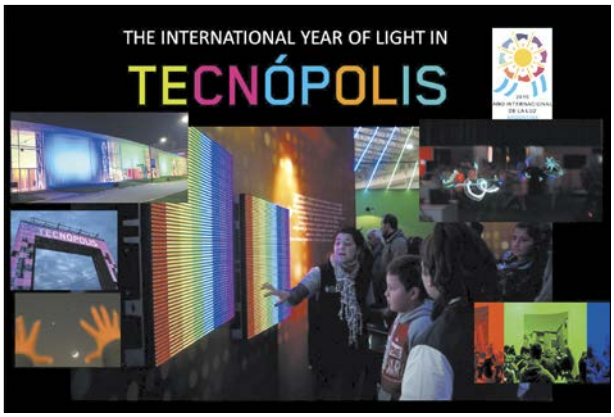
Other National Partners: Comité Territorial de Óptica de Argentina (CTO)

Sponsors: Ministerio de Ciencia Tecnología e Innovación Productiva, Ministerio de Educación, Consejo Nacional de Investigaciones Científicas y Técnicas, Comisión Nacional de Energía Atómica, Comisión de Investigaciones Científicas de la Provincia de Buenos Aires, Universidad Tecnológica Nacional, Facultad Regional Mendoza, Universidad Nacional de las Artes, Asociación Argentina de Astronomía, Instituto de Tecnologías en Detección y Astropartículas, Universidad Nacional del Nordeste, Universidad Nacional de San Martín Municipalidad de Malargue

Estimated number of IYL 2015 activities organised: more than 250 events

Number of people reached by IYL 2015 activities: around 1,000,000 people

General overview of IYL 2015 activities in Argentina



IYL in TECNOPOLIS, a mega exhibition of science, technology, industry and art, based in Argentina and the largest in Latin America. More than 700,000 people celebrated the IYL 2015 by participating in exhibitions, interactive experiments, art performances, and other multiple activities.

Festival de la Luz. Open Optics experiments for general public. Planetarium of the City of La Plata. Buenos Aires, Argentina. September 5, 2015. CREDIT: Gabriel M. Bilmes.

The International Year of Light (IYL 2015) was celebrated with more than 250 activities all over the country. The inauguration was held 22-23 January at the Museum of Contemporary Art in Mar del Plata. The celebration began with an outdoor laser show consisting of images of ephemeral art created by graffiti artists.

The IYL 2015 activities were developed by academic institutions, amateurs, museums, and artists. They included lectures, multiday scientific conferences, workshops, artistic performances, exhibitions, films, interactive experiments for children, photography contests, photo exhibitions, open days for laboratories, astronomical observations, teacher-training activities, and other activities (most of which were announced on our website,[1] but some were triggered by personal initiatives). Researchers from the photonics community produced more than 20 articles and notes, published in different media, to reach out to non-specialist audiences. They also performed at three national schools and offered more than 20 courses for students and young graduates.

Among the most prominent events of the year: the presence of IYL 2015 at TECNOPOLIS, a mega-exhibition of science, technology, industry, and art, based in Argentina and the largest in Latin America. During the 2015 edition of TECNOPOLIS, several booths celebrated the IYL 2015 with exhibitions, interactive experiments, art performances and other activities, involving more than 700,000 people. The Patagonia region also developed an important program, performed mainly in the cities of Esquel (Complejo Plaza del Cielo) and Bariloche. *VACACiencias de Invierno,* an activity for children between 3 and 10 years of age featured experiments with light, shadow, color, and fluorescence. It took place in July and was organised by the Universidad Nacional del Centro de la Provincia de Buenos Aires.

Argentina also participated in IYL 2015 events at the international level, such as the organisation of *Light: Beyond the Bulb* exhibitions in several cities around the country.

Closing activities began in December 2015 and lasted until the end of March 2016. They were held mainly in Malargüe, Mendoza (with over 1,000 participants), Tandil, Corrientes, Esquel, and finally in Buenos Aires with the event Posta Lumínica developed by the University of Arts.

1. http://2015luz.com.ar

Armenia

Primary National Organiser: State Committee of Science of the RA Ministry of Education and Science

Other National Partners: RA National Academy of Sciences (NAS RA), Yerevan State University, RA NAS Institute of Physical Research, Center for the Advancement of Natural Discoveries using Light Emission (CANDLE)

Sponsors: European Union, LIGHT2015-UNESCO-IYL 2015, EOS, ECOP, ICTP, JINR, and RFBR

Estimated number of IYL 2015 activities organized: 17 events

Number of people reached by IYL 2015 activities: 2,500 people

General overview of IYL 2015 activities in Armenia

Laser physics, optics, and photonics have developed long-established traditions and achieved significant progress in Armenia. It is noteworthy that the first Armenian laser was launched in 1962. Furthermore, in 1965, the first Armenian industrial lasers "Arzni-2" and "Hrazdan," pioneers in the entire Soviet region, were exhibited at the Leipzig International Trade Fair.

Nowadays, up-to-date, world-class scientific research in this area is conducted at Yerevan State University, the Institute for Physical Research, CANDLE, and other research centres and institutions.

It is natural that the International Year of Light (IYL 2015), with the above-mentioned activities, achieved great resonance in Armenia among scientists, engineers, and students, as well as schoolchildren interested in high-level technology. In this context, we highlight several activities: The 3rd International Symposium *Optics & Its Applications* (OPTICS-2015) in Yerevan-Ashtarak, was held 1-5 October 2015. The main organiser of the event was SPIE under the Federation of Optics College and University Students (FOCUS) conference grant: SPIE FOCUS Armenia. The objective of the symposium was to bring together experienced and young scientists working in various areas of optics so that they could share their ideas and achievements, present their works, and discuss the most recent developments in their fields.

During the symposium, seven SPIE student chapters from around the world presented their activities. Also during OPTICS-2015, the project "Optics Zone" was presented by the OSA and SPIE Armenian student chapters, where they demonstrated experiments for students.

An international photography contest entitled "Light in the daily life of Armenia" received entries from 87 people from various countries. The winner of the photo contest was Anna Reymers a PhD student at Russian Armenian (Slavonic) University, Yerevan, Armenia. The prize was presented during the closing ceremony of SPIE FOCUS Armenia on 5 October 2015.

The IYL 2015 activities concluded with the organisation of a LIGHTtalk event within the framework of the LIGHT2015 project in Yerevan on 30 April 2016. Around 100 participants attended the event, which was dedicated to the application (and possible perspectives) of photonic and optical devices in various fields. Several topics regarding the applications of photonics in a wide variety of fields included PC virtual-reality gaming, medicine, Internet services, science, military, archeology, etc. The keynote speaker of the event was Dr. Levon Mardoyan, Head of Staff for the State Committee of Science, who is a representative of the RA government.

At the opening of Optics 2015, the Armenian SPIE student chapter brought an IYL 2015 cake. CREDIT: Anna Reymers.

Australia

Primary National Organiser: Australian Optical Society

Other National Partners: Australian Institute of Physics, Astronomical Society of Australia

Estimated number of IYL 2015 activities organized: 139 events

Number of people reached by IYL 2015 activities: Billions through the international broadcast of the Sydney New Year's Eve celebrations

General overview of IYL 2015 activities in Australia

The International Year of Light (IYL 2015) had its first event in Sydney when the New Year was heralded by an IYL 2015 slideshow on the Sydney Harbour Bridge at midnight on 1 January 2015. A light bulb shone as the midnight icon.

Prior to that, we had started the ball rolling with a series of briefing events around the country in Sydney, Canberra, Brisbane, and Melbourne in order to create excitement and activity about the IYL 2015.

The IYL 2015 in Australia was supported by the Australian Optical Society, the Australian Institute of Physics, and the Astronomical Society of Australia. Financial support from the AOS and the AIP enabled us to engage the services of the science publicity organisation "Science in Public" to promote and help coordinate events nationally.

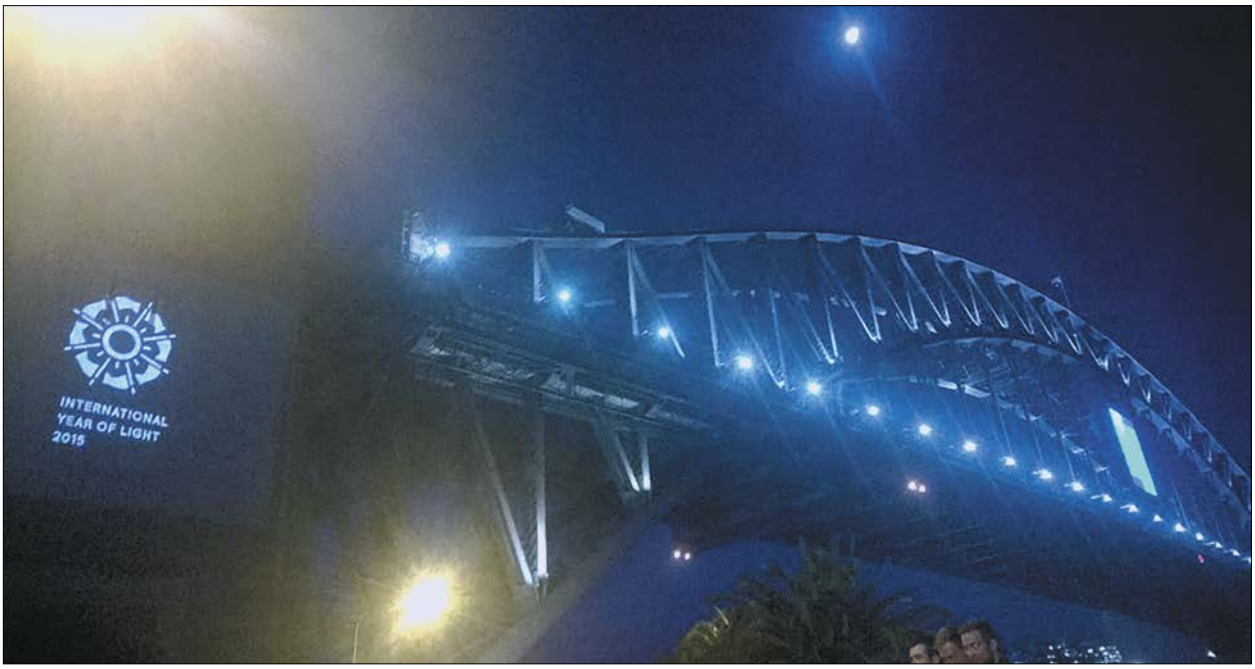
The Australian IYL 2015 organising committee comprised representatives from optics, physics, astronomy, arts, and education. The committee also included two representatives from New Zealand to coordinate activities between the two countries.

The International Year of Light was officially launched by the Honourable Karen Andrews MP (Parliamentary Secretary for Industry and Science) on 2 March 2015 at the Questacon National Science and Technology Centre in Canberra. The opening coincided with *Enlighten,* a celebration of light through the illumination of national monuments around the capital.

Other major public events included the light festivals at Federation Square in Melbourne, and VIVID Sydney. A total of 139 events in Australia were listed on the International Year of Light register. Of these, 53 were coordinated by the Australian IYL 2015 committee as listed on the its website[1] and were held in the following States and Territories: Australian Capital Territory (9), New South Wales (10), Northern Territory (2), Victoria (10), Queensland (5), South Australia (7), Tasmania (2), and Western Australia (8).

To leave a lasting legacy, the committee collaborated with Questacon to develop light-based teaching resources for high-school teachers. Furthermore, the Australian Science Teachers Association adopted "light" as its National Science Week school theme.

All told, the Australian IYL in 2015 was a great success!



Sydney New Year's Eve - IYL 2015 logo. CREDIT: Prof. Kenneth Baldwin, Dr. Fred Watson.

1. http://light2015.org.au

Austria

Primary National Organiser: Austrian Physical Society (OePG)

Other National Partners: Photonics Austria

Estimated number of IYL 2015 activities organized: >80 events

Number of people reached by IYL 2015 activities: 8,000 people

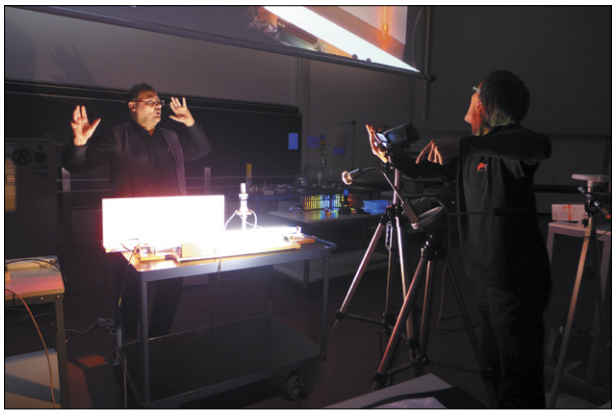
General overview of IYL 2015 activities in Austria

The International Year of Light (IYL 2015) reached the people of Austria by way of a number of events. Although constraints in funding and in particular, manpower, largely precluded the organisation of mass gatherings, there were events that targeted groups ranging from the man on the street and teachers to industrial stakeholders and scientists. Many of these events arose from the actions of individuals, groups, or small companies, and it is hardly possible to cover them all in a brief report. Some events were specially organised as official events, while others featured special IYL 2015 contributions.

The official kick-off of the IYL 2015 in Austria was a Day of Photonics on 21 October 2014 which celebrated the awarding of the Nobel Prize in Physics in 2014 to the inventors of blue light-emitting diodes. Appropriately, this event took place in a building at the Vienna University of Technology completely illuminated by LEDs.

LED trolleybus. CREDIT: Photonics Austria, U. Trog.

Several awards covered the design and architectural aspects of light: The International VELUX Award for Students of Architecture (with more than 800 participants) featured the topic "Light of Tomorrow." In conjunction with the 75th anniversary of trolleybuses in the city of Salzburg, the Salzburg AG invited young folks with innovative ideas to design a unique exterior for a trolleybus. The winning project was later showcased on one of these busses. A number of industrial events—workshops, seminars, and the like—dealt with various aspects of lighting.



Urania Lux Lecture Series. CREDIT: Wolfgang Ernst, TU Graz.

Several scientific conferences about physics throughout 2015 focused particularly on topics related to light. Most of these conferences featured public lectures on light-related subjects.

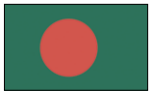
There were also numerous public lectures by high-level scientists on various aspects of light. These lectures not only focused on physical and technical aspects of lighting, some also covered the physiological aspects of light, or of light in art.

Many universities and industrial enterprises focused their respective public events on light and light-related phenomena or technologies wherever possible.

Later in 2015, a series of six public lectures took place in Graz on the topic of the IYL 2015, which also covered various aspects of light from philosophy to science theory and architecture to physics and astrophysics.

Last but not least, a rather large number of events targeted teachers and children, paving the way for the younger generation to develop an understanding of light and its phenomena.

Bangladesh



Primary National Organizer: Society for the Popularization of Science, Bangladesh (SPSB)

Sponsors: Advanced App Bangladesh Limited (AAPBD) and BizMotion Limited

Estimated number of IYL 2015 activities organized: 50 events

Number of people reached by IYL 2015 Activities: 10,000 people

General overview of IYL 2015 Activities in Bangladesh

The International Year of Light 2015 (IYL 2015) was celebrated with great enthusiasm through many activities in Bangladesh. The Society for the Popularization of Science, Bangladesh (SPSB)—the national node of IYL 2015—arranged public lectures and hands-on workshops on light throughout the year.

A lecture series on different topics regarding light and light-based technologies entitled *Light Talks* was introduced on 13 February 2015. In the first event of the series, Dr. Dipen Bhattacharya, astrophysicist and research scientist at University of California, Riverside talked about the history and development of the theories on light. He also discussed the works of Albert Einstein, Max Planck, James Clerk Maxwell, and Isaac Newton who contributed significantly in the field of optics as well as electromagnetism. It was held at University of Dhaka.

A student watches through a pinhole camera in one of the Spark of Light episodes. CREDIT: SPSB 2015

Students being shown how a periscope works in one of the Spark of Light episodes. CREDIT: SPSB 2015.

The second Light Talk was held on 7 May 2015 at University of Dhaka. Soumitra Roy Joy, assistant professor of Electrical and Electronic Engineering, Bangladesh University of Engineering and Technology (BUET) lectured on the works and life of French engineer and physicist Augustin-Jean Fresnel.

At the third Light Talk, Dr. Arshad Momen, professor and Chairman of the Department of Theoretical Physics, University of Dhaka, talked about blackbody, the works of Albert Einstein, Max Planck, and Bengali physicist Satyendra Nath Bose on blackbody radiation, Bose-Einstein statistics, Einstein's concept of photons, etc. This episode was held on 27 August at University of Dhaka.

The fourth event was held on 18 September 2015 at BUET. Dr. Farseem Mannan Mohammedy, associate professor of Electrical and Electronic Engineering, BUET lectured on the history of semiconductor devices, the development of light-emitting diodes, the 2014 Nobel Prize in physics for the development of blue LEDs, and the use of blue LEDs in today's electronics.

Spark of Light, or *Aalor Jhilik* in Bengali, was a hands-on program for high school students to make them familiar with the properties of light. In addition to public lectures, this program was introduced on 16 February 2015 at the SPSB office in Elephant Road, Dhaka, Bangladesh. After that, 37 episodes of Spark of Light were conducted in different schools throughout the country. About 2,500 high school students participated in this program combining all the episodes.

Properties of light like reflection, refraction, total internal reflection, polarization, diffraction, interference, scattering and so on, were demonstrated to the students using experiments that were simple to set up. Periscopes, kaleidoscopes, pinhole cameras, optical fibers, Newton discs, polarizers, lasers, and many other instruments were used to demonstrate the properties of light. The program was a huge success. Students were very enthusiastic to join the program.

The closing ceremony of IYL 2015 activities in Bangladesh, headlined by Aamar Mukti Aaloy Aaloy (Liberated am I in Light), was held 17 January 2016 in Dhaka. The headline was taken from a song written by Bengali Nobel Laureate in Literature, Rabindranath Tagore. The program was attended by scientists, teachers, journalists, and artists along with the general public. In addition to reviewing the yearlong activities, a cultural function was also held.

Two television programs were also made on IYL 2015 activities in Bangladesh. Those programs were aired on ATN News and Jamuna TV. Video clips of these programs can be found in the website of SPSB.[1]

1. www.spsb.org

Belgium

Primary National Organizer: VUB and B-PHOT Brussels Photonics Team

Other National Partners: Ugent, ULB, and KUL

Sponsors: Brussels Capital Region, Vrije Universiteit Brussel

Estimated number of IYL 2015 activities organized: 25 events

Number of people reached by IYL 2015 Activities: Around 1,000,000 people

General overview of IYL 2015 Activities in Belgium

The International Year of Light (IYL 2015) was celebrated throughout the whole country with 25 major events reaching out to around one million people.

The Vrije Universiteit Brussel (VUB) took the initiative at this occasion to organise an exhibition named, *Discover the Power of Light!* This informative, visual, and lively experience-exhibition, was located in the nation's illustrious national monument, the Atomium in Brussels, with the aim of spreading the positive message of durable light technology for a better world. The exhibition, which was set up with the expertise of B-Phot, Brussels Photonics Team, was an overwhelming success. Around 270,000 visitors had the opportunity to discover a variety of fascinating aspects of light. The highlight of the exhibition was a custom-made screen along the inside, covering 260° of the entire sphere. This was used as a projection screen to illustrate various aspects of light and light-based technology.

B-Phot has used the opportunity offered by "Discover the Power of Light!" to train teachers in science on the site of the Atomium through the Photonics Explorer Kit. This kit equips teachers with a class set of experimental material and contains a supporting didactic framework, which they can readily use in the classroom. Special workshops sessions were also held for dozens of school visits. At these workshops for young minds, pupils from secondary schools were able to learn through hands-on experiments, the technology behind telecommunication, polarisation, and interference.

Discover the Power of Light event. CREDIT: Vrije Universiteit Brussel.

The University of Ghent organised several activities during the Light Festival in Ghent, such as a scientific light-show, a kid's university, and a conference. The Light Festival reached 640,000 visitors in 2015. In addition to these major events for the general public, some smaller events took place organised by KUL and others.

To close this fantastic IYL 2015, ten young B-PHOT researchers teamed up 26-27 October 2015 for an interactive photonics science show, where they showcased basic but important concepts of light and light-based technology. These concepts were illustrated with cutting-edge real-life applications. More than 1,500 students from 45 secondary schools came to the VUB to participate in one of the three photonics science shows.

Bolivia (Plurinational State of)

Primary National Organizer: Universidad Privada Boliviana (UPB)

Other National Partners: Sociedad Boliviana de Educadores de Física en Secundaria (SOBOEFIS)

Sponsors: UNESCO, ICTP, SPIE, and UPB

Estimated number of IYL 2015 activities organized: 2 events

Number of people reached by IYL 2015 Activities: 300 people

General overview of IYL 2015 Activities in Bolivia

The central International Year of Light (IYL 2015) activity in Bolivia was the organization of the UNESCO's Active Learning in Optics and Photonics (ALOP) Workshop that took place in the city of Cochabamba, Bolivia on 23-27 November 2015 and was organized by the Universidad Privada Boliviana (UPB).

The workshop was designed to accommodate the needs of high-school teachers and university professors in Latin American countries. Participants are expected to use the inquiry-based methods learned at the workshop and help disseminate these methods by organizing new workshops in their home countries while acting as facilitators.

The UPB was designated by UNESCO to organize the ALOP workshop during IYL 2015 in Cochabamba. The workshop was attended by 40 university and high-school teachers. All participants received grants from the IYL 2015 Global Fund to attend the events. The workshop facilitators included prominent scientists such as Prof. Ángela Guzmán (Florida Atlantic University, and coordinator of ALOP Workshops in Latin America), Prof. David Sokoloff (University of Oregon), Prof. Freddy Alberto Monroy Ramirez (National University of Colombia), and Prof. Omar Ormachea Muñoz (Universidad Privada Boliviana and Bolivian IYL 2015 National Node).

The other IYL 2015 activity in Bolivia was *Cochabamba, a Light Year Away*, organized in Cochabamba on 12 November 2015. It was a one-day event targeted at young people and included many different activities: sunspot observation, the conference *Light, developments that illuminate each human step*, video screenings, stroboscopic observation (modulation of water molecules with acoustic waves), and the competition *Guiding laser.* The event was a success with attendance of around 250 students who were exposed to different aspects of light-based technologies.

ALOP 2015 Bolivia. CREDIT: Omar Ormachea Muñoz.

Bosnia and Herzegovina

Primary National Organizer: Astronomical society Orion

Other National Partners: Astronomical society Pleiades

Estimated number of IYL 2015 activities organized: 19 events

Number of people reached by IYL 2015 Activities: 1,000 people

General overview of IYL 2015 Activities in Bosnia and Herzegovina

The main opening celebration of International Year of Light (IYL 2015) was held at a local venue in Sarajevo. The event included speeches by the president of the astronomical society Orion and the IYL 2015 National Node Contact for Bosnia and Herzegovina. During the event, the main goals and aims of the the project were presented. Our aim was mainly to bring the science of light and light-based technologies, with special emphasis on astronomy, closer to the younger generation through lectures, workshops and observations of the Sun, stars, planets, and other objects.

Among the central activities of the IYL 2015 we noted:

- Workshops in local elementary school that included writing essays, puppet shows, light games with LED light bulbs, presentation of documentaries that related the to science of light and astronomy, and practical experiments that showed various light phenomena.
- In local high school for Electro-energetics, we held lectures and workshops regarding energy efficiency and use of solar power for electric grids.
- Activities aimed to raise awareness of lighting and energy efficiency such as the LED public lighting project “Smart House.”
- Public astronomical observations in a number of cities including Sarajevo, Tuzla, and Mostar. One interesting event was the public observation of the solar eclipse on 20 March 2015 is a quite rare astronomical event that attracted dozens of people.
- The IYL 2015 activities were also part of the participation in the European Researchers’ Night 2015 on 25 September that included a public lecture about IYL 2015 and other activities.
- Lectures related to IYL 2015 during World Space Week 4-10 October 2015.
- Issue of a commemorative IYL 2015 stamp.

IYL 2015 activities in Bosnia and Herzegovina. CREDIT: Adela Subasic-Kopic.

IYL 2015 activities in Bosnia and Herzegovina. CREDIT: Adela Subasic-Kopic

Almost all of the work done by the IYL 2015 Bosnia and Herzegovina National Committee was based on voluntary participation with very limited assistance outside of our astronomical society, with the notable exception being the *Charlie Bates Solar Astronomy Project* based in the USA, from whom we received a few hundred solar sunglasses and an H-alpha solar telescope.

In all, we believe that we have managed to achieve significant publicity regarding the main goals of the IYL 2015 initiative that will, we hope, have a lasting effect on the community as a whole.

Brazil

Primary National Organizer: Brazilian Physical Society and Brazilian Society for the Advancement of Science

Other National Partners: Brazilian Chemical Society, Brazilian Astronomical Society, Brazilian Society for Biochemistry and Molecular Biology, and Brazilian Society of Microwaves and Optoelectronics, among other societies and organizations.

Sponsors: Ministry of Science Technology and Innovation, CNPq and CAPES

Estimated number of IYL 2015 activities organized: About 3,000 specifically on light. Approximately 140,000 in the National Week of Science and Technology (SNCT), with the main theme: *Light, Science and Life.*

Number of people reached by IYL 2015 Activities: About 1,000,000 people in activities directly related to the IYL 2015. About 4 million in activities of the National Week of Science and Technology (SNCT) with the main theme: *Light, Science and Life.*

General overview of IYL 2015 Activities in Brazil

The International Year of Light 2015 (IYL 2015) opening in Brazil took place at the 21st National Symposium on Physics Teaching at the Federal University of Uberlândia (Minas Gerais) 26-30 January 2015. The opening conference, *Light, its importance and need for inclusion in physics teaching,* was given by Prof. Vanderlei Salvador Bagnato (University of São Paulo, São Carlos). At this event many other activities were held including round tables, scientific communications, and exhibitions of experiments on light and its applications.

Poster for the Brazilian National Week of Science and Technology 2015. CREDIT: SNCT.

The second largest IYL 2015 event in Brazil took place in São Carlos (São Paulo): the 67th Annual Meeting of SBPC, 12-18 July 2015, which had *Light, Science and Action* as its main theme. The activities on the theme of light in this meeting featured 19 conferences, seven symposiums, eight short courses, four round tables, and eight interactive exhibitions. A special workshop, *Light: Life and Science,* was attended by Alain Aspect, winner of the 2010 Wolf Prize in Physics, and many Brazilian scientists working in photonics, nanotechnology, and technologies for health. About 15,000 people attended the event, most of them children and high school and university students visiting the SBPC.

Several activities on light and chemistry occurred at the Annual Meeting of the Brazilian Chemical Society, 25-28 May 2015, Águas de Lindóia (São Paulo). Among them were the beautiful exhibition *Light, Image, & Science,* organized by a team of the Brazilian Chemical Society. The symposium *Shedding Light on Life* was organized during the meeting of the Brazilian Society for Biochemistry and Molecular Biology, 24-28 August, in Foz do Iguaçu, with scientists from the USA and Brazil participating. About 400 researchers and students participated in the 24th International Conference on Optical Fibre Sensors (OFS-24), Curitiba, 28 September-2 October, organized by the Brazilian Society of Microwaves and Optoelectronics. This event included a technical exhibition with 25 enterprises and the exhibition *Light: Beyond the Bulb*. This last exhibition was also shown at the Federal Technological University of Paraná 16-23 March 2015.

Two new planetariums were opened in 2015: (1) the planetarium of Sobral (Ceará), June 2015; (2) the planetarium of the Federal University of São Carlos (São Carlos, São Paulo), in October 2015.

The biggest event in Brazil related to the IYL 2015 was the National Week of Science and Technology (SNCT), with the main theme: *Light, Science, and Life,* 19-25 October and into mid-November. Approximately 140,000 activities in 1,055 cities or small towns were recorded on the SNCT site, involving 2,600 institutions such as universities, schools, research institutions, companies, government agencies, and NGOs. About 2,700 activities included the word "light" in the title. Many programs and scientific videos about light have been exhibited at the VerCiência—the International Festival of Science TV programs.

The magazine *Ciência Hoje das Crianças (Science Today for Children)* produced a special issue on light. Some

scientific journals or magazines produced special issues on light and the IYL 2015: *Science and Culture* (Brazilian Society for the Advancement of Science), *Revista Virtual de Química* (Virtual magazine of the Brazilian Chemical Society) and *Revista Brasileira de Ensino de Física* (Brazilian Journal of Physics Teaching, Brazilian Physical Society). The activities of the IYL 2015 in Rio de Janeiro were closed with the *Light for Poets,* the series of weekly conferences for a general public. Moysés Nussenzveig, a well-known Brazilian physicist who has done important work in quantum physics and optics, participated in the Christmas conference *Light and Life* closing this event.

Sobral square where the solar eclipse was observed in May 29, 1919. Museum of the Eclipse and the new Sobral Planetary. CREDIT: Assessoria de Comunicação—Prefeitura de Sobral.

The IYL 2015 activities were massively followed online and the Brazilian national node social media channel were quite popular for obtaining information about IYL 2015 in the Portuguese language. The Facebook (FB) page, Ano Internacional da Luz 2015 no Brasil[1] daily published materials and information about events and activities on the IYL in Brazil and worldwide. It has the second largest share in the world with 5,048 organic followers (as of April 2016), about half of the number of followers of the international FB page. More information on the FB page of the IYL in Brazil: about 55% of the followers of the FB page in Brazil were young people (< 34 years); gender of followers: men 52% and women 48%; number of posts ≈ 800; reach: 1.800.000 (estimated); engagement (likes on specific posts, comments, shares) ≈ 120.000.

Activities of the National Week of Science and Technology—Rio de Janeiro, Brazil. CREDIT: SESC.

1. https://www.facebook.com/2015luz

Bulgaria

Primary National Organizer: Union of Physicists in Bulgaria and Sofia University

Estimated number of IYL 2015 activities organized: 26 events

General overview of IYL 2015 Activities in Bulgaria

The International Year of Light (IYL 2015) goals were spread all over the country with the organization of 26 events. The activities were composed of exhibitions about light, public contests about light and photonics, dedicated workshops about photonics, school activities, activities to learn more about researchers, open days at laboratories, and the participation in IYL 2015 global activities.

Many open days to visit laboratories were organized in several cities around the country. These activities served to let people learn more about the work of researchers. In particular, Bulgaria joined the international initiative CIE GOLD—Global Open Lab Days. Over the month of May, laboratories around the world opened their doors, demonstrating what measuring light is about. Laboratories in the cities of Sofia and Varna opened their doors and welcomed the general public. One of these events was organized by the Bulgarian Institute of Metrology (BIM) during World Metrology Day on 20 May 2015. At the event, BIM measurement capabilities were presented (which are included in the BIPM database), and also different possibilities for measurement in the fields of photometry and radiometry, and optical properties of materials. Topics covered included, photometry and radiometry, spectrophotometry, polarimetry (optical rotation), refractometry, reflectometry, and colour. The second part of the event featured tours in BIM optical laboratories.

An interesting event took advantage of the 60th International Regatta TID 2015—*Tour International Danubien.* On 14 August 2015, over 130 participants from Germany, Austria, Hungary, Serbia, Switzerland, UK, the Netherlands, Bulgaria, and South Africa landed their boats on the Danube River near the village of Baykal, Municipality Dolna Mitropolia. Participants had the opportunity to see an exhibition about IYL 2015, which attracted great interest. In addition, the participants in the regatta enjoyed astronomical observations with a telescope and laser show on the currently visible constellations.

Open Day at the Bulgarian National Committee on Illumination. CREDIT: University of Mining and Geology "St. Ivan Rilski."

Bulgaria also joined international initiatives around IYL 2015 such as the LIGHT2015 project with the organization of LIGHTtalks and teacher training workshops as well as the *Light: Beyond the Bulb* exhibitions. The exhibitions in the cities of Shumen and Dolna Metropolia over the IYL 2015 were a great success receiving thousands of participants.

The IYL 2015 was closed with a ceremony celebrated in Sofia on 22 January 2016.

World Metrology Day 2015 Measurements and Light

Each year, on May 20, the worldwide metrology community celebrates the anniversary of the signing of the Metre Convention on 20 May 1875. For 2015, World Metrology Day chose *Measurements and Light* as its theme to align with the IYL 2015, celebrating the importance of metrology to light-based technologies, and of light to metrology. Events were organised in 36 countries around the world and thousands of World Metrology Day posters were produced and distributed in 21 languages.

World Metrology Day 2015 Poster. CREDIT: World Metrology Day.

Cameroon

Primary National Organizer: Cameroon Physical Society (CPS)

Other National Partners: IEEE, OSA, and SPIE Student Chapters in Cameroon

Sponsors: CPS, IEEE, OSA, SPIE, ICTP

Estimated number of IYL 2015 activities organized: 7 events

Number of people reached by IYL 2015 Activities: 2000 people were directly reached by the activities organized. However, we have organized an IYL conference in Yaoundé that was covered by national media (accessible by the full population of the country: 23 million), namely Canal 2 International (most popular TV channel in the country), CRTV Radio (most popular radio channel in the country), and the newspaper *Mutations* (most popular private newspaper in the country).

General overview of IYL 2015 Activities in Cameroon

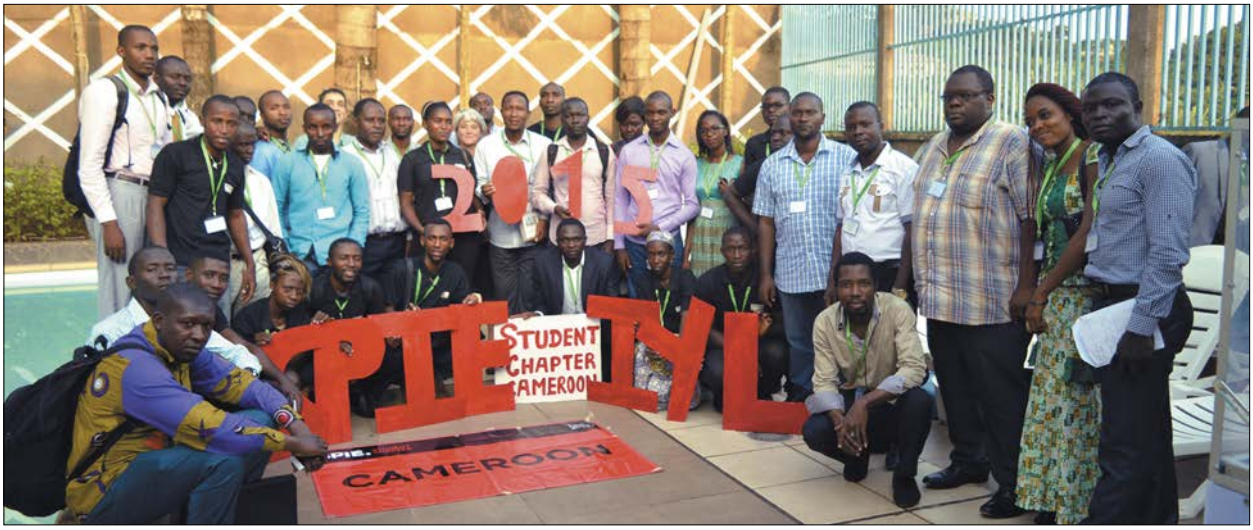
The International Year of Light 2015 (IYL 2015) activities in Cameroon have been organized throughout the year 2015, and they unfolded in two steps.

In the first one, the IEEE, OSA, and SPIE student chapters organized outreach activities from January to November 2015. They led outreach activities about light and light-based technologies in primary schools, high schools, universities, NGOs, and cultural centers.

The goal of these outreach endeavors was to raise awareness in the public about the technological potential of photonics in Africa, but also to educate the youth about optical sciences. Along that line, the student chapters implemented several simple experiments that can help primary- or middle school students to understand some of the key properties of light. A non-exhaustive list of these experiments include Young's double-slit interference (which shows the wave nature of light), total internal reflection using a John Tyndall water pipe (which explains the principle of an optical fiber), transmission of audio-signals using free-space laser communications (which explains how laser light can be an information-bearing signal), and infrared detection using a webcam (which shows that light might be invisible to humans but detectable with other systems).

The second step of IYL 2015 activities in Cameroon was an international workshop held on 24-27 November 2015 in Yaoundé, with an attendance of around 100 participants coming from Africa (Cameroon, Nigeria, Benin, Central-African Republic, Kenya), Europe (France, Belgium, Spain) and Oceania (New Zealand). Thanks to the generous support of all our sponsors (mainly IEEE, OSA, SPIE, and ICTP), we were able to provide financial support to all the participants who were MSc/PhD students, postdocs, and young professionals. From the scientific point of view, this IYL 2015 workshop gave young African scientists the opportunity to present their research in optoelectronics, optomechanics, optical materials, nonlinear optics, optical telecommunications, and solar cells.

The impact of this research for African development has been thoroughly discussed, and the conference was an excellent platform for strengthening the African network of researchers in photonic sciences. This IYL 2015 conference was organized with the support of the Cameroon Physical Society and the Cameroon Academy of Science. The event also received wide attention and was covered by the most popular media sources.



Cameroon SPIE Student Chapter at the IYL 2015 Conference in Yaoundé. CREDIT: Cameroon SPIE Student Chapter.

Canada

Montréal En Lumière—16th edition. CREDIT: Frédérique Ménard-Aubin, Montréal En Lumière.

Primary National Organizer: Canadian Photonic Industry Consortium and Canadian Association of Physicists

Other National Partners: From university: University of Alberta, British Columbia, Calgary, Ottawa, Sherbrooke, Toronto, Waterloo Windsor, Ecole Polytechnique of Montreal, and INRS. From industry: Attodyne, Christie Digital and Mira Concept, and from other organizations: Canadian Light Source, INO, NSERC, and QPN.

Sponsors: CMC Microsystems, Canadian Light Source, IEEE, OSA, SPIE and many companies, organizations and universities supported specific activities.

Estimated number of IYL 2015 activities organized: 60 events

Number of people reached by IYL 2015 Activities: 2,600,000 persons

General overview of IYL 2015 Activities in Canada

Various activities were organized to open the International Year of Light 2015 (IYL 2015) in Canada from coast to coast. During the whole year, scientific conferences, student activities, public exhibits, and demonstrations were organized to promote light and photonics.

International photonic conferences such as Photonics North in Ottawa, Artificial Light at Night in Sherbrooke, Innovation 360 in Gatineau, Alberta Nanotechnology in Banff, International Conference on Image Processing in Quebec City and various IEEE, OSA, and SPIE topical conferences were held, gathering researchers and students in various aspects of photonics. In addition, there were many university and high school student activities to promote photonics and science such as the Photonic Games in Quebec City, the mini-robots competition in Ottawa, the International Astronomy Day in Victoria, the session on Fingerprints of the Sun in Calgary, an interactive photonics exhibit in Quebec City, etc.

The major efforts were focused on public reach and were very successful. In Vancouver, the Lighting Architecture Movement Project was a competition challenging designers to create novel lighting fixtures. A large, winter festival called Montréal en lumière presented an array of free outdoor light-based activities integrating digital arts and interactive initiatives. In Niagara, the Wintertime Light Festival featured a 5km long illuminated route. In Québec City, giant street lamp shades presented paintings by major Canadian artists. A Twitter account dedicated to the International Year of Light was created to facilitate the global dissemination of the importance of light in our lives.

In parallel, a study of the impact of photonics on the Canadian economy was held throughout the year and resulted in the publication of a report called *Light Technologies, A Strategic Economic Asset*[1] presenting the impact of photonics in eight economic sectors which are important to Canada.

1. http://photonscanada.ca/media/67747/cpic-report- en-15_feb_2016.pdf

Chile

Primary National Organizer: Universidad de Concepción

Estimated number of IYL 2015 activities organized: 18 events

Number of people reached by IYL 2015 Activities: 75,000 people

General overview of IYL 2015 Activities in Chile

The International Year of Light (IYL 2015) activities in Chile were a great success, reaching out to thousands of people all over the country. It featured general events for the public, exhibitions about light, lectures, dedicated workshops about light, school activities, photography competitions, artistic performances, and participation in IYL 2015 global activities.

The biggest event in the country was the *Post Tenebras Lux* (Light after Darkness) event in the city of Valparíso. On 24 January 2015, a series of activities took place along a route in the neighbourhood of Barrio Puerto, the old historic port of Valparaiso protected as a UNESCO World Heritage Site. Public art exhibitions and visual concerts were part of this program dedicated to light. Around 50,000 people participated on the event.

The Light Fest organized in Concepción on 11 October 2015 also drew a big crowd of over 25,000 people. Light Fest was a celebration of light not only in the context of science, but included other creative expressions to remind us how important light is in our lives. Science, art, photography, dance, and other activities were the core of the Light Fest, and these activities reached a wide audience in celebration of the International Year of Light.

From April to June 2015, popular science lectures around the IYL 2015 main theme were held at the Faculty of Physical Sciences and Mathematics from the University of Chile.

Chile also participated in international initiatives supported by the IAU's IYL 2015 Cosmic Light programme such as *SkyLight: a Global Science Opera* and the GalileoMobile Constellation Programme that visited schools in remote areas to engage in astronomical activities with students and teachers.

Post Tenebras Lux event. CREDIT: Ronald Kay.

China

Primary National Organizer: The Chinese Optical Society (COS) and The Chinese Physical Society (CPS)

Other National Partners: China Association for Science and Technology, China Science and Technology Museum, and Xinhua Net

Sponsors: University of Science and Technology of China, Zhejiang University, Peking University, Tsinghua University, Shanghai Institute of Optics and Fine Mechanics of CAS, Light: Science & Applications, and China International Optoelectronic Exposition

Estimated number of IYL 2015 activities organized: 500 events

Number of people reached by IYL 2015 Activities: 300,000 people

General overview of IYL 2015 Activities in China

To celebrate the International Year of Light (IYL 2015), more than 500 activities have been held in China, including science lectures, academic conferences, photonics weeks in colleges, special issues in journals, a college photography competition, popular science publications, micro videos, interviews, websites, symposiums and exhibitions, and the commemoration of the 100th birthday of Mr. Daheng Wang. More than 200 activities were organized by the Chinese Optical Society (COS) and the Chinese Physical Society (CPS). In collaboration with the government ministries, societies, associations, institutes, universities, and companies, a series of celebration activities were held. Over 300,000 people have been reached by IYL 2015 activities.

The opening ceremony of IYL 2015 in China was held at the University of Science and Technology of China (USTC) on 11 January 2015. Six members of the Chinese Academy of Sciences and the Chinese Academy of

Light Week Activities. CREDIT: Qihuang Gong, Yan Li, Prof. Qihuang Gong.

Engineering, and three directors of major optics institutes presented invited talks to over 500 attendees.

More than 100 optical science and technology symposiums featuring IYL 2015 were held. Many presentations were given by members of the Chinese Academy of Sciences and the Chinese Academy of Engineering, the fellows and members of COS, CPS, and related societies. Over 20,000 people attended, including primary and secondary school students, college students, graduate students, and researchers.

IYL 2015 activities were added to academic conferences. One major conference was the Academic Conference of COS, held in Chengdu in August 2015 with 1,500 in attendance. Another was the Autumn Academic Conference of CPS, held in Changchun in September 2015, with 2,500 in attendance. In addition, about 200 related academic conferences were held in China.

IYL 2015 was celebrated in many Chinese universities and institutes including USTC, the Capital Normal University, Huazhong University of Science and Technology, Chongqing University, Anhui Institute of Optics and Fine Mechanics of CAS, who organized optical science weeks or photonics weeks. These events attracted many participants. IYL 2015 was also celebrated in several exhibitions around the country. There were two major exhibitions for the photonics industry. The Laser World of Photonics China 2015 was held in Shanghai 17-19 March 2015. There were 700 exhibitors in a 36,900 square meter facility. The China International Optoelectronic Exposition (CIOE) was held in Shenzhen 31 August-3 September 2015. CIOE 2015 attracted more than 2,000 companies and more than 20,000 industry elites to participate in the exhibition, covering 110,000 square meters. Two major popular science exhibitions were held in Beijing. The Second City Science Festival was held at the Beijing Exhibition Hall 18 July-2 August 2015. Another exhibition on light and light-based technology was held at the China Science and Technology Museum 9 July–5 September 2015, with 153,199 attendees.

In 2015, a lot of popular science activities were held. Ancient optics in China going back two thousand years was summarized and introduced to the public. COS and the USTC SPIE student chapter compiled a booklet for IYL 2015 and over 10,000 copies have been printed. Several feature papers about IYL 2015 were published. Knowledge Is Power and Physics and Engineering magazines published special articles about IYL 2015. The Shanghai Institute of Optics and Fine Mechanics in the Chinese Academy of Science produced more than a dozen micro videos. The IYL 2015 college photography competition lasted for three months, which was hosted by COS and CPS and organized by Zhejiang University. Thirty photographs won awards. The president, vice president, and general secretary of COS introduced IYL 2015 in interviews with Xinhuanet.

2015 was also the 100th birth year of Mr. Daheng Wang, a founder of modern Chinese optics and optical engineering. COS and CPS, together with the China Instrument and Control Society and the Chinese Society for Measurement, held a symposium in memory of Mr. Wang. Two young outstanding scientists and 21 college students won the 2015 Wang Daheng Optics Award, founded by Mr. Wang in 1996.

China participated in the opening and closing ceremonies of IYL 2015. China also collaborated on a series of activities with OSA, SPIE, IEEE, and other international organizations.

The closing ceremony for IYL 2015 in China was held in Beijing on 9 January 2016. The ceremony summarized the major activities organized in 2015 and was attended by 200 people. The IYL 2015 is over, but the activities in China highlighting the light and the light-based technologies will continue.

China Hong Kong

Primary National Organizer: The Hong Kong Polytechnic University

Other National Partners: Hong Kong Space Museum, Ho Koon Nature Education cumAstronomical Center and IAU's Office of Astronomy Outreach, Kuk and Elegant Jewelry Holding Limited, Education Bureau, the Hong Kong Institute of Education and the Hong Kong Society for Education in Art and K11.

Estimated number of IYL 2015 activities organized: 10 events

General overview of IYL 2015 Activities in China Hong Kong

Among the activities of IYL 2015 in Hong Kong we could highlight: To tie in with the International Year of Light 2015 (IYL 2015), the Hong Kong Space Museum presented lectures and jointly organized the *Light-Pollution Research Competition 2015-2016* and the *Light-Pollution Video Competition 2015-2016* with the University of Hong Kong, Ho Koon Nature Education cum Astronomical Center, and the Office of Astronomy Outreach from the International Astronomical Union. The lecture series consisted of four sessions and attracted an audience of 230 persons. The research and video competition were designed to promote awareness of light pollution among the public and engage secondary school students to learn about light pollution. Around 60 students from 14 schools participated, submitting a total of 12 reports and 12 videos.

The exhibition *Supernova X'mas Luminastic* brought the important discoveries of light over the past 1,000 years to a renowned mall from 3 November 2015 to 3 January 2016. During the crowded Christmas season, the mall's visitors could experience the possibilities of light by enjoying Hong Kong's largest 4D Interactive "teamLab Crystal Tree," a giant "Artificial Moon" by Wang Yuyang from China and a multi-sensory colour chamber "Seven Keys" by Hong Kong's renowned LED artist Teddy Lo.

Kuk and Elegant Jewelry Holding Limited, together with the Education Bureau, the Hong Kong Institute of Education, and the Hong Kong Society for Education in Art launched the 2015 International Year of Light and Light-based Technologies Art and Design Competition to raise students' awareness of how light and light-based technologies affect the future development of human daily lives globally. A national contest and an international contest took place, which received several entries from countries around the world. The prizes were presented in a ceremony 19-20 March 2016.

Other activities included the 4th Workshop on Specialty Optical Fiber and Their Applications 4-6 November 2015, with participation of around 150 delegates and the Asia Communications and Photonics Conference (ACP), 19-23 November 2015 with around 600 attendees.

Award Ceremony of the Light-Pollution Research and Video Competition 2015-2016. CREDIT: University of Hong Kong.

Chinese Taipei

Primary National Organizer: The Physical Society in Taipei and the Photonics Society in Taipei (TPS)

Other National Partners: The Center of Advancement for Science Education (CASE) of the National University in Taipei; National Synchrotron Radiation Research Center (NSRRC); The Photonics Industry and Technology Development Association (PIDA); Taipei Astronomical Museum (TAM); National Science Education Center (NTSEC) in Taipei; the Interdisciplinary Science Education Center of National Tsing-Hwa University

Sponsors: The Physical Society in Taipei, Photonics Society in Taipei (TPS), and donations by local industry

Estimated number of IYL 2015 activities organized: 100 events

Number of people reached by IYL 2015 Activities: >10,000,000 people

General overview of IYL 2015 Activities in Chinese Taipei

Annual Meeting of TPS, incorporated with OPTIC2014 in National Chung-Hsing University. CREDIT: Dr. Ching-Cherng Sun, Dr. Fu-Jen Kao.

The IYL 2015 presented great opportunity for our academic and educational organizations to work together in reaching out to the general public in Chinese Taipei. Taking advantages of existing festivals, conferences, and exhibitions, many outreaching and educational activities and events were planned accordingly in a laissez-faire style.

To celebrate IYL 2015, TPS organized the Chinese Taipei IYL 2015 committee to initiate most related activities. The first activity started from the Annual Meeting of TPS, incorporated with OPTIC2014 (Optics and Photonics International Conference) at National Chung-Hsing University on 5 December 2014, when Morris Chang of the TSMC Semiconductor Manufacturing Company was presented the SPIE Visionary Award.

As the key event, the *Lantern Festival* has been of great significance since the Western Han Dynasty (206 BC-AD 25) and is symbolized by imaginative colourful lanterns embossed with intriguing puzzles and riddles. In Chinese Taipei, the festival marks the conclusion of Lunar New Year celebration and has attracted more than 8 million visits annually in the last few years. The Physical Society in Taipei and TPS have championed IYL 2015 by promoting popular science through outreach activities and a lantern featuring Einstein by TPS, held 5-15 March 2015 in Wuri, near Taichung High Speed Train Station. Official report addresses that the attendant number reaches more than ten million people.

As many as 30 universities continuously held IYL 2015 special seminars or campaigns in the campus through the whole year. Taichung City, the largest city in central Chinese Taipei, announced the foundation of a Photonics Valley to celebrate IYL 2015 and to promote the optics and photonics industry.

It takes a social network to follow up IYL 2015 subsequently nationwide. We are grateful that many institutes and organizations contributed to the IYL 2015 outreaching events by reallocating their budgets and resources, despite the short notice and limited funding. Specifically, we appreciate greatly the vision and efforts of those who proposed IYL 2015.

Colombia

Primary National Organizer: Colombian Network of Optics and Universidad del Valle

Other National Partners: Colombian Academy of Exact, Physical, and Natural Sciences, National University of Colombia, the University of los Andes and the University of Antioquia, Instituto Tecnológico Metropolitano, Sociedad Red Colombiana de Óptica; Universidad EAFIT, Universidad Pontificia Bolivariana, Parque Explora, Instituto Francés, Sociedad Antioqueña de Astronomía, Planetario de Medellín, Centro de Innovación y negocios RutaN, University of Quindio and Technological University Pereira.

Estimated number of IYL 2015 activities organized: 70 events

Number of people reached by IYL 2015 Activities: about 5,000 people

General overview of IYL 2015 Activities in Colombia

The International Year of Light 2015 (IYL 2015) activities in Colombia were a great success involving around 70 events all over the country. The activities were composed of light exhibitions, dedicated workshops about photonics, international conferences with IYL 2015 special sessions, public lectures, school activities, and participation in IYL 2015 global activities.

The IYL 2015 commemorations started back in late 2014 with a few events around the country, most notably the FOCUS LATIN AMERICA 2014 event in the city of Medellín 11-13 November 2014. This optics workshop featured great technical and non-technical professional development opportunities for optics students. Over 100 attendees had the chance to present their works, share experiences with colleagues from SPIE and OSA Student Chapters, and learn from specialized research leaders.

The crowning IYL 2015 event in the country was the international conference *Colombia in the International Year of Light 2015* held in the cities of Bogotá and Medellín 16-19 June 2015. It was organized by the Colombian Academy of Exact, Physical, and Natural Sciences in collaboration with the National University of Colombia, the University of Los Andes, and the University of Antioquia. The goal was to hold an international event that would 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. Keynote speakers included two Nobel Prize Laureates, Profs. Serge Haroche (France) and David Wineland (USA), who shared the 2012 Nobel Prize in Physics. Other international keynote speakers included Prof. Paulo Sergio Soares Guimaraes (Brazil), Prof. Alain Aspect (France), Prof. Suzanne Fery-Forgues (France) and Prof. Jean-Pierre Galaup (France), and Prof. William Unruh (Canada). Four Colombian scientists completed the impressive group of key-note speakers: Dr. Ana Maria Rey, Dr. Boris Rodríguez, Dr. Alejandro Mira, and Dr. John Henry Reina from University of Valle. Over 2,000 participants attended the lectures in Bogotá (June 16 and 17) and Medellín (June 18 and 19).

Closing the celebration's year (16-20 November), the Colombian Network on Optics and Universidad del Valle, with support from Universidad Autónoma de Occidente and Universidad Javeriana, and the OSA & SPIE student chapters, organized the XIV National Meeting on Optics (ENO-CANCOA 2015). The most important national event in optics and photonics, with over 170 presentations and 200 attendees, was held in Santiago de Cali at the Universidad del Valle. The conference opening was presided by Prof. Glenn Boreman, SPIE Vice-President.

Colombia was also part of international IYL 2015 initiatives such GalileoMobile's Constellation project, SkyLight: a Global Science Opera, and World Metrology Day.

Participants in the Night of the Stars event in the city of Pereira. CREDIT: Dr. Cesar Torres Moreno, Prof. Efrain Solarte Rodriguez.

Costa Rica

Primary National Organizer: CIENTEC

Other National Partners: National Academy of Sciences, LANOTEC, MUCYM, and Distance Learning National University (UNED)

Sponsors: National Academy of Sciences, LANOTEC, MUCYM, and Distance Learning National University (UNED), Nitro Art and Colinas del Poas

Estimated number of IYL 2015 activities organized: 20 events

Number of people reached by IYL 2015 Activities: 2 million persons

General overview of IYL 2015 Activities in Costa Rica

The International Year of Light 2015 (IYL 2015) Costa Rican Committee collaborated with the local members of RedPOP (the Latin American Network for the popularization of Science and Technology) and had support from the international network to launch the IYL 2015 with workshops and conferences with international speakers.

The next strategy was the creation of a map of the zenital sun path in April, looking at light and shadows across the country, with a citizens science component to contribute data and define times and dates for each location. This strategy was supported heavily by the media (TV and newspapers).

An important activity was the collaboration of the *First Conference on Photometry and Lighting* with the Mechanical, Electrical and Industrial Engineering Association.

The *BVS Light Fest 2015* was a school science fair in San José around the topic of light. All students from preparatory to fifth grade presented a research project, a demonstration, or an experiment. Secondary school students worked with different mentors according to the nature of their research.

There were *Painting with Light* workshops in different locations of the country and many presentations about light and light-based technologies in schools and communities throughout the year.

The country was also involved in international IYL 2015 initiatives such as the exhibit *Light: Beyond the Bulb* that was displayed in different locations in Costa Rica.

Finally, representatives from the IYL 2015 Costa Rican National Committee participated in the IYL 2015 Official Closing Ceremony in Mérida, Mexico.

BVS Light Fest 2015. CREDIT: Alejandra León-Castellá, Jaime Cascante.

Croatia

Primary National Organizer: Croatian Physical Society

Other National Partners: Institute of Physics, University of Zagreb, University of Split, University of Rijeka, University of Osijek, Zagreb Observatory, and Museum of Contemporary Art

Sponsors: Croatian Academy of Sciences and Arts, LIGHT2015 project, The Foundation of the Croatian Academy of Sciences and Arts, Školska knjiga

Estimated number of IYL 2015 activities organized: over 100 events

Number of people reached by IYL 2015 Activities: over 40,000 people

General overview of IYL 2015 Activities in Croatia

The International Year of Light 2015 (IYL 2015) celebrations in Croatia took place all over the country. More than 40,000 people of all ages (mostly young people) attended the conferences, lectures, workshops, exhibitions, open days, and popular experiments with light. Among more than 100 events, we highlight only a few of them here.

The central IYL 2015 event in Croatia was a symposium/workshop/exhibition entitled *Man and the Light*, organized by the Croatian Physical Society (CPS). The symposium (together with the LIGHTtalk session organized along with the LIGHT2015 project) was held under the auspices of the Croatian Academy of Sciences and Arts (29-30 September 2015) while the workshop and exhibition were held under the auspices of the Museum of Contemporary Art (1-4 October 2015). This event was open to the public (over 400 attendees directly plus live stream). The event was free to participating national scientists and experts involved in optics.

The theme of the Open day (17 April 2015) of the Institute of Physics, Zagreb, was *Let it be light,* The over 1,200 visitors had the opportunity to see the laboratories and to attend lectures, workshops and popular experiments with light. The works of talented students realized in cooperation with scientists from the Institute of Physics were also presented.

The *International Conference of Physics Students* (ICPS) was held in Zagreb 12-19 August and was organized by the Student Section of the CPS. The ICPS is an event where physics students from around the world gather each year for a week to present their work, attend lectures held by distinguished physicists, participate in workshops and round tables, and visit local institutes and labs.

The 13th *Science Festival* with the theme *The Sun* was held 20-25 April simultaneously in 18 Croatian cities. With the aim of bringing science closer to citizens, the festival involved many actively participating institutions.

To conclude, these and many other events and efforts organized in Croatia successfully highlighted the importance of light and optical technologies in our everyday lives.

Man and the Light Symposium. CREDIT: Dr. Nazif Demoli.

Cuba

Left: Under the dome of the main operative telescope of the project *Young sky observers in Havana, Optics & Photonics trainees—scientists of the future,* awarded by the International Commission for Optics (ICO) on IYL 2015. Right: The Special Issue of *Cuban Physical Journal* dedicated to closing the IYL 2015, with selected papers from CIOFF conference. CREDIT: Ángel G. Augier / Ernesto Altshuler and Ángel G. Augier.

Primary National Organizer: Cuban ICO Territorial Committee and Cuban Physical Society

Other National Partners: Institute of Science and Technology of Materials (IMRE) and Physics Faculty from Havana University (UH), Institute of Cybernetics, Mathematics and Physics (ICIMAF), Centre of Technological Applications and Nuclear Developments (CEADEN), Cuban Academy of Sciences and Institute of Technology "Jose A. Echeverria" (CUJAE)

Sponsors: International Commission for Optics (ICO), International Centre for Theoretical Physics (ICTP), CIOFF, Cuban Physical Society

Estimated number of IYL 2015 activities organized: 60 events

Number of people reached by IYL 2015 Activities: 10,000 persons

General overview of IYL 2015 Activities in Cuba

The International Year of Light 2015 (IYL 2015) activities in Cuba were officially opened with a ceremony at the International Conference on Optics, Photonics and Photosciences (CIOFF) on 14 October 2014 at Hotel Nacional de Cuba in Havana, and the successful Art-Science Exhibition *Light and Interdimensional Universes*, which included national and international personalities and over 120 participants. A more modest opening activity was carried out at Havana University on 20 January 2015. Around 60 activities were organized by scientific and academic institutions, associations, as well as cultural and health organizations, spread by the Internet, radio and TV, magazines and journals, and reached around 10,000 people in the whole country.

The activities included: topical papers, scientific conferences, international exhibitions, cultural and scientific festivals, projects, competitions, and activities with students. Among the highlights was the ICO-awarded project *Young sky observers in Havana, Optics & Photonics trainees—scientists of the future* for promoting optics and photonics among young people. Other important activities were the national photography contest *CienciArte 2015,* and the publication on February 2016 of a special issue of *Cuban Journal of Physics*, dedicated to closing the IYL 2015, with selected papers from the CIOFF conference. Also relevant was the series of activities *One summer taking care of your skin,* involving doctors and physicists, July-August 2015 in collaboration with the Cuban Health Ministry (MINSAP) and the Havana Office of the City Historian, with special attention to pregnant women and children.

The Closing Ceremony of IYL 2015 was celebrated on 2 February 2016 at Havana University, under the Award Ceremony of the Cuban Contest *CienciArte,* where the more important activities organized during the Year were summarized.

Cyprus

Primary National Organizer: Kition Planetarium & Observatory

Estimated number of IYL 2015 activities organized: 37 events

Number of people reached by IYL 2015 Activities: Over 4,000 people were directly reached by the events as well as 1,000,000 through media actions

General overview of IYL 2015 Activities in Cyprus

The International Year of Light 2015 (IYL 2015) was organized in Cyprus for celebrating the achievements of light science and its applications. It aimed to raise awareness of the importance of light and light-based technologies to humankind and encourage people to get involved in future development of technologies which could benefit society.

Around 27 events were organized nationwide by the Kition Planetarium & Observatory's volunteers team, including a grand opening at the Municipal Theater of Larnaca and two closing ceremonies in Nicosia and Larnaca.

The opening ceremony included the official IYL 2015 song by Katerina Mina and Linda Lamon, with the family of the singer as official guests. It was followed by a small speech by Mr. George Troullias, the National Coordinator for IYL 2015 and director of the Kition Planetarium & Observatory. In addition, the IYL 2015 official trailer was screened followed by a speech from the Larnaca Deputy Mayor to welcome the initiative in Cyprus and to express that the city of Larnaca was honoured for holding the opening ceremony. Dance performances by Mambo School of Dance enriched the program with the artistic use of light. The whole event was presented by the well-known actor, Thanasis Drakopoulos.

As IYL 2015 was meant to raise awareness and spread knowledge about light-technologies, a guest speaker, Russian astrophysicist Alexandr Prokophiev, presented in simple words and examples the general theory of relativity to the audience—commemorating 100 years since Albert Einstein developed this theory.

All important milestones in the history of the science of light were mentioned in a presentation by George Troullias. This presentation also included the purpose and mission of the declaration of the IYL 2015 by UNESCO and gave examples of uses of light and light-based technologies.

Throughout the year, events included observations, speeches, presentations, planetarium shows, workshops, science cafes, light pollution measurements, and many more.

The second closing ceremony in Larnaca meant the beginning of a new yearly project in Cyprus. It included the opening ceremony of the International Astronomical Union (IAU) approved project *Cosmic Light Reaches Cyprus 2016,*[1] which is a continuation of the successful celebrations of IYL 2015 in Cyprus.

IYL 2015 Opening Ceremony in Cyprus. CREDIT: George Troullias (Kition Planetarium & Observatory).

1. http://www.astronomycyprus.eu/pages/cosmiclight2016en.htm

Czech Republic

Primary National Organizer: Institute of Scientific Instruments of the Czech Academy of Sciences

Other National Partners: Czech Academy of Sciences, Transparent Communications, Czech Physical Society, Czech and Slovak Phonics Society, Palacký University Olomouc, Masaryk University, Charles University, Brno Observatory and Planetarium, and Amazing Theatre of Physics

Sponsors: Czech Academy of Sciences, Measurement Technic Moravia, Photon Systems Instruments and OptiXs

Estimated number of IYL 2015 activities organized: 71 events

Number of people reached by IYL 2015 Activities: 50,000 people

General overview of IYL 2015 Activities in the Czech Republic

The aim of the International Year of Light (IYL 2015) national node, led by Prof. Pavel Zemánek from the Institute of Scientific Instruments in Brno, was to motivate and incite both public and private sector institutions to take an active part in the promotion of light and the popularization of light science and technologies. The ultimate task was first and foremost to appeal to school children and young students. Many artistic and knowledge-based competitions concerning light, public lectures, scientific plays or interactive displays were held throughout the year in the Czech Republic. In total, 71 events during IYL 2015 were registered at the official IYL 2015 Czech website[1] that reached 35,000-50,000 people. The Czech

Week of Science and Technology. CREDIT: The Czech Academy of Sciences.

IYL 2015 Facebook page[2] provided daily captivating news from various areas of science and social life.

The main effort was focused on young people and children with the goal of making science and technology more attractive to them. The Amazing Theatre of Physics visited many schools throughout the IYL 2015 with their play explaining the physics behind light. Volunteers across the entire country organized various competitions at schools, events popularizing science and technology at universities or public places, all having light as the main topic. Czech scientific institutions concerned with light science paid special attention to its popularization in 2015. For instance, young visitors gained an exclusive insight into laser technology and its applications.

The public was welcome at various light shows and fairs, and exhibitions in museums organized by various societies and communities. Countless lectures on light science were given by Czech experts during IYL 2015. The Czech Academy of Sciences dedicated its annual festival, Week of Science and Technology, in November to light. It hosted the exhibition *Light: Beyond the Bulb* as well as interactive workshops for children and a video mapping show at its headquarters in Prague. Artistic displays of light technologies for the public took place in the larger Czech cities. The video mapping festival *Septembeam* in Olomouc in September, the *SIGNAL Festival* in the streets of Prague in October, and a light show on Museum Night at the Technical Museum in Brno in May were some of the bigger events.

SIGNAL Festival. CREDIT: Alexander Dobrovodsky.

Experts participated in about ten scientific conferences dealing with light and light-based technologies in the Czech Republic.

1. www.roksvetla.cz
2. https://www.facebook.com/svetlo2015

Denmark

Primary National Organizer: Danish Physical Society

Other National Partners: Department of Photonics Engineering, Technical University of Denmark

Sponsors: 2 private funds

Estimated number of IYL 2015 activities organized: 25 events

Number of people reached by IYL 2015 Activities: 5,000 people

General overview of IYL 2015 Activities in Denmark

The National Committee for the International Year of Light 2015 (IYL 2015) in Denmark was organized in April 2014 by the president of the Danish Physical Society (DFS), Jørgen Schou, almost immediately after the announcement at the annual meeting of the European Physics Societies in Trieste, Italy. The members were primarily physicists from universities and educational institutions and chairmen for organisations. The committee mostly served as a coordinating council for all events. Jørgen Schou from DFS was elected as Chairman of the Danish National Committee by the board of DFS.

IYL 2015 Opening Ceremony in Denmark. CREDIT: Jørgen Schou.

The opening of IYL 2015 in Denmark took place at the Technical University of Denmark in Lyngby north of Copenhagen with the Danish Physical Society and the Department of Photonics Engineering (DTU Fotonik) as hosts 22-23 January 2015 as part of the annual meeting of the Danish Physical Society. Around 150 physicists attended the meeting with a program of talks by prominent speakers, the Nobel Laureate W. Ketterle; the director of attosecond laser physics in Munich, Ferenc Krausz; the former leader of the Laser Centre in Lund, Sweden, Sune Svanberg; and the chairman of the IYL 2015 Steering Committee, John Dudley.

While the opening of IYL 2015 was dominantly scientific, the Danish National Committee and DTU Fotonik organized a meeting for the public at the Technical University in the middle of February 2015. Six physicists and entrepreneurs gave popular talks on the physics of light, light in art, new industrial developments, and applications of inexpensive solar cells. This meeting was attended by about 100 persons.

The committee also held a common series of lectures from scientists and engineers about their work with light in Danish high schools on 7 October 2015. This day was also Niels Bohr's birthday and a way to remember that his atomic model was based on light transitions. Over 20 lectures were organized in schools around the country.

The closing of IYL 2015 took place in the Black Diamond (the Royal Danish Library) on 15 December 2015 in the city of Copenhagen. This was the largest meeting that the committee and DTU Fotonik organized in 2015 with about 400 attendees. The Innovation Prize for LEDs was awarded to a small Danish company which improved the light conditions in apartments for elderly people. Two talks by a well-known Danish scientific author, Tor Nørretranders, and an artist, Olafur Eliasson, *Light in Life* and *Life in Light* were the major attractions of this evening meeting. With this event, all activities of the IYL 2015 were finished in Denmark.

Dominican Republic

Primary National Organizer: Mujeres Poetas Internacional (MPI), Inc. (Women Poets International Movement)

Sponsors: Feria Internacional del Libro de Santo Domingo

Estimated number of IYL 2015 activities organized: 2 events

Number of people reached by IYL 2015 Activities: 250 people

General overview of IYL 2015 Activities in the Dominican Republic

The main International Year of Light 2015 (IYL 2015) event in the country was celebrated on 3 May 2015, when the Movimiento Mujeres Poetas Internacional MPI Inc. (Women Poets International Movement, WPI) once more became part of the worldwide chain of acts of the IYL 2015 with poetry, a music recital, and the lecture. Poetry and music performances by female laureate poets and artists were celebrated at the XVIII Santo Domingo International Book Fair in the Dominican Republic.

The event featured a dozen new and laureate Dominican female poets and artists, under the motto: "Because we are real women of light, we are an example for others to become." The WPI Movement campaign encourages women to be become part of the light, to teach others to find their true voices, regain self-esteem, and protect themselves and others from any kind of violence and abuse.

During the event, women poets of different generations read poems analogous to women. Jael Uribe (President and founder of WPI and Woman Scream Festival), explained about the IYL 2015 initiative and the Woman Scream 2015: Women of Light mission for this year, and gave an overview of all the events celebrated in 41 countries during the month of March to honor women and end violence.

Among the participants were Camelia Michel, María Farazdel (Palitachi), Reina Lissette Ramírez, Angie Carolina Jiménez, Natasha Battlle, Mel Dinzey Castro, Griselle Lerebours, Gennie Redondo, and Kathenie Redondo. A performance by Raquel Salas was presented, and the music was performed by the excellent composer, guitarist, and singer, Virna García. Poems of the Grito de Mujer (Woman Scream) anthology from other countries such as Mexico, Argentina, USA, Chile, etc. were also read by Jael Uribe. The poetess and performer Abril Troncoso also attended.

The event was covered by the national press, and had the support of the Manuel Rueda Pavilion coordinator, the Dominican cultural activist Eduardo Gautreau de Windt and his assistant, actress Daga Gautreau.

Participants of the Woman Scream International Poetry and Arts Festival 2015 in the Dominican Republic.
CREDIT: The Woman Scream International Poetry and Arts Festival 2015.

Ecuador

Participants at the OptoAndina 2015 School. CREDIT: OptoAndina 2015 School. CREDIT: OptoAndina 2015 School.

Primary National Organizer: Escuela Politecnica Nacional EPN

Other National Partners: Universidad de las Fuerzas Armadas ESPE, Universidad Andina Simón Bolívar (sede Quito), International Commission for Optics Optical Committee of Ecuador and RIAO-OPTILAS

Estimated number of IYL 2015 activities organized: 6 events

Number of people reached by IYL 2015 Activities: Around 5,000 people

General overview of IYL 2015 Activities in Ecuador

The central International Year of Light (IYL 2015) activity in Ecuador was the *OptoAndina 2015* event in Quito 11-13 November 2015. The goal of *OptoAndina 2015* was to expose and familiarize Latin American students at master's, graduate, and postgraduate levels with modern concepts, methods, and technology in the fields of optics, spectroscopy, photonics, and lasers. Practical sessions were carried out, with suitable hands-on experiences. An important part of this event were the poster and oral sessions, where students actively presented their scientific works, and engaged in enlightening discussions. Networking plenary meetings were devoted to discuss future collaborations. Over 40 students from five major universities of Ecuador attended, and about 20 from Peru, Bolivia, Colombia, and Mexico. The instructors were well-known researchers from Latin America and Europe.

Another important event was *The XIV Encuentro de Física* where researchers presented their scientific work both orally and as posters mainly in topics related to optics.

The Municipality of Quito—through the Metropolitan Institute of Heritage (Instituto Metropolitano de Patrimonio)—also celebrated IYL 2015 through three activities: a conference series about cultural heritage; a mapping performance; and hands-on activities for children at the Museo Interactivo de Ciencias. The activities were organized 15-28 June 2015 and attracted thousands of participants.

Ecuador also celebrated the World Metrology Day 2015, with a theme devoted to IYL 2015, on 20 May 2015.

The astronomy outreach programme *GalileoMobile* visited schools and performed astronomical activities with students and teachers in Ecuador 21 February - 3 March 2016 as part of the project *Constellation*, which organized a network of 20 schools in six South American countries and worked with them throughout 2015. The project was supported by the IAU's *Cosmic Light Programme*.

Egypt

Primary National Organizer: National Institute of Laser Enhanced Science (NILES), Cairo University

Other National Partners: Library of Alexandria and Egyptian Academy of Scientific Research and Technology

Sponsors: 1001 Inventions

Estimated number of IYL 2015 activities organized: 11 events

General overview of IYL 2015 Activities in Egypt

The International Year of Light (IYL 2015) activities in Egypt were a great success, reaching out to the inhabitants of the country to disseminate the main goals and themes of IYL 2015. The IYL 2015 activities in Egypt consisted of general events for the public, international scientific conferences, lectures, dedicated workshops about light, school activities, dedicated seminars, exhibitions, and the participation in IYL 2015 global initiatives.

During IYL 2015, there were several international scientific conferences in Egypt that highlighted the most important IYL 2015 themes and topics. One event, the *African conference on Laser and Spectroscopy (ACOLS 2015)* organized in the city of Cairo 8-12 March 2015, covered cutting-edge experimental and theoretical works conducted to deepen our understanding of the basics of laser and spectroscopy applications in different fields. The conference focused on laser biomedical, environmental, and nanotechnological applications as well as atomic and molecular laser spectroscopy fundamentals and applications. Another event, the *6th International Conference on Optical Spectroscopy, Lasers, and their Applications,* also held in Cairo 4-7 April 2015, covered issues on spectroscopy and spectral analysis for creating a stage to exchange the latest research results and share advanced research methods. This conference integrated both basic and technical sciences to bridge the gap toward building a new Egypt on the basis of science and technology.

The commemoration of Ibn Al-Haytham's work was greatly celebrated in Egypt during IYL 2015. Most notably, on November 2015, 1001 Inventions, in partnership with the Library of Alexandria and Cairo University, organized two events in Egypt to celebrate IYL 2015 and Ibn al-Haytham.

On 12 November 2015, the Library of Alexandria hosted an event organized in partnership with 1001 Inventions and the Egyptian Academy of Scientific Research and Technology. Attended by school and university students, the event celebrated IYL 2015 and highlighted the contributions of pioneering scientific thinker Ibn al-Haytham to the understanding of vision, optics, and light. The day's activities included hands-on workshops demonstrating the role of light and its applications, science performances (light show and shadows play), and a small exhibition with one of Ibn al-Haytham's rarest manuscripts.

On 17 November 2015, the Science Heritage Center at Cairo University, in collaboration with 1001 Inventions, organised a seminar to celebrate IYL 2015 and pay tribute to the contributions of Ibn Al-Haytham in the field of optics and light. The seminar, entitled *The World of Ibn Al-Haytham and his Journey from Darkness to Light*, included talks by reputable professors of history, science, and literature. The event also featured an exhibition of relevant books and a bibliography of the works of Ibn Al-Haytham with the support of the Egyptian General Authority for Books and National Documents. The film *1001 Inventions and the Library of Secrets,* about the scientific heritage of Muslim civilisation starring Oscar-winning actor Sir Ben Kingsley, was screened during the event.

Egypt also participated in the worldwide celebrations of World Metrology Day on 20 May 2015.

In partnership with 1001 Inventions, the Library of Alexandria celebrates the International Year of Light. CREDIT: 1001 Inventions.

El Salvador

Primary National Organizer: Grupo de Investigación Rudamas and Laboratorio de Espectroscopia Óptica

Other National Partners: Escuela de Física, Facultad de Ciencias Naturales y Matemática, Universidad de El Salvador, Central American DAAD Alumni Network for Research - El Salvador (CADAN:R – El Salvador)

Sponsors: Grupo de Investigación Rudamas, Escuela de Física, Facultad de Ciencias Naturales y Matemática, Universidad de El Salvador, Programa Jóvenes Talento El Salvador and The Mesoamerican Centre for Theoretical Physics (MCTP), and Secretaria de Relaciones Exteriores from Mexico (SRE).

Estimated number of IYL 2015 activities organized: 10 events

Number of people reached by IYL 2015 Activities: 500 persons

General overview of IYL 2015 Activities in El Salvador

The International Year of Light (IYL 2015) activities in El Salvador started on 24 March 2015 with the opening ceremony celebrated at the School of Physics and the Faculty of Natural Sciences and Mathematics at the University of El Salvador. Many students and faculty as well as high school teachers and people from the industry and governmental institutions attended this event. The ceremony started with the message from the IYL 2015 SC Chair. The importance of the use of light in the scientific and technological development of many countries was discussed. There was also time to show the activities that would take place during the year to celebrate the IYL 2015 and discuss with the audience the applications of light in research and teaching.

The IYL 2015 activities included a series of conferences (once a month), an international workshop, and two Physics Olympiads. Many interesting topics were covered in the conferences, which took place during the last week of the month. Among the topics highlighted were the experimental and theoretical studies of the optical properties of mycorrhizal structures. Fascinating applications of the optical properties of these structures in biophysics, biology, and agriculture were presented. Research on the optical properties of colloidal quantum semiconductor structures for their possible use in solar cells with higher efficiency was also showed. These topics, among others, gained the attention of the audience, especially the possible applications in solving environmental problems in El Salvador.

Another interesting activity was the international workshop entitled *Optical spectroscopy for the detection of narcotics and dangerous substances* held 25-30 March 2015 at the University of El Salvador. Scientists and students from academic and governmental institutions from Mexico and El Salvador attended the workshop. The application of light in the form of optical spectroscopy to detect dangerous substances and narcotics was the main topic of this event. This event was considered quite important considering the traffic of these substances is one of the biggest problems in the region.

The *VIII Salvadoran Physics Olympiad* and the *I Mesoamerican Physics Olympiad* were celebrated at the University of El Salvador with IYL 2015 activities, in February-March 2015 and December 2015, respectively. The Young Talent Program and the School of Physics of the University of El Salvador organized both events.

Finally, the celebration of the IYL 2015 in El Salvador was a great success with various institutions showing, among other interesting things, how light-based technologies can solve important problems in Salvadoran society.

Estonia

Light Festival at Tartu Observatory. CREDIT: Ahto Avi.

Primary National Organizer: Estonian Physical Society

Other National Partners: Tartu Observatory, Science Centre AHHAA, Old Observatory at University of Tartu

Sponsors: Eesti Kultuurkapital, Nõo Parish, Stellaarium, Enics Estonia, Elva Linn, Tartumaa Omavalitsuste Liit

Estimated number of IYL 2015 activities organized: 20 events

Number of people reached by IYL 2015 Activities: 5,000 people

General overview of IYL 2015 Activities in Estonia

In Estonia, the International Year of Light (IYL 2015) was celebrated by a series of science shows and public astronomical observations in schools and public places. The main event of IYL 2015 in Estonia was the Light Festival at Tartu Observatory.

Special science shows were carried out by the team of Science Bus. The shows were about properties of light and light-based technologies in the modern world. The public astronomical observations were organized by the Science Centre AHHAA and the Old Observatory at University of Tartu.

Other events included seminars in different Estonian cities to raise awareness about energy-efficient street lighting and to share experiences related to this undertaking.

The event *Light Festival*[1] was held on 30 October 2015. It was the final IYL 2015 event in the country and consisted of two parts: outreach activities inside the building, explaining the research and use of light and light-based technology (e.g., either looking at distant stars or vegetation on Earth) or the use of light in medical applications (e.g., X- ray imaging, etc, or with police forces for crime scene investigations) and a light performance as a custom production in the open air all around the observatory. The festival was free of charge and more than 1,700 people from all over Estonia took part. Festival producers were Heli Lätt (Tartu Observatory) and Jaan Ulst. The performance was directed by Jaan Ulst.

1. http://valgusefestival.to.ee

Finland

Primary National Organizer: No primary organizer. Activities organized locally and coordinated by volunteers

Other National Partners: University of Eastern Finland, University of Helsinki, Tampere University of Technology, Photonics Finland, Suomen valoteknillinen seura, City of Jyväskylä, Valoparta

Sponsors: University of Eastern Finland, Tampere University of Technology, City of Light - Jyväskylä, Valoparta

Estimated number of IYL 2015 activities organized: 20 events

Number of people reached by IYL 2015 Activities: About 400,000 people

General overview of IYL 2015 Activities in Finland

There were several big light art events in Finland during the International Year of Light (IYL 2015): *Aurora Carealis, Valoa Oulu, Tampereen valoviikot,* and *Lux Helsinki.* Hundreds of thousands of people enjoyed light art in these public events.

Also, Finnish light artist Kari Kola created a marvelous installation for the IYL 2015 Opening Ceremony in Paris. This visibility enabled him to get requests for other large scale installations in Finland and around the world.

In Joensuu, there was a science festival, *SciFest,* where about 12,000 school children, teachers, and other visitors got familiar with science and technology. In 2015, the theme was naturally *The Power of Light.* Light was then visible in various workshops where children were able to get familiar with light-enabled technologies.

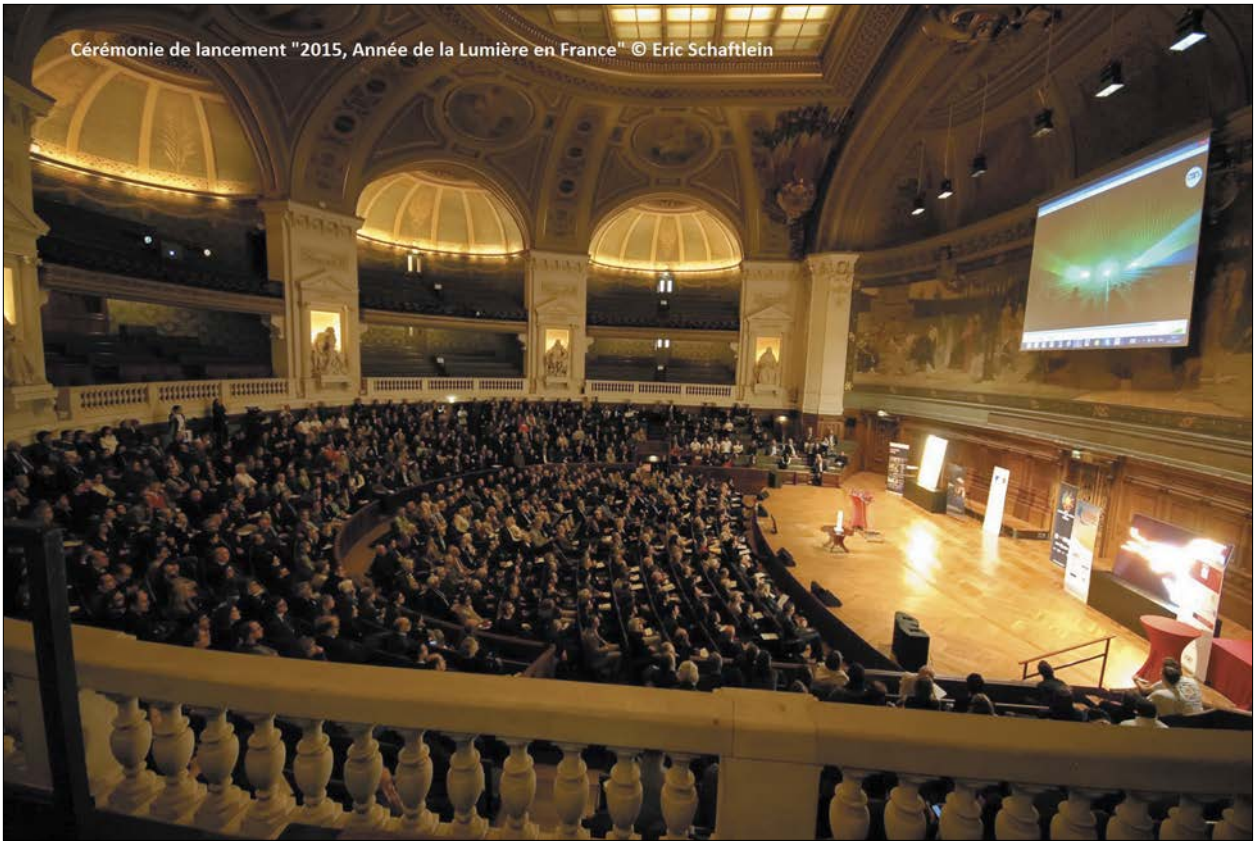
In several locations there were other smaller events where IYL 2015 was also involved to some extent, including, e.g., lectures for a general audience. Also, IYL 2015 was recognized in several activities in schools (such as competitions) and in meetings for science and technology teachers. The main theme of the discussions in schools was related to lighting, especially LEDs. The awareness of climate change seemed to be strong, and people discussed ways of reducing energy consumption.

Also, some scientific events on photonics were organized in 2015, including the *Annual Meeting of Photonics Finland* and the *Forest & Photonics workshop.* In these meetings, IYL 2015 was present, but these events did not get that much public visibility.

There were no IYL 2015 activities that were initiated at the national level. Rather, there were a good number of locally organized events where the IYL 2015 theme was embedded in a successful way.

Panorama SciFest 2015. CREDIT: Rami Saarikorpi.

France



IYL 2015 Opening Ceremony in France. CREDIT: Eric Schaftlein.

Primary National Organizer: AFOP, CNOP, EDP Sciences, Opticsvalley, and SFO

Other National Partners: MCC, DGE and MENESR

Sponsors: Essilor, CNOP, Sagem, Nokia, CNRS-SCTD, GIF Lumière, Hamamatsu, Horiba Scientific, LNE and Thalès

Estimated number of IYL 2015 activities organized: Over 1,000 events

Number of people reached by IYL 2015 Activities: Around 100,000 people

General overview of IYL 2015 Activities in France

On 8 January 2015, a prestigious opening ceremony at University of Sorbonne's big amphitheater in Paris marked the start of the International Year of Light (IYL 2015) in France. *2015, Année de la Lumière en France* was a huge success with more than 1,000 events in France celebrating light in 2015 and more than 100,000 people attending them—we lived a unique year full of lights. IYL 2015 attracted people from various sectors, including art, culture, education, youth, astronomy, lighting, vision, research, industry, health, and many more. Throughout IYL 2015, a new community was created, mixing art and science, young and old, and brought together old acquaintances to build new projects and ignite new ideas.

All the regions in France were involved in making the IYL 2015 a great success. Events around the theme of light were organized from small villages to big cities. Whether it was shows with performances such as 3D dance (Dance – 4ème correspondence: *Expression de la Lumière*), presentations to young students explaining the importance of the laser, an exhibition featuring the past 25 years of breakthroughs related to light, or a contest inspired by the theme *Light and colours* for young photographers, the events were multiplied and expanded throughout the country.

The National Committee is proud of the educational program performed throughout 2015 with French light events, in particular for young pupils and students, but also for the general public, no matter their age.

Scientific events also had an important role during 2015.

For example, for World Sight Day, at the Cité des Sciences, Essilor International organized a series of presentations from renowned speakers discussing subjects related to vision, lenses, and natural light to better see the world. There was also a congress, *OPTIQUE Bretagne 2015,* organized by the French Optical Society, whose target is to reunite researchers and industrials in optics and photonics.

IYL 2015 Closing Ceremony in France. CREDIT: F. Jolly.

We overcame the opposition between sciences and arts in the event, *Fresnel Light,* between art and sciences, at the Louvre Museum and at the University Diderot in Paris where astrophysicists, biologists, writers, and artists came together and showed the multidisciplinary of light skills!

France was also home to spectacular moments during IYL 2015. There was an eclipse on March 20th, that mobilised 28 colleges and 38 schools in Lyon alone. The Pont du Gard celebrated its 30th anniversary and was entirely lit up to offer a message of universalism and humanism; also to highlight the use of light as a huge aesthetics element and as an instrument of memory and a symbol of unity. We also saw many other facades of important monuments decorated by light, for example Kolektif Alambik who projected moving images on cathedrals and forts, or Spectaculaires in Rennes who installed a light show and a scenography called *Lumières* at the Place of Parliament every night from 8 July to 23 August.

In 2015, France was also home to *COP21,* since light plays a huge role in our everyday life and in the use of energy. To commemorate this idea, a project called Human Energy was put in place to generate energy through humans to light up the Eiffel Tower, a symbolic monument in France. This project's main objective was to fight against climate change and to put the dynamism of art at the service of the environmental revolution, with light.

The IYL 2015 was officially closed at the French closing ceremony that took place in the prestigious salon of Paris' City Hall on 23 February 2016. However, the IYL 2015 initiative was such a success over the country that the National Committee agreed to continue the celebrations until 30 June 2016 in order to take advantage of the whole school term.

Throughout 2015, light was also a tool for dialogue; a dialogue to bring together health, social issues, and technologies; to bridge the gap between science and culture, and to enlighten and to spark the interest of youngsters to the importance of light in all its shapes. IYL 2015 was a humanist year and a cultural year of humanity. The 21st century will be to photonics as the 20th century was to electronics. We metamorphosed the light, we ordered coherent light for human well-being and the great light adventure to come.

Germany

Primary National Organizer: Deutsche Physikalische Gesellschaft e. V. (German Physical Society)

Other National Partners: German IYL Steering Committee and numerous local organizers

Sponsors: Berlin Partner für Wirtschaft und Technologie GmbH, Berliner Glas KGaA, Carl Zeiss AG, Deutsche Gesellschaft für Angewandte Optik (DGaO), Edmund Optics GmbH, Europäische Union – Europäischer Fond für Regionale Entwicklung (EFRE), Fisba AG, Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V., Hamamatsu Photonics, Hermann von Helmholtz- Gemeinschaft Deutscher Forschungszentren e.V., HypoVereinsbank, Laser Components GmbH, Max-Planck-Gesellschaft zur Förderung der Wissenschaften e. V., MenloSystems GmbH, Ministerium für Wirtschaft und Energie des Landes Brandenburg, Optec-Berlin-Brandenburg (OptecBB), OptecNet Deutschland e. V., Osram Licht AG, Senatsverwaltung für Wirtschaft, Technologie und Forschung des Landes Berlin, Spectaris - Deutscher Industrieverband für optische, medizinische und mechatronische Technologien e.V, Trumpf GmbH+o.KG, Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz e.V. Zentralverband Elektrotechnik- und Elektronikindustrie e.V. (ZVEI) and ZukunftsAgentur Brandenburg GmbH

Estimated number of IYL 2015 activities organized: Over 750 events

Number of people reached by IYL 2015 Activities: 26 million accounting for people reached by the media

General overview of IYL 2015 Activities in Germany

The International Year of Light 2015 (IYL 2015) was celebrated in Germany with a wide variety of activities. In the German event calendar for the IYL 2015 there are approximately 700 entries for events in over 170 cities across Germany, with 50 extra events on the international event programme. Most of the events were addressed to the general public. The activities included lectures, workshops, discussions, theatre performances and cinema festivals, guided tours, exhibitions, scientific meetings and conferences, and online activities.

Many of these events took place in Berlin. In January 2015, for instance, outstanding light artists received the *International Light Art Award (ILAA)*. In October 2015, during two light festivals, national and international artists creatively illuminated famous buildings and squares in the historical centre of Berlin, fascinating more than two million citizens and visitors. An exposition near the Deutsches Technik Museum Berlin presented modern technologies in urban street lighting. Later on, numerous lectures and conferences focussed specifically on the science of light and its applications. Finally, Berlin was also chosen as site of the official German closing event for the International Year of Light 2015.

Additionally, many more activities took place throughout Germany: scientific institutions opened their doors to give the public insights into light-related research and development of applications. Groups of hikers used the absence of artificial light in sparsely populated areas of Germany to observe the stars at night. Artists were inspired by the many aspects of light. Light as a metaphor and symbol in philosophy was discussed, as well as the biological effects of light on humans and animals. To illustrate how the ideas of the global initiative of IYL 2015 were implemented in Germany, two cities, Dresden and Jena, should be mentioned.

Highlights of Physics in Jena. CREDIT: Highlights der Physik/Offer und Offer 2015.

In Dresden, about a dozen research institutes and technology companies, educational institutions, and art projects teamed up to form the initiative *Dresdner Lichtjahr 2015.* Highlights were a very well visited exhibition by Technische Sammlungen Dresden and the staging of *Light!* by theater junge generation (tjg). For children and teenagers, for example, experimenting days in a student research laboratory and LED light workshops were set up. A solar mobile race attracted many

Brandenburger Gate during the Festival of Lights in Berlin. CREDIT: Festival of Lights/Nelofee 2015.

Illuminated Ernemann-Tower in Dresden. CREDIT: Stephan Floss/Technische Sammlungen Dresden 2015.

spectators. Scientific public talks and conferences were organised for different target audiences. Finally, film screenings and lectures focussed on the subject of light in art.

Jena is an important location for the high-tech industry of optics and photonics and a European centre in the field of light-based technologies. Therefore, the *City of Light* sought to promote public and political understanding of the importance of light for our modern society with numerous activities, projects, and events demonstrating how different light can be. One of the city's main objectives was to interest and inspire the younger generation in study programmes and apprenticeships in the scientific, technical, and optical fields. The cultural aspect of the IYL 2015 was met by offering a remarkable event programme with activities approaching the subject of light from a different, philosophical or historical point of view. A lot of attention was garnered at the science festival *Highlights of Physics* with approximately 53,000 visitors. As in Dresden, stakeholders like international and local businesses, research institutes, and universities worked closely together with the City of Jena, Jena Business Development, and JenaKultur.

Ghana

Primary National Organizer: Ghana National Commission for UNESCO and Ghana Academy of Arts & Sciences

Other National Partners: Ministry of Environment, Science, Technology and Innovation, Ghana Physical Society, Ghana Museums and Monuments Board, Laser & Fibre Optics Centre and University of Cape Coast.

Sponsors: Phillips Ghana, Dutch & Co, Ghana Oil Company Ltd., UT Bank, Lakeside Estate, Star Property Management, Teledata ICT; Panacea Consulting, Bui Power Authority, Tullow Oil, Volta River Authority,GRIDCo, Energy Commission of Ghana, Coca Cola Bottling Company, Ghana National Petroleum Corporation, Cadbury Ghana, Sunon Asogli Power Ltd., Japan Motors, Special Ice Group of Companies

Estimated number of IYL 2015 activities organized: 6 events

Number of people reached by IYL 2015 Activities: 3,040 people

General overview of IYL 2015 Activities in Ghana

In the wake of the declaration of 2015 as the International Year of Light (IYL 2015) by the United Nations General Assembly, Ghana took the centre stage, on the African Continent, to commemorate the Year.

In celebrating the IYL 2015, the government of Ghana organized a series of activities which began with the launch of the International Year of Light in March 2015. This was followed by the Africa Regional Conference and Exhibition on *Harnessing Light and Light-based Technologies for Africa's Development*; lectures on the topics *Architecture for Autism: A Technical Response With Mind And Heart To Human Need, Introduction to Passive Seismology and Earthquake Hazard*; and observation of International Metrology Day in respect to light and light-based technologies.

On 28 April 2015, a lecture was organized on the theme *Architecture for Autism: A Technical Response with Mind and Heart to Human Need,* subtitled *Light it blue*. This was organized by the Ghana Academy of Arts and Sciences.

On 20 May, Ghana observed International Metrology Day under the theme "Measurement and Light," organized by the Ghana Standards Authority. The observation aligned with the IYL 2015. The observation of the day was used to educate participants on how metrology, science, and the application of measurement play a central role in enabling the application and advancement of light-based technologies, whether for more efficient energy production, a better understanding of climate change, or optimal lighting of cities.

From 14-16 September 2015, Ghana commemorated the IYL 2015 by organizing the Africa Regional Conference and Exhibition on *Harnessing Light and Light-based Technologies for Africa's Development.* The Regional Conference and Exhibition was jointly organized by

Africa Regional Conference and Exhibition. CREDIT: Riche-Mike Wellington.

the Ghana National Commission for UNESCO, the Ghana Academy of Arts & Sciences, and the Ministry of Environment, Science, Technology & Innovation. It sought to promote interactions and dialogue among academics, professionals, policy-makers, industrialists, entrepreneurs, young scientists, innovators, and other stakeholders to highlight the relevance of light and its related technologies in the sciences, the arts, culture, and the humanities.

The three-day exhibition, which ran parallel with the conference, had participants from industries in light-based technologies, students in primary, secondary, and tertiary institutions as well as research institutions. A statement emerged from the conference urging the government of Ghana to take leadership in bringing the issues from the conference to a larger forum of stakeholders and the African Union for further deliberation and implementation across the continent of Africa. The government of Ghana was further urged to build effective institutions to bring efficiency in the energy sector as a means of diversifying the energy mix; undertaking effective research in solar and other renewable energy technologies to reduce cost, increase efficiency, and build capacity.

As means of leaving a legacy with the year's celebration, Ghana will champion the achievement of the following key directives:

- The upgrading of the Laser and Fibre Optics Centre (LAFOC) of the University of Cape Coast into a fully-fledged Institute for capacity-building and research in lasers and fibre optic communications;
- The establishment of a Solar Technology Research Centre to enhance the study and promotion of solar science and the use of alternative energy;
- The establishment of a sub-regional Laser Medical Application Laboratory (LMAL) for training medical practitioners and other professionals;
- The establishment of a Museum of Light and Light-Based Technologies as part of a solution for emerging needs in the post-2015 UN Development Agenda.

From 5-9 October 2015, another lecture was delivered on the *Introduction to Passive Seismology and Earthquake Hazard.* This lecture was organized by the Department of Physics of the Kwame Nkrumah University of Science and Technology, Kumasi.

Quizzes were also organized for schools at the district as well as regional levels by the Ghana Science Education Unit. This was a platform used to educate young school children about light and light-based technologies as well as raise their interests in pursuing science-related careers.

Planetarium events/shows on light and its impact on life were also organized for children and adults by the Accra Science Planetarium.

Greece

Primary National Organizer: PCRL

Other National Partners: Eugenides Foundation/ Planetarium, UNESCO, AG. Nikolaos community in Crete and the Hellenic Illumination Committee

Sponsors: Eugenides Foundation/Planetarium and PCRL

Estimated number of IYL 2015 activities organized: 100 events

Number of people reached by IYL 2015 Activities: 50,000 people

General overview of IYL 2015 Activities in Greece

The International Year of Light (IYL 2015) activities in Greece were of various types, i.e. conferences, exhibitions, festivals, lectures, meetings, open days, school activities, workshops, etc. and were very successful overall. They reached almost 50,000 people around the country and many people had the chance to learn about light and photonic technologies. On the national website[1] there is useful information about light technologies and the national events around the country. Also, there are photos and information about the various events that took place.

The *Athens Science Festival* celebrated 17-22 March 2015 was one the major outreach events for the general public in the country aimed at bringing contemporary scientific activities closer to the public. The main theme of the Festival focused on light and its application to all aspects of scientific activities, celebrating IYL 2015: from LHC, to biology, to telecommunications, to outer space. Within six days, approximately 33,000 people visited the Festival, including 8,000 students. The programme consisted of workshops, educational activities and games, scientific presentations, discussions, performances, film screenings, exhibitions and interesting talks by well-known Greek and international scientists.

One of the highlight of the IYL 2015 was the *2 Days Full of Light* organized by PCRL/NTUA and Eugenides Foundation/ Planetarium 9-10 October 2015, in the Eugenieds Foundation/ Planetarium premises. Actions for all age groups were scheduled and these attracted families with children of all ages (from 3 years old and up). There were interactive games for the children and presentations for adults and a planetarium film especially made for the IYL 2015. Overall, the event was a great success.

Another highlight was the *6th Children's Festival* at Ag. Nikolaos on the island of Crete, 12-14 June 2015. The weekend after children finished school on the beautiful beach of Ag. Nikolaos, many events were organized that attracted around 2,000 people.

The Hellenic Illumination Committee staged the *2nd International Lighting Design Workshop* on the island of Kea 12-16 October 2015. It was aimed at the development and promotion of night friendly lighting techniques for areas of extraordinary night sky quality as happens at Kea.

***Rethink the Night* workshop. CREDIT: Hellenic Illumination Committee.**

1. www.light2015.gr

Honduras

Primary National Organizer: National Autonomous University of Honduras

Other National Partners: Space Science Faculty

Sponsors: Department of Astronomy and Astrophysics and Archaeoastronomy and Cultural Department of Astronomy

Estimated number of IYL 2015 activities organized: 58 events

Number of people reached by IYL 2015 Activities: 1,630 persons

General overview of IYL 2015 Activities in Honduras

Attending the invitation made by United Nations, urging the nations to promote and increase people's awareness about the importance of the sciences of light, the Faculty of Space Science at the National Autonomous University of Honduras decided to organize a local team of astronomers, astrophysicists, and archeoastronomers to develop meetings, talks, picture exhibitions, astronomical observations, and others activities. The purpose was to explain to the citizens of the country the role and importance of light in astronomy and astrophysics in knowing the science of stars, planets, far galaxies, and the very origin of the universe.

The Space Sciences Faculty of the National Autonomous University of Honduras inaugurated the International Year of Light 2015 (IYL 2015) in Honduras on 9 April 2015. During the event, the IYL 2015 activities that would be carried out throughout the IYL 2015 were presented. The Faculty's Dean, María Cristina Pineda de Carías, presented the most important milestones in the Science of Light during the conference *International Year of Light.* This conference served as the starting point for a cycle of conferences in the context of IYL 2015, which seeks to highlight the importance of light in different disciplines.

Among the activities that people enjoyed the most was *Astronomical Nights in the International Year of Light.* Theses academic activities were held on Friday evenings and consisted of a 45-minute talk on a theme in astronomy, followed by observations through telescopes.

The exhibition of astronomical pictures in different wavelengths also captured people's attention. Every presentation consisted of three panels with pictures of sky objects that were also explained by astronomers and undergraduate astronomy students. A total of 537 people were reached with five presentations.

IYL 2015 Opening Ceremony in Honduras. CREDIT: Ricardo Pastrana.

Hungary

Primary National Organizer: Hungarian Academy of Sciences (HAS)

Other National Partners: Hungarian National UNESCO Committee, the Hungarian Academy of Arts, the Roland Eötvös Physical Society, the Hungarian Chemical Society and the Ministry of Human Resources

Sponsors: Tungsram Schreider Limited Ltd.

Estimated number of IYL 2015 activities organized: 70 events

Number of people reached by IYL 2015 Activities: Over 1,000,000 people

Watching a solar eclipse in front of the headquarters of MTA in Széchenyi tér, Budapest. CREDIT: Roland Eötvös Physical Society.

General overview of IYL 2015 Activities in Hungary

The main goal of the International Year of Light (IYL 2015) activities in Hungary was to involve the younger generation via light-related events into scientific, educational, technological and cultural activities. The partners in the organisational work have been the universities and research institutions and 26 selected high schools, coordinating the activities of the secondary education units in their region. The estimated number of schools reached with activities is about 1000. The number of active participants was above 10,000 and the media impact of the events was definitely far above 1 million.

The IYL 2015 opening ceremony for Hungary took place in February 2015 where academician Norbert Kroó, the president of the program committee for the IYL 2015 spoke about the significance of the five main pillars of the distinguished year, namely—science, education, industry, arts, and international relations.

The most important event organized by the Roland Eötvös Physical Society was the *Day of Physics* that took place in 45 localities (52 primary and secondary schools) on 18 April 2015, with the slogan "physics for everyone." The subjects of various competitions for schoolchildren, laboratory and open air experimental demonstrations were all related to light. The total number of visitors exceeded 5000 and the initiative received nationwide news coverage.

For the occasion of the solar eclipse on 20 March 2015, a number of schools staged academic programs in natural sciences, and those visiting the seat of the Hungarian Academy of Sciences were allowed to use the special, sun-observing telescopes of the Hungarian Association of Astronomers to observe images of the rare celestial phenomenon at a higher resolution.

On 21 May 2015, a 1,400km long light relay went around Hungary. It started from the *Extreme Light Infrastructure* (under construction) in Szeged and arrived back after two hours of travel. The trajectory consisted of 16 legs and a great number of students and volunteers took part in the event and transferred the light signal by using various devices, such as lasers, firing signaling rockets, etc. to its next station.

A bus with optical demonstration experiments travelled around the country, visiting around 30 high schools or museums. Outstanding scientists in the field also participated in these events by giving lectured.

The IYL 2015 was also part of the World Science Forum 2015 organized in Budapest 4-7 November 2015. In a thematic session, keynote speakers provided an overview of the aims the IYL 2015 and presented several topics to raise awareness of how important the science and technology of light is for humankind, and the many ways in which photonics provides solutions to problems of global importance.

In publications, the journal of the Hungarian Academy of Science, *Magyar Tudomány (Hungarian Science),* the popular journals *Természet Világa (The World of Nature)* and *Élet és Tudomány (Life and Science)* published special issues. The *Journal of the Physical Society* and several others of technical, medical and cultural character, also published light-related articles.

Iceland

Local poets Anton Helgi Jónsson and Elías Knörr and Canadian poet Mary Pinkoski. CREDIT: Sævar Helgi Bragason.

Primary National Organizer: University of Iceland

Estimated number of IYL 2015 activities organized: 3 events

General overview of IYL 2015 Activities in Iceland

The International Year of Light 2015 (IYL 2015) was celebrated in Iceland with three main activities. The Year started off with an Opening Ceremony in Reykjavík on 27 January 2015 organized by the University of Iceland.

On 5 February 2015, the event *Light Seeps In* aimed to build literary bridges between Edmonton (Canada) and Reykjavik and to introduce poetry to the public at the Reykjavik Winter Lights Festival. Edmonton Poet Laureate, Mary Pinkoski, visited Reykjavik and worked with two local poets, Anton Helgi Jónsson and Elías Knörr, for two days. The experience resulted in a public poetry night where they performed poems using the theme of light in human context.

The aim of the scientific and artistic, multidisciplinary international conference *The Dynamics of Darkness in the North* held in Reykjavík on 26-28 February 2015 was to bring together different perspectives and to create conversations between different groups of audiences, ranging from students and academics to artists and the general public. Among the themes discussed were quality of darkness, the northern lights and tourism, darkness and light in architecture and playing with shadows. Keynote speakers included Dr. Tim Edensor, Reader at the School of Science and the Environment, Manchester Metropolitan University, and Haraldur Jónsson, visual artist who is based in Reykjavík.

India

Primary National Organizer: In India there was no Primary National Organizer. The IYL 2015 events were independently organised by different organisations, academic and research institutions, government bodies, and NGOs.

Sponsors: The IYL 2015 events were generally sponsored by Government Agencies (like University Grants Commission, Department of Science & Technology, Indian National Science Academy, All India Council for Technical Education, etc.), Scientific Societies (Optical Society of India, Indian Laser Association, etc.), NGOs, etc.

Estimated number of IYL 2015 activities organized: 246 events

Number of people reached by IYL 2015 Activities: Millions of people

General overview of IYL 2015 Activities in India

In India, the International Year of Light 2015 (IYL 2015) events may be categorized into two different classes: (1) those registered on the Light 2015 website, whose total number is 246, and (2) those events that were not registered on the website, but are very significant in view of their broad coverage on the national TV. In addition, since most events were organized by volunteer bottom-top initiatives around the country that are very difficult to track, especially activities performed in schools, we might give a conservative estimation of 1,000 events around the country.

These events registered may be categorized in the following major groups:

[A] Public Outreach

[B] Academic and Research,

[C] Lighting the Young Minds,

[D] Anniversary Celebrations, and

[E] Audio-Visual Films on Light and related Themes

[A] PUBLIC OUTREACH:

In this group there were 72 events covering

(i) General Awareness – 31

(ii) Public lectures, Seminars, Symposia, and Workshops – 11

(iii) Competitions and Contests – 3

(iv) National/Regional level Fairs, Exhibitions, and Science Festivals – 19

(v) International Festivals/Exhibitions – 8

Most of these events were organized by local/regional/district level scientific committees. Some of the events

The Story of Light Festival. CREDIT: The Story of Light Foundation.

were also at the national or international level. For instance, the SPIE international exhibition *Light: Beyond the Bulb,* was organized at seven different places in the country. Another international event was the *Story of Light Festival* organized in Goa in which 70 artists and scientists from 14 countries were involved for 5 days, and was visited by 15,000 persons. The importance of light in art and culture was also highlighted in events like the national-level Photography Contest with the participation of 1000+ schools, which included three verticals, viz., schools, open schools, and special schools.

[B] ACADEMIC AND RESEARCH:

Institutions of higher learning (universities, colleges, and institutes) and scientific societies organized 75 academic and research related events, covering the following types of programmes:

(i) International Conferences - 13
(ii) National/Local/Institutional Workshops/ Conferences/ Symposia/ Seminars/ Discussion Meetings – 46
(iii) Schools/Short Courses/Teachers' Training - 6
(iv) Celebrations/Fests/Competitions – 10

The research workshops/conferences/symposia/ seminars generally covered the following themes:

- Optics and Photonics; Light Technologies
- Applications of Lasers in Medicine
- Vision Science and Optometry
- Lasers in Photonics Applications
- Science and Technology of Free Electron Lasers
- Solid-State Lighting
- Nano bio-photonics
- Light-Matter Interaction and Applications
- Astronomy and Astrophysics; Solar Astrophysics
- Optoelectronics and Photonics Materials

[C] LIGHTING THE YOUNG MINDS:

The 26 events under this group were organized by school children which comprised the following:

(i) Quiz and Lecture Competitions – 9
(ii) Science Seminars and Workshops – 10
(iii) Optics Exhibits and Science Exhibitions – 7

Though participation of schools in IYL 2015 events was low, many of them organized optics model making competitions for their junior and senior classes, which generated a lot of interest among the young minds.

[D] ANNIVERSARY CELEBRATIONS:

To commemorate the pioneering work of Ibn Al-Haytham in optics 1000 years ago, eight events were organized by some universities/organizations/academies. Apart from this, in some of the seminars, a special session was devoted on the contributions of the Arab scientists to optics.

[E] AUDIO-VISUAL FILMS ON LIGHT AND RELATED THEMES:

There are programmes which do not figure in the calendar of events of Light 2015 website, but are very important to mention here. One such prominent example is that of Vigyan Prasar - a national institute for science and technology communication, established under the Department of Science and Technology, Government of India, produced a 13-episode film on light and related themes, comprising:

- Why International Year of Light
- Properties of Light
- Laser and Its Applications
- Photonics and Optical Fibers
- Light and Health
- Light and Culture
- LED Technology
- Quantum Era
- Relativity
- The Magical Year: Documentary on Albert Einstein
- Sir C.V. Raman: Life and Work. Why the Sky is Blue
- Spectroscopy and What the Universe is made of
- Measuring The Cosmos

The films have been telecast on Doordarshan—the national TV channel—as well as on the Rajya Sabha channel, which are accessible to millions of people in the country, with the aim to promote and propagate scientific and rational outlook in the society, nurturing interest in science, encouraging creativity, and developing the capacity for informed decision making.

Children at the Story of Light Festival. CREDIT: The Story of Light Foundation.

The Story of Light Festival

The Story of Light festival was India's first arts-meets-science festival conceived by The Story of Foundation for IYL 2015. It took place in Goa, India, from 14 to 18 January 2015. A public call for proposals was carefully curated to 62 events across various formats illustrating the depth and breadth of light and its connections to science, technology, nature, culture, spirituality, history, and cosmology. The festival was preceded by a month-long residency during which 65 participants—artists, designers, researchers, educators, and philosophers—came together to build their installations, performances, and workshops.

Around 15,000 visitors including students, tourists, and local residents attended the five-day festival. Public installations, performances, and screenings were curated for a more general audience including local residents and tourists, while workshops and talks were directed at specific communities and school and university students. Attendance was free and the festival was successful in introducing a new audience to contemporary science and technology in a state with less scientific impetus. It also provided an opportunity for artists and designers to present their works to a wide audience outside a gallery environment.

Indonesia

Primary National Organizer: Institut Teknologi Bandung

Other National Partners: Goethe Institute

Sponsors: Pudak Scientific

Estimated number of IYL 2015 activities organized: 12 events

Number of people reached by IYL 2015 Activities: 1,000 people

General overview of IYL 2015 Activities in Indonesia

The celebration of the International Year of Light 2015 (IYL 2015) in Indonesia started in 2014 and ended in November 2015. The commemoration of Day of Photonics on 21 October and World Science Day on 10 November were part of the great success of IYL 2015 in Indonesia.

Lectures, workshops, seminars, conference, observations, demonstrations, competitions on light, optics, photonics, both in scientific and popular ways, were organized by universities, centers, companies, schools in various places in the country, such as the Center for Young Scientists (Bandung), Pudak Scientific (Bandung), Universitas Ahmad Dahlan (Yogyakarta), IEEE (Bali), Cikal Amri School (Jakarta), Indonesia Science Institute (Serpong), Institut Teknologi Bandung (Bandung), Goethe Institute (Jakarta), Forum of Scientists Teenagers (Jakarta).

On the main campus of Institut Teknologi Bandung, activities on optics and light were held by several departments. An open house at the Physics Engineering Department gave students the chance to learn about science and technologies based on light and optics in fun ways. The Indonesian Optical Society (InOS) and the Physics of Magnetism and Photonics Research Group of ITB worked together in organizing the *10th International Symposium on Modern Optics and its Applications – ISMOA 2015.* The symposium was highlighted by 14 invited speakers and 52 contributed talks and poster presentations.

Another scientific meeting held in Serpong was the *1st Indonesian Scientific Meeting on Optics and Photonics Applications* attended by 44 people from the Indonesian Science Institute and Indonesian Optical Society.

Over 200 students from high school science groups in the area of South Jakarta attended science activities on the commemoration of Science Day for Peace. Activities included a talk show on Einstein's Theory of General Relativity, nanotechnology activities, a poster presentation of students' science projects, workshops on robotics, and an astronomical festival. Activities were supported by UNESCO and the National Astronomical Observatory of Japan.

The *Science Film Festival* was held by the Goethe-Institut as a celebration of science communication in over 20 places within the country. The selection demonstrated that science can be communicated in an educational, as well as entertaining manner through audio-visual media.

Opening Ceremony of the Science Film Festival in Indonesia. CREDIT: Goethe-Institut Indonesia / Ramos Pane.

Iran (Islamic Republic of)

Primary National Organizer: RIAPA - University of Tabriz

Other National Partners: IASBS University (Zanjan), Yazd University (Yazd), Urmia University (Urmia), Mohaghegh Ardabili University (Ardabil), Iranian National Laser Center (Tehran), Shahed University (Tehran), Shahid Beheshti University (Tehran), Payam Noor university (Tehran), Shahid Rajaee Teacher Training University (Tehran), Sharif University (Tehran), Azad University (Tehran), Tarbiat Modares University (Tehran), Institute of Tehran University, University of Science and Application, Al-Zahra University (Tehran), AUT University (Tehran), Laser and Optics Research Center (Tehran), Khajeh Nasir University (Tehran), Malek Ashtar University Tehran), Farhangian University (Tehran), Isfahan University (Isfahan), Ferdowsi University (Mashhad), Shahrekord University (Chahar Mahal va Bakhtiari), Shahid Chamran University (Ahvaz), Sistan and Baluchestan University (Sistan and Baluchestan), Shiraz University (Shiraz), Shahid Bahonar University (Kerman), Glestan University (Golestan), Gilan University (Gilan), Lorestan University (Lorestan), Arak University (Markazi), Kordestan University (Kordestan), Mazandaran University (Mazandaran) and Bu-Ali University (Hamedan)

Sponsors: Ministry of Science, Research and Technology and Optics and Photonics Society of Iran.

Estimated number of IYL 2015 activities organized: 385 events

Number of people reached by IYL 2015 Activities: 10,000 people

General overview of IYL 2015 Activities in Iran

A conference focusing on the physics of light and its related technologies in January of 2015 was held in Urmia University, Urmia, Iran. CREDIT: Habib Tajalli.

Student conference in December 2015 was held in Khawje area, Bu-Ali Sina Research house, Tabriz, Iran. CREDIT: Habib Tajalli.

All International Year of Light 2015 (IYL 2015) activities in Iran were managed by 34 universities. Each university established the IYL 2015 group of university staff and people in municipalities. They began their program at the start of 2015 by holding opening ceremonies simultaneously. Some of them created a website about the year of light and linked it to the IYL 2015 National website. The activities were not limited to universities, and, in many cities, public activities were reported in schools. The activities are summarized below:

- Delivered around 207 lectures about light and its applications at schools and universities in different provinces.
- Held about 125 seminars, meetings, and conferences in schools, universities, and cities for students and the public.
- Held about 53 scientific school competitions related to IYL 2015.
- Held an international conference about Ibn Al-Haytham at Shahid Bahonar University of Kerman as well as other smaller activities commemorating Ibn Al-Haytham.
- Information about the experts in the field of optics and light in Iran and abroad and also biographies of scientists in these fields were gathered to be published in a book entitled *Iranian Experts in Optics*.
- Published six books about Ibn Al-Haytham.
- Iran high-tech laboratory networks cooperated in order to share the possibilities and facilities of different optics and photonics laboratories all around Iran and made access to these facilities easy.
- Created a contract with the National Museum of Iran in order to build the elementary optical tools of Ibn Al-Haytham and establish a permanent light gallery in the museum.

Iraq

Primary National Organizer: Iraq IYL 2015 National Committee

Other National Partners: University of Technology-Baghdad

Sponsors: University of Technology Baghdad

Estimated number of IYL 2015 activities organized: 2 events

Number of people reached by IYL 2015 Activities: 1,200 people

General overview of IYL 2015 Activities in Iraq

Two major events commemorated the Year of Light 2015 (IYL 2015) in Iraq reaching out to around 1,200 people in the country.

International Conference on Laser Applications & Advanced Materials Baghdad

Through 16-18 December 2014, the *International Conference on Laser Applications and Advanced Materials Baghdad* gathered around 1,100 researchers from inside and outside Iraq who presented the latest advancements in laser applications. The conference included the opening of an exhibition on scientific devices. The goals aimed on the conference included:

- Show thoughtful research in the field of laser and optoelectronics engineering, applications, and advanced materials.
- Exchange views and scientific developments of scientific engineering experiments to specialists inside and outside Iraq.
- Create research experiences for graduate students and increase their knowledge of scientific disciplines in the corresponding terms of reference and approach.
- Show some of the devices and systems, laser and optoelectronics and advanced materials and the latest scientific innovations offered by some international and local companies on the sidelines of the conference.

Celebration of the Arab world, al-Hasan Ibn Al-Haytham

On 1 March 2015, Iraqi scientists celebrated the Arab scientist Ibn Al-Haytham with a presentation of Ibn al Haytham's biography and books, scientific lectures, and an exhibition gallery with many cultural activities. The event was held in the University of Technology in Baghdad, under the auspices of Prof. Dr. Mohamed Abdel Wahab, head of the Department of Laser Engineering and Optical Electronics.

The Department of Laser Engineering and Optical Electronics of the University of Technology in Baghdad organized scientific and cultural celebrations for the IYL 2015 with a special focus devoted to the achievements of Ibn Al-Haytham who made significant contributions to mathematics, optics, physics and astronomy, engineering, ophthalmology and scientific philosophy, and visual sciences and cognition.

The celebration in Baghdad included two special lectures: the first one titled *Al-Hasan Ibn Al-Haytham: Curriculum and Writings, and Scientific Creations in Optics and Medicine,* given by Asst. Prof. Ayad Zwayen Mohammad. The second one was titled *Numerical and Scientific Miracles in the Quran,* given by Asst. Prof. Akram Nouri from the Department of Applied Science. In addition, *Miracles*, an exhibition of posters representing the biography and writings of Ibn Al-Haytham as well as an exhibition of lasers for an optical show was organized in the Graduate Studies Laboratory.

Iraqi scientists celebrate Ibn Al-Haytham at the Technology University Baghdad. CREDIT: Dr. Ausama Ismael Khudiar.

Ireland

Primary National Organizer: NUI Galway

Other National Partners: UCD, Tyndall, TCD, SPIE/OSA/IEEE, IMDA, GoPhoton!, UCC, DCU, UL, DIT, RCSI, IOP Ireland, NUI Galway, SFI, EI, IDA and OPW

Sponsors: EU LIGHT2015 and GoPhoton, Philips, SPIE, OSA, NUI Galway, St. Patrick's Festival and Dublin City Council

Estimated number of IYL 2015 activities organized: 40 events

Number of people reached by IYL 2015 Activities: 630,000 people

General overview of IYL 2015 Activities in Ireland

The Irish International Year of Light (IYL 2015) National Committee were fortunate to get an agreement from the President of Ireland, Michael D. Higgins, to act as patron of IYL 2015 in Ireland.

The Institute of Physics and the GoPhoton project got IYL 2015 Ireland off to a good start, fascinating all comers with the beauty and versatility of light at the BT Young Scientist Exhibition attended by 59,000 people, most of whom were school children.

The IYL 2015 was officially launched on 13 March 2015 by lighting up the Dublin Spire in green and was the central event in the launch of the St. Patrick's Festival. It was viewed by more than 570,000 people on the national TV news. The campaign continued apace throughout the year with events including the IOP Ireland Spring Meeting in March (Cork); Focus on Women in Light in April (Trinity College Dublin); Light and Shadow in May (UCD, Dublin); Dublin Maker in July (Trinity College Dublin); Photonics Ireland 2015 in September (Maryborough Hotel and Spa, (Douglas, Cork); Irish Lighter Awards 2015 in October (DIT, Dublin); Photonic Splash in November (NUI Galway) and Table top X-ray lasers: from Star Wars to nanotechnology in December (Royal Irish Academy, Dublin).

The School of Physics at NUI Galway hosted a series of outreach events to coincide with Science Week 2015 in Ireland and the 18th Galway Science and Technology Festival from 14 to 22 November 2015. The Irish GoPhoton team created heart rate and colour educational apps which are free on Google Play and have been installed by 500-1000 users each.

On 10 September 2015, iconic landmarks and buildings throughout the island of Ireland were lighted up in orange to commemorate World Suicide Prevention Day and to spread the message "It's OK not to feel OK; and it's absolutely OK to ask for help."

Newgrange - likely the oldest still functioning optical instrument used in Ireland and possibly worldwide, at about 5,000 years old, continues to inspire and played a role in some of the IYL 2015 events in Ireland including the IEEE International Year of Light Event at Brú na Bóinne (Newgrange) on 21 October 2015.

GoPhoton! activities in Galway. CREDIT: NUI Galway.

Israel

Primary National Organizer: Israel Physical Society

Estimated number of IYL 2015 activities organized: 19 events

Number of people reached by IYL 2015 Activities: 10,000 persons

General overview of IYL 2015 Activities in Israel

The International Year of Light (IYL 2015) activities in Israel were a great success involving around 19 events all over the country. The activities were composed of light exhibitions, dedicated workshops about photonics and lighting, scientific conferences, public lectures, school activities, and participation in IYL 2015 global activities.

Among all IYL 2015 events in Israel we could highlight:

The *5th OASIS International Conference and Exhibition on Optics and Electro-Optics* organized in Tel Aviv 3-4 March 2015. OASIS 5 presented a platform where science, technology, academia, and industry met. Its main features comprised cutting-edge keynote addresses and parallel sessions by both prominent industry and academic leaders from Israel and abroad, a full day of poster presentations, a meeting place for personalized one-on-one meetings and networking opportunities, an Extensive Exhibition area that showcased new technologies and achievements in the field of optical engineering and research. The *Oasis 2015 Conference and Exhibition* was set as a milestone, and a major focal point for executives, and leading key decision makers worldwide.

The *Biophotonics Conference 2015* was held in Ramat-Gan 1-2 December 2015. Biophotonics is the fastest growing sub-field in optics/photonics, having a large variety of research and clinical applications. Scientists and engineers working in relevant topics presented recent advances in the field. The purpose of this event was not only the exchange of scientific knowledge and the exposition of recent progress, but also the facilitation of national and international collaborations among researchers, and especially between academic institutes and industry.

Israel IYL 2015 Stamp.

Israel also participated on the IAU's Cosmic Light activity *SkyLight: a Global Opera,* where a network of schools, universities, art institutions, and volunteers in 35 countries collaborated to create and perform a science opera inspired by cosmic light, providing a platform for creative science learning as well as cross-border friendship and cooperation.

Israel also issued an IYL 2015 commemorative stamp.

Italy

Primary National Organizer: Società Italiana di Fisica (SIF)

Other National Partners: Italian Astronomical Society SAIt, Italian Society of Optics and Photonics SIOF, Italian Society of Synchrotron Light SILS, Italian Society of Physics Teachers AIF, History of Science Societies SISS and SISFA, Coordinamento Ricerca e Innovazione Fotonica Italia AEIT-CORIFI, National Institute for Nuclear Physics INFN, Istituto Nazionale di Astrofisica INAF, Agenzia Spaziale Italiana ASI, Istituto Nazionale di Ricerca Metrologica INRIM, Consiglio Nazionale delle Ricerche CNR, European Laboratory for Non-Linear Spectroscopy LENS, Istituto Nazionale di Geofisica e Vulcanologia INGV, Museo Storico della Fisica e Centro Studi e Ricerche "Enrico Fermi", Roma, Elettra Sincrotrone Trieste, Fondazione Alessandro Volta, Bruno Kessler Foundation FBK, Trento Science Museum MUSE, University of Trento, University of Brescia, Politecnico di Milano and Institute for Photonics and Nanotechnologies (CNR).

Sponsors: INFN Sezione di Bologna, Accademia delle Scienze dell'Istituto di Bologna, Centro Fermi Università di Bologna, Società Italiana di Fisica, Istituto Nazionale di Fisica Nucleare (INFN), Società Astronomica Italiana (SAIt), Istituto Nazionale di Astrofisica (INAF), Fondazione Golinelli Edison, Roma Capitale, Sapienza Università di Roma, Dipartimento di Fisica Sapienza Università di Roma, Università di Roma Tor Vergata, Accademia dei Lincei, INFN Sezione di Roma, INFN Sezione di Roma Tor Vergata, INFN Laboratori Nazionali di Frascati, Gran Sasso Science Institute (GSSI), Consiglio Nazionale delle Ricerche (CNR), European Physical Journal (EPJ), EPL (Europhysics Letters), Springer, Ametek, CAD Manager, CAEN Electronic Instrumentation, Criesel Instruments, Hamamatsu, Link Engineering, Vacuum FAB, Camera di Commercio di Lecco, Centro Fermi, Istituto Nazionale di Geofisica e Vulcanologia (INGV), Istituto Nazionale di Ricerca Metrologica (INRIM), Comune di Varenna, Provincia di Lecco, European Physical Society (EPS), The Abdus Salam International Centre for Theoretical Physics (ICTP), Consortium GARR, INFN, CNAF (centro nazionale per la ricerca e lo sviluppo nelle tecnologie informatiche e telematiche) and Visual Lab, European Commission through CSA projects GoPhoton!, Ligth2015 and Photonics4All.

Estimated number of IYL 2015 activities organized: 265 events

Number of people reached by IYL 2015 Activities: 1,000,000 people

General overview of IYL 2015 Activities in Italy

In Italy, the Italian Physical Society (SIF) has acted as a "hub" for national activities, in collaboration with many other institutions and societies. Almost 100 events based on the theme of light have been organized, coordinated, sponsored or signaled by the SIF throughout the year,[1] out of the 265 events registered on the International Year of Light (IYL 2015) Event Programme. The results have been very positive. We express our gratitude to all those who have worked with passion and enthusiasm for the success of the IYL 2015.

From the events organized by SIF, we highlight:

- The Italian IYL 2015 Opening Ceremony was organized in Torino at the Sala del Senato at Palazzo Madama 26 january 2015. The ceremony was attended by 200 participants and featured lectures by Nobel Laureate Wolfgang Ketterle (MIT, USA). The opening speeches were delivered by the Mayor of Torino and the Dean of the University of Torino and of the Polytechnic University of Torino. An IYL 2015 commemorative postage stamp was unveiled on the day of the opening.
- The celebration symposium *Light & Life* 20-21 July 2015 in Villa Monastero, Varenna, Lake Como was dedicated light in basic research.
- The international symposium *Light and Innovation* on 16 October 2015 included lectures on the theme of light in science, technology, and art were given by distinguished speakers. During the event, the European Prize for Physics *EPS EDISON VOLTA* was awarded to Nazzareno Mandolesi, Jean-Loup Puget and Jan Tauber, scientific Leaders of the Planck Mission of the European Space Agency (ESA).
- The 50th anniversary of the first evidence of antimatter was celebrated with an international symposium in honour of Antonino Zichichi in Bologna on 6 November 2015.
- The event *Bologna s'illumina* was part of the activities of *Light in Astronomy,* a week-long programme of public events dedicated to light and light-based technologies, promoted and coordinated by INAF in several Italian cities.

Among other interesting activities in the country, we include:

- The *Alberobello Light Festival,* the first International festival of lights in Puglia, in the wonderful natural area of the Trulli of Alberobello, UNESCO World Heritage, attracted 500,000 persons between 7 December 2014 and 6 January 2015. Spectacular video mapping projections on historical UNESCO World Heritage limestone dwellings transformed purely visual experience into an interactive experience by giving the public the opportunity to create their own works of art and see them appear immediately on the monuments.

1. http://en.sif.it/activities/iyl2015

Recipients of the IYL 2015 Medal on the occasion of the 101th Italian Physical Society National Congress. From left to right: Gabriele Scarascia Mugnozza, Fernando Ferroni, Luisa Cifarelli, Luigi Nicolais, Eugenio Coccia. CREDIT: Italian Physical Society.

- The *Como Light Festival,* held on the beautiful Como Lake from 9 April to 17 May 2015, promoted and organized by Fondazione Alessandro Volta and Associazione Città della Luce, featuring many events ranging from entertainment light shows to scientific dissemination.
- The *Fiat Lux conference* was a multidisciplinary event including discussions about light, science, art, philosophy, and faith in the beautiful city of Rome 3-5 June 2015. The congress also hosted lectures from Nobel Laureates such as Ada Yonath, Stefan W. Hell, and Vint Cerf.
- The *Photonics Week* in Milano, 24 September-3 October 2015, including public events, a light show during the European Researchers Night and educational events for students from primary to high school and round tables with university students, young researchers and entrepreneurs.
- The *Frontiers of Light* event at CNR in Rome on 8-9 October 2015, dedicated to the dissemination of "extreme light" research for students and to the Extreme Light Infrastructure presentation.
- The *Photonics Week* in Trento, 23-31 October 2015, including laboratory activities for young students and public conferences.

Japan

Primary National Organizer: Science Council of Japan

Other National Partners: ICO Commission at Science Council of Japan

Sponsors: Council of IYL2015-Japan

Estimated number of IYL 2015 activities organized: 200 events

Number of people reached by IYL 2015 Activities: 20,000 people

General overview of IYL 2015 Activities in Japan

The Closure symposium, held at the Yasuda Auditorium at The University of Tokyo, with about 1,200 participants. CREDIT: Tokyo University.

The International Commission for Optics at the Science Council of Japan (SCJ-ICO), the ICO territorial commission of Japan, took the role of presiding over the International Year of Light 2015 (IYL 2015) activities in Japan. This involved promoting the importance of light and light-based technologies to the general public. The SCJ-ICO launched the Council of IYL2015-Japan (CIYLJ), whose participating members included various organizations such as academic societies, universities, research institutes, and companies. Among the 76 CIYLJ members, 57 members became promotion partners, contributing financial funds to the CIYLJ.

The CIYLJ set up a website[1] and collected information on event activities in Japan. Two main events were organized as part of the IYL 2015 in Japan. The first event, hosted by the SCJ-ICO, was the IYL2015-Japan Commemorative Opening Ceremony. This event was held at the Yasuda Auditorium of The University of Tokyo on 21 April 2015. The auditorium was fully packed with about 1,200 attendees, and the program included a special plenary lecture given by Prof. Hiroshi Amano (2014 Nobel Laureate in Physics), who talked about the prospects of research on blue LEDs and lasers to young students and researchers. The second large event was the closure symposium, which was again held at the Yasuda Auditorium at The University of Tokyo, again with about 1,200 participants. In the first part of this symposium, activity reports were presented by the presidents of five academic societies, including SPIE. After this, the attendees enjoyed a fascinating plenary lecture given by Prof. Isamu Akasaki (2014 Nobel Laureate in Physics).

In addition to the aforementioned events, many additional events were held by various academic societies and other organizations. One example of such an event was the *Park for Light and Energy 2015* held at Uneno Onshi Park in Tokyo from 30 October to 3 November 2015. The CIYLJ joined this event as one of many exhibitors. About 15,000 people visited this event.

To help publicize the IYL 2015, a pamphlet and plastic clear folder were designed by the SCJ-ICO. These were distributed to participants at many of the IYL2015-Japan events, including the opening ceremony. The pamphlet explained that the year 2015 coincides with the anniversaries of several important milestones in the history our understanding of light, in particular highlighting the works of Ibn Al-Haytham, of whom little is known in Japan.

In December 2015, people in Japan were again excited to hear the news that Prof. Takaaki Kajita had been awarded the 2015 Nobel Prize in Physics for his discovery of neutrino oscillations. Needless to say, highly sensitive photo-multipliers played an essential role in this great discovery.

The IYL 2015 activities in Japan were very successful, and work will be continued with the support of the IYL2015-Japan. One of the biggest planned events is the *24th Congress of the ICO (ICO-24),*[2] which will be held in Tokyo in August 2017.

1. http://iyl2015-japan.org
2. http://ico24.org

Lithuania

Participants of the 11th National Conference Lasers: Science and Technologies. CREDIT: Lidaris, Ltd.

Primary National Organizer: Center for Physical Sciences and Technology, Vilnius University and Lithuanian Laser Association

Other National Partners: Lithuanian Physical Society, Lithuanian Academy of Sciences, Student Scientific Association of Faculty of Physics, Vilnius University and NGO Creative Workshop

Sponsors: Research Council of Lithuania and companies: Light Conversion, Ekspla, Altechna, Eksma Optics, Gammadata, Thorlabs, Brolis Semiconductors, Ruptela, Gaudre, Korgas; EPS, SPIE and OSA organisations, as well asLithuanian Council of Culture, Parish of Pilate, Creative Europe, Nordic Council, Vilnius City Municipality and other Private Sponsors.

Estimated number of IYL 2015 activities organized: 10 events

Number of people reached by IYL 2015 Activities: 20,000 people

General overview of IYL 2015 Activities in Lithuania

The International Year of Light 2015 (IYL 2015) was a thrilling and exciting year for every enthusiastic person in Lithuania: from students to specialists. Several activities offered a great insight into the current knowledge and future tasks in the field of photonics technologies, especially lasers and optics.

The international conference for students of physics and natural sciences *Open Readings 2015*, was focused on photonics and gathered almost 300 presenters from all over Europe and at least twice as many spectators. The Lithuanian National Physics Conference had an extraordinary IYL 2015 session, during which Prof. Audrius Dubietis from Vilnius University presented the phenomena of our beautiful sky. Pianist Prof. Rokas Zubovas made an outstanding artistic overview of world-famous Lithuanian artist M. K. Čiurlionis in connection with physics and metaphysics of light for the whole scientific community. This positive mood was carried further to the meeting of the Lithuanian laser society in the national conference *Lasers: Science and Technologies*.

Throughout the IYL 2015 there were also numerous outreach activities. Thanks to several initiatives, many schools were visited and pupils were introduced to the basics of optics and other phenomena. The general public also had glimpse into the beauty of light in the lighting design and installation festival *Beepositive.*

The IYL 2015 in Lithuania officially closed after the overview led by Prof. Juozas Vaitkus in the LIGHT2015 project's *LIGHTtalk: The Power of Photonics* event. It was a truly enlightening year!

Malaysia

Primary National Organizer: Ministry of Higher Education

Other National Partners: Ministry of Education

Sponsors: Ministry of Higher Education

Estimated number of IYL 2015 activities organized: 8 events

Number of people reached by IYL 2015 Activities: 1,000 people

General overview of IYL 2015 Activities in Malaysia

Most of the activities were organized by universities and involved mainly postgraduate students and academics. Only one activity involved secondary school students—the Al-Haytham Photonics Club. The Photonics Club was formed in eight schools in Malaysia. The club members are brought regularly to visit the Photonics Research Laboratory at the University of Malaya, where they engage in many experiments on optics. We also established the Optical Society of Malaysia in 2015 to promote photonics researches.

In conjunction with proclaiming 2015 as the International Year of Light and Light-based Technologies 2015 (IYL 2015), the following activities were organized in Malaysia:

- The *2nd International Workshop on Convergence of Radio and Optical Technologies 2015* on 15 January 2015. This workshop served as a venue for inspiring new ideas, presenting cutting-edge studies, and encouraging collaborations between international scholars and industry leaders in the area of radio over fiber (RoF) technology for access networks.
- Training on the use of Dialux, 23-27 February 2015. *The Building Sector Energy Efficiency Project (BSEEP)* offered training in the use of Dialux for professionals in building energy efficiency.
- Official launching of the Al-Haytham Photonics Club at the Imtiaz School of Excellence in Terengganu on 11 April 2015. The Education Ministry, the Terengganu Foundation, and University of Malaya collaborated to establish photonics clubs in seven Imtiaz secondary schools (School of Excellence) in Terengganu, Malaysia. The launching was officiated by Dato' Seri Idris Jusoh, Malaysian Minister of Education.
- *Topical Meeting on Photonics 2015,* 17-18 August 2015. Various talks on photonics were presented at the symposium.
- The *1st International Laser Technology and Optics Symposium (LATOS 2015),* 13-14 October 2015. LATOS 2015 aimed to create a forum for researchers, academics, engineers, and industry leaders from various fields of laser and electro-optics to exchange views that could create mutual interest.
- The *2nd Meeting of Malaysia Nitrides Research Group (MNRG 2015),* 8-9 June 2015. This event was carried out in conjunction with Malaysia's celebration for the IYL 2015 in recognition of the contributions of Ibn al Haytham and other scholars in the field of optics and light-based technologies.

Malaysia was also part of other international activities related to IYL 2015 such as the Science Film Festival and World Metrology Day 2015.

Prof. Zainuriah Hassan at the 2nd Meeting of Malaysia Nitrides Research Group (MNRG 2015). CREDIT: Ibn Al-Haytham International Working Group.

Mauritius

Primary National Organizer: University of Mauritius

Other National Partners: Ministry of Education and Human Resources; Tertiary Education and Scientific Research; Mauritius Commercial Bank

Sponsors: UNESCO, The Abdus Salam International Centre for Theoretical Physics

Estimated number of IYL 2015 activities organized: 12 events

Number of people reached by IYL 2015 Activities: 200,000 persons

General overview of IYL 2015 Activities in Mauritius

The University of Mauritius organised one activity each month as part of the International Year of Light 2015 (IYL 2015). The activities included talks, video programmes, and workshops.

The opening of IYL 2015 took place 6 February 2015 and the guest of honour was Prof. Romeela Mohee CSK, the Vice-Chancellor of the University of Mauritius. She highlighted the importance of light in our daily life and discussed how we should be part of the IYL 2015 activities.

The talks were based on sharing results of research activities. Among the talks, Prof. Lok C. Lew Yan Voon from the The Citadel in Charleston, SC, presented the *Electronic Structure of 2D Materials.* Mr. Vikram Ramgolam from Emtel presented *How Optical Technologies Connect the World.* We had one video programme entitled *Light and Life* by Prof. Ahmed Zewail, 1999 Nobel Laureate in Chemistry.

IYL 2015 Opening Ceremony in Mauritius. CREDIT: University of Mauritius.

A workshop with Active Learning on Optics and Photonics (ALOP) was held for five days to train educators on light-based experiments so that they can transmit the knowledge and skills to the students. We also had a video competition and participants had to create a 3-minute video. The competition was entitled *Three Minute Enlightment: Make a brilliant movie that sheds light.* Apart from these, the total lunar eclipse on 28 September 2015 was part of the IYL 2015 celebration and this was reported in the evening news on national television.

The closing session was held on 4 December 2015 and Dr. Vikrant Sibartie gave a talk entitled *Light in Medicine: Endoscopy.* All the activities were organized to illustrate light and its applications in our life. The activities were attended by students, academics, teachers, and the general public. To summarise, the celebration of IYL 2015 in Mauritius was a success and the organizing committee would like to thank those who contributed and the sponsors—in particular, UNESCO, Institute of Centre of Theoretical Physics, and the Mauritius Commercial Bank.

Mexico

Primary National Organizer: International Year of Light National Committee

Other National Partners: Academia Mexicana de Ciencias, Academia Mexicana de Óptica, A.C., Academia Nacional de Medicina de México, Centro de Investigación Científica y de Educación Superior de Ensenada, Centro de Investigación y de Estudios Avanzados-IPN, Centro de Investigaciones en Óptica, A.C., Comisión Mexicana de Cooperación con la UNESCO, Consejo Nacional de Ciencia y Tecnología (CONACYT), Dirección General de Divulgación de la Ciencia-UNAM, Fondo de Cultura Económica, Instituto de Física-UNAM, Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE), Laboratorio Arte Alameda, Lighteam, Museo de la Luz-UNAM, Planetario de Cancún Ka'Yok', Planetario de Cozumel Cha'an Ka'an, Secretaría de Relaciones Exteriores, Sociedad Mexicana de Física (SMF), Student Chapters OSA-SPIE, Televisión Educativa-SEP, Universidad Autónoma Metropolitana

Sponsors: Universidad Nacional Autónoma de México (UNAM), CONACYT

Estimated number of IYL 2015 activities organized: 600 events

Number of people reached by IYL 2015 Activities: 600,000 people

General overview of IYL 2015 Activities in Mexico

The International Year of Light (IYL 2015) celebrations in Mexico were a great success involving around 600,000 people all over the country. A diversity of stakeholders participated in the organization of activities, from academic institutions, amateur associations, academies as well as public libraries, museums, planetariums, theaters, and schools. On the national website were registered 320 events. Most of the activities were triggered by personal initiatives, but we estimate that over 600 IYL 2015 events have been organized in the country. The activities included lectures, multi-day scientific conferences, exhibitions, festivals, public observations, courses, workshops, open-days for laboratories and universities, light-shows, competitions, school activities, cinema festivals, and citizen science activities.

The IYL 2015 was officially opened with a press conference in Mexico City, at the Ministry of Foreign Affairs, on 27 January 2015, with over 50 participants, including the Ambassador Juan Sandoval, Prof. Ana Maria Cetto as the IYL 2015 National Coordinator, and representatives of the main institutes of optics and photonics.

One of the highlights was the organization of the *22nd National Science Week* 7-13 November, dedicated to the IYL 2015. All over the country, workshops, hands-on activities, and light-shows, reaching out to over 100,000 people were organized. In Mexico City, the Zócalo main square featured 8,500 square-meters that included seven interactive museums, three special exhibitions, 20 science workshops, and a vocational guidance program. Additional participants were 14 science companies,

Beyond Light exhibition at the Zócalo, Museum of Light. CREDIT: Federico Nájera Febles / Museo de la Luz.

11 science public centers, 48 thematic networks and national laboratories, and ten outreach magazines.

Another interesting event was the *Night of the Stars* on 28 November 2015. With 67 national nodes and seven international nodes in Latin America, over 200,000 people gathered to celebrate astronomy and light with diversity outreach activities, including lectures, exhibits, and astronomical observations.

The Light of Knowledge, Axochiapan, Morelos. CREDIT: Consejo de Ciencia y Tecnología del Estado de Morelos.

Most of the Mexican States have their own outreach science center. Several of them carried out activities related to the IYL 2015. For example, the State of Morelos organized a Science Fair with workshops, conferences, and exhibits with about 25,875 visitors from over 100 schools in Morelos. They also created a travelling exhibition called *Light of Knowledge* with ten exhibits of physics and optics which visited the poorest communities in Morelos.

The State of Puebla jointly with the INAOE organized numerous activities related to IYL 2015; most notable were their lectures *Cosmic Light* organized every month for the general public. Over 50,000 people participated in those activities.

The Museum of Light carried out diverse activities such as conferences and workshops for children and teachers to promote science, both within its premises and outside the museum in communities in Mexico. A special exhibit entitled *Beyond Light* was created by the Museum of Light for the National Science Week.

Through 17-21 August 2015, the summer school *Light in Science, Light in Life – LiSci 2015,* was held in Tequisquiapan, Queretaro, with about 180 attendees from different countries, mostly students. Over the week, a set of tutorial lectures on frontier topics, from biophotonics to quantum optics, were delivered by an impressive list of 19 invited speakers, including Profs. Sir Michael Berry, Govind Agrawal, and Paras Prasad, among many other top-level scientists. In a friendly atmosphere of scientific discussion, the students attended the lectures and presented their research in poster sessions.

On 18-21 November the Transnational Lighting Detectives (TNT) Tanteidan Forum took place in Mexico City, with the participation of 16 international experts in urban environmental lighting. The TNT participating members and students divided into teams to walk through six different routes within the City's historic downtown and identify key points of opportunity that led to lighting proposals to improve the urban nightscape.

Night of the Stars, Ciudad Universitaria, Mexico City. CREDIT: Elizabeth Ruiz Jaimes / Academia Mexicana de Ciencias.

The IYL 2015 International Closing Ceremony took place 4-6 February 2016 in the city of Mérida, Mexico. During three days, over 400 participants reviewed the activities and major outcomes of the IYL 2015 as well as discussed potential legacies of the Year. The involvement of the City of Mérida was also of great importance during the Closing Ceremony. Cultural and educational activities for the general public were organized during the week, such as a film festival, art installations, and an outreach programme in high schools and universities with an overall attendance of 14,000 people. An IYL 2015 commemorative postal stamp for Mexico was also issued.

Mongolia

Group picture of the National 28th Olympiad for Physics and Astronomy. CREDIT: Tsolmon Renchin.

Primary National Organizer: The National University of Mongolia

Estimated number of IYL 2015 activities organized: over 100 events

Number of people reached by IYL 2015 Activities: 10,000 people

General overview of IYL 2015 Activities in Mongolia

Many different organizations such as academic institutions, schools, libraries, and NGO organizations participated successfully in activities for the International Year of Light (IYL 2015) in Mongolia. The National Committee have registered more than 100 IYL 2015 events in the country reaching out to around 10,000 people.

The activities included lectures, scientific conferences, exhibitions, public astronomical telescope observations, courses, workshops, and open-days for laboratories in universities.

On 31 March 2015, the IYL 2015 Opening Ceremony in Mongolia was formally held at the National University of Mongolia in Ulaanbaatar city. The ceremony was attended by researchers from light-related fields, professors, teachers, students, specialists, and people who were interested in science.

During 2015, National University of Mongolia created special lectures and workshops on the topics of physics and optics. These special lectures covered topics related to the IYL 2015 and its importance to society and sustainable development. Public lectures on cosmic light and its wonders were organized in urban and remote areas. A mobile planetarium was used in remote areas for lectures on an exciting journey into modern astronomy and the latest space technology. All lectures were focused encouraging people's interest in science and technology.

One of the highlights of the activities was the national *28th Olympiad for Physics and Astronomy* among schools. The Olympiad was held 24-27 April 2015. During these activities school children visited museums and participated in star parties for telescope observations.

Morocco

Primary National Organizer: Al AKhawayn University in Ifrane

Other National Partners: Ministry of Education, Mohamed V University, MAScir, CITI association, RAAM association, AMANAT association, MCDA association, Association d'Astronomie de Rabat, AM2A Association Marocaine d'Astronomie et d'Astrophotographie, SaharaSky Observatory , Club d'Astronomie de l'université Al Akhawayn and UNAWE network in Morocco

Sponsors: Al Akhawayn University in Ifrane/ Ministry of Education/ Hightech Payment Systems (HPS)

Estimated number of IYL 2015 activities organized: About 150 events

Number of people reached by IYL 2015 Activities: Around 75,000 people

General overview of IYL 2015 Activities in Morocco

The objectives of the International Year of Light (IYL 2015) National Node in Morocco were to first educate citizens about the importance of the science of light, optics, and techniques using light, in their daily lives. We also worked on presenting the potential of light technologies to provide solutions pertaining to our current development challenges such as energy, education, agriculture, and health, and the opportunity to integrate these technologies into a sustainable development approach.

The targeted public was mainly young people, teachers, trainers, and scientists. There were also activities arranged for the general public as well as conferences targeting specialized people (artists, scientists, researchers, engineers, and technicians). Awareness about light pollution and energy conservation in lighting was among the IYL 2015 Moroccan activities. The target was politicians, policy makers, local authorities, and architects.

Many events were organized in schools and universities (conferences, festivals, light and/or astronomy days, educational conferences and workshops about Ibn Al-Haytham, Camera Obscura, and sundials, etc). There were also workshops and campaigns about light pollution through two major events in schools: *Dark Skies Rangers and Globe at Night.* A number of training workshops were offered to science teachers and science animators about some innovative techniques in teaching optics. These events were organized in partnership with the Ministry of Education. A number of pedagogical tools, art exhibitions, and posters related to light were produced during IYL 2015.

The topics of five major astronomy and science festivals in major cities in Morocco were related to light during 2015. The general public in Morocco also had a rendez-vous with light and astronomy during the partial solar eclipse on 20 March. The festivals and the eclipse events attracted a very large audience.

Overall the IYL 2015 was a great opportunity to reach out to Moroccan citizens and educate them about light. We estimate the number of people reached by IYL 2015 activities in Morocco to be more than 75,000 persons.

Pupils watching sunspots through a telescope – Astronomy Festival of Ifrane, 4-7 Sep. 2015. CREDIT: Hassane Darhmaoui.

Nepal

Primary National Organizer: Balmiki Campus

Other National Partners: Takshashila Astronomy Club

Sponsors: Takshashila College

Estimated number of IYL 2015 activities organized: 3 events

Number of people reached by IYL 2015 Activities: 500 people

General overview of IYL 2015 Activities in Nepal

The Nepalese International Year of Light (IYL 2015) national committee was headed by Mr. Jayanta Acharya. The year 2015 is known as an earthquake year in Nepal since a 7.8 magnitude earthquake hit Nepal on 25 April 2015. There were many IYL 2015 activities planned that were cancelled.

However, there were still many activities in the country and we focused mainly on the students and schools in the regions most affected by the earthquake. We did our activities in Gorkha, epicenter area of the earthquake, and Nuwakot and Kathmandu, the most affected areas in Nepal.

There were many astronomical activities during this year, including moon observations, a lunar eclipse, a sun observation programme, and solar eclipse viewing programme. During this programme, we talked about light pollution, one of the central messages of the IAU's IYL 2015 Cosmic Light Programme, and why light is very important for us and how light plays a vital role in astronomy. We distributed telescopes (Galileoscopes) to many schools around the country.

Utpal (age 6 years), a Nepali young boy, is learning how to observe the sun. CREDIT: Shamiksha Sharma.

In Nepal, since 2007, public astronomical activities have been organized frequently and after the International Year of Astronomy in 2009, the activities have been brought to many schools in the country. Within the framework of the IYL 2015, the programme bringing activities to schools has been strengthened and we hope these become an everlasting legacy in the country.

The general public observes the sun during a solar eclipse. CREDIT: Shamiksha Sharma.

Netherlands

Primary National Organizer: Stichting ('Foundation') International Year of Light 2015 NL

Other National Partners: Nederlandse Natuurkundige Vereniging (Netherlands' Physical Society), Science Center Nemo, Utrecht University, FOM Institute Amolf (Research Lab), NOVA Information Center (Netherlands Research School for Astronomy) and others

Sponsors: Stichting Physica (Physics Foundation), Science Center Nemo, Zumtobel, FOM foundation, all universities with science departments, Nederlandse Natuurkundige Vereniging (Netherlands' Physical Society) and others.

Estimated number of IYL 2015 activities organized: 86 events

Number of people reached by IYL 2015 Activities: 2,000,000 people

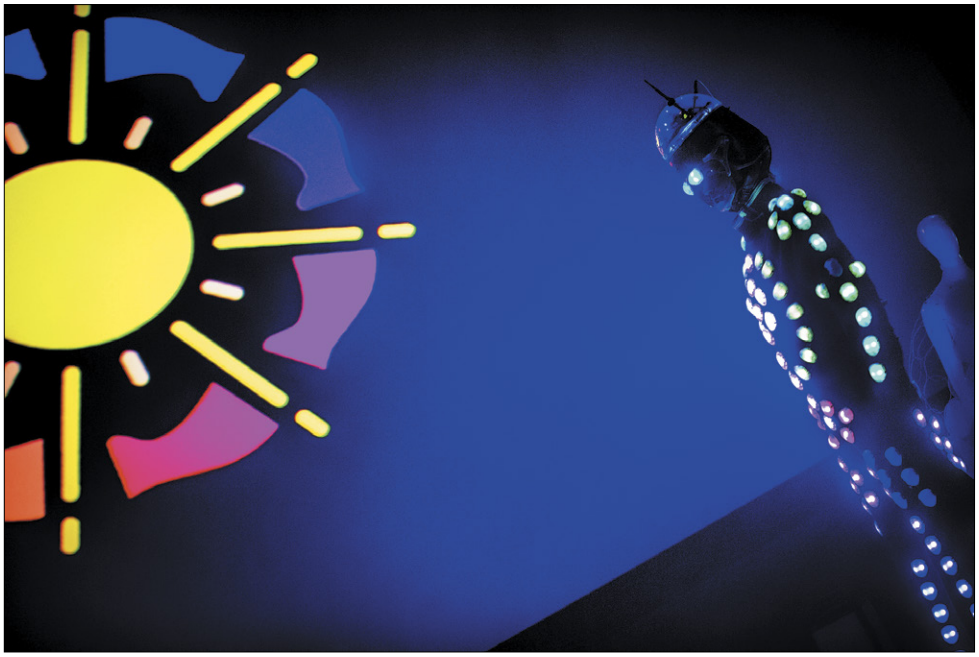
General overview of IYL 2015 Activities in the Netherlands

The International Year of Light (IYL 2015) started off in the Netherlands with a well-organized meeting at the Science Centre NEMO in Amsterdam. The public was enlightened by scientific lectures on the many uses of light, e.g. medical diagnosis and imaging, and entertained by performers who used light in very innovative ways.

Since there was not a large budget available to the organizing committee, the idea was to foster local initiatives. Small seeds were planted throughout the country, which through the work of many agencies and individuals, grew into a wide range of wonderful activities.

Lectures, conferences, and symposiums were organized from the highest to the lowest level: from universities to primary schools. Universities and museums succeeded very well in incorporating the meaning of light in their public activities and exhibitions. Light also inspired a host of artists, musicians, photographers, performers to produce amazing things.

An interesting activity in the Netherlands throughout the IYL 2015 was the Rainbow Station project. On 11 December 2014, a large public artwork at the monumental Amsterdam Central train station saw first light, in the form of a rainbow that was projected on the large arch construction that spans over the platforms. The project constituted a unique collaboration between world-renowned Studio Roosegaarde, astronomers from Leiden University, and optics researchers from North Carolina State University. The core technology of the installation is a patterned liquid crystal grating that creates a curved spectrum that follows the shape of the roof, and is extremely efficient over the entire visible wavelength range. The rainbow was visible once a day for the duration of 2015.



Opening ceremony IYL 2015 in Amsterdam, the Netherlands. CREDIT: Digidaan.

A special school project was a National *Measurement of Light Experiment* by children in secondary education. They built their own spectrometers to investigate which kinds of light were used most in their home environments.

The awareness of the importance of light in society and in our daily lives was raised by all of these examples of light use.

New Zealand

Primary National Organizer: New Zealand National Committee for the International Year of Light and Light Based Technologies

Other National Partners: New Zealand National Commission for UNESCO

Sponsors: Dodd-Walls Centre for Photonic and Quantum Technologies, The MacDiarmid Institute for Advanced Materials and Nanotechnology, The University of Auckland, Victoria University-Wellington, MetService, Lastek, New Zealand Institute of Chemistry, The Photon Factory, The Ministry of Business, Innovation and Employment

Estimated number of IYL 2015 activities organized: 33 events

Number of people reached by IYL 2015 Activities: 100,000 people

General overview of IYL 2015 Activities in New Zealand

The International Year of Light and Light-based Technologies 2015 (IYL 2015) was a big event in New Zealand (NZ), with dozens of activities for young and old that stretched across the country. To encourage the most activity, the NZ committee sponsored and supported dozens of activities, and organized large-scale events as well. This approach led to a wide range of participating organisations, from industry sponsors to universities to museums, and brought the wonder and power of "Photonics is the 21st Century" to a large and diverse audience.

Light Matters Kit Spectrometer. CREDIT: Illuminating NZ.

The national highlight was the *Illuminating NZ* celebration. With six-figure NZ government funding from the Unlocking Curious Minds initiative of the Ministry of Business, Employment, and Innovation, and support from universities and centres of research excellence, we worked with eight museums, large and small, urban and rural, to hold fun, educational events for children, youths, and their parents, caregivers and teachers. Thousands of New Zealanders participated, and rated the events >2.5 of 3 on fun, learned something cool, and would do it again!

Illuminating NZ kicked off in mid-winter, to coincide with *Matariki* (the Māori New Year, heralded by the appearance of the Pleiades on the horizon) and closed with a 9-day celebration of light and the coming of spring: *Te Kōanga*. The Museum of Transport and Technology (MOTAT) in Auckland on the North Island kicked off the celebration with a party that linked music and light, and we closed with a demonstration day and public lecture series at the Otago Museum in Dunedin on the South Island.

A team of graduate students from across NZ developed and delivered 5,000 *Light Matters* kits that were distributed at the *Te Kōanga* events, held on the museum's grounds—sometimes as part of education outside the classroom experiences, and sometimes as stand-alone demonstrations. These kits contain light-themed experiments that children can do at home or at school, and that can be "refilled" with inexpensive components from a $2 shop, grocery, or hardware store. They were a huge success, and we are still getting requests for these now!

Another great event was *Luminescence: The Spectrum of Science,* which included a photography competition that received submissions from children as young as seven years old. The event also featured a great number of talks for the general public on areas of research performed at New Zealand's universities. Through this initiative, the general public was introduced to such exotic topics as light and Bose-Einstein condensates.

Along similar lines, the Royal Society of New Zealand (RSNZ) themed the annual *Ten By Ten* lecture[1] series to honour the IYL 2015. The national committee worked with the RSNZ to develop *Luminaries*, a slate of ten speakers that would appeal to diverse audience interests. The series presented New Zealanders with the wonders and power of light in everything from poetry and astronomy to sunburn and lasers. Financial support raised by the national committee allowed the talks to be live-streamed across NZ and the videos to be archived, so that all New Zealanders could benefit.

1. http://www.royalsociety.org.nz/events/ten-by-ten/ten-by-ten-luminaries

IYL 2015 activities at the Kauri Museum. CREDIT: Illuminating NZ.

In addition to these events, in which the national committee led or had a large hand in organizing or sponsoring, other institutions, organizations, and groups ran creative, exciting light-themed events as well. We supported these with promotion via the national websites and social media accounts, and sometimes with funding and participation.

New Zealand embraced the IYL 2015. The long-term impact of our efforts, dovetailed with those resources of the International Committee that we were able to tap into, will be significant. The connections we forged with schools and museums have brought us to a better understanding of light in the NZ context. They also will enable us to bring our science more effectively to our people, to make New Zealand a more scientifically literate and informed society, ready to lead in the 21st Century of Photonics.

Nigeria

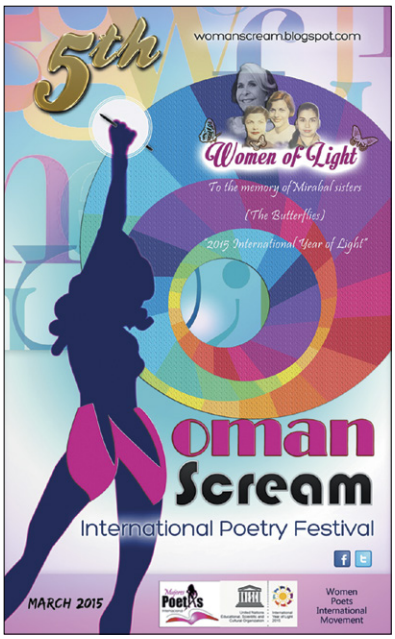
Estimated number of IYL 2015 activities organized:
6 events

General overview of IYL 2015 Activities in Nigeria

The International Year of Light 2015 (IYL 2015) was celebrated at the University of Lagos, Lagos, Nigeria by the Initiative for Technology-Based Sustainable Development (ITBSD) in partnership with the Department of Physics at the university. There were two main events, which included a conference on the *Role of Light and Light-Based Technologies in the Development of Modern Society,* and workshop on *Active Learning in Optics and Photonics (ALOP)* at the university facilities in Lagos, Nigeria.

During these events, the high-resolution colour panels, which were printed from the software kindly given to us by SPIE, were displayed visibly, and the Light 2015 lapel pins also donated by SPIE were distributed to participants. More than 200 participants showed up for the conference and the five-day workshop on ALOP had 25 university lecturers from universities in Nigeria, Cote d'Ivoire, and Cameroon as participants and four international university professors as facilitators.

In addition, on 25 March 2015, a recital as part of the worldwide chain of Woman Scream International Poetry and Arts Festival was celebrated in Ibadan, Nigeria. Seven poets raised their voices against violence against women and to honor the 2015 Woman Scream cause *Women of Light,* as part of the IYL 2015 by UNESCO. It was coordinated by the Nigerian poet Temi Bamgbose.



Women Scream International Poetry Festival Poster. CREDIT: Women Scream International Poetry Festival.

Norway

Primary National Organizer: Norwegian Physical Society

Other National Partners: Norwegian Organization of Photobiology and Photomedicine, Norwegian Light Designers, University College of Stord Haugesund and Lindesnes Lighthouse.

Sponsors: Physics Department University of Oslo, Dep. Physics and Technology (DPT) University of Bergen, DPT University of Tromsø, Solund Lys, Oslo Lux, Vestfold Fylkeskommune, Slottsfjellmuseet, Rambøll company and Lindesnes Lighthouse, Oslo School of Architecture and Design, Norsk Kulturråd.

Estimated number of IYL 2015 activities organized: Around 30 events

Number of people reached by IYL 2015 Activities: 70,000 people

General overview of IYL 2015 Activities in Norway

The activities for the International Year of Light (IYL 2015) in Norway were organized around several local events and some web-based activities, as permitted by the resources of the diverse educational institutions, companies, and organizations behind them. The web-based activities were aimed at availability well after the end of 2015.

A major activity was a lecture series on light and its applications. Lectures at the Science Library of University of Oslo were also broadcasted live on the web and made available for downloads and reached altogether 1000 persons. During *Science Days,* lectures were organized in Oslo by the Norwegian Organization of Photobiology and Photomedicine, and by the DPT at the University of Tromso.

Several exhibitions and artistic events celebrating the IYL 2015 were held by organizations and museums. At Lindesnes Lighthouse, an exhibition on the theme *The light – how important it is for human existence,* communication, and development, was open throughout the year from June. A movie was also made, and about 60,000 visitors saw the exhibition.

The yearly light art festival by Solund Lys held at Hardbakke in November 2015 included a *Light: Beyond the bulb* exhibition. In September 2015, The Oslo LUX exhibition and symposium investigated applications of bioluminescence and phosphorescence, and undergraduate students from the Creative College organized a Guerilla Lighting stunt at Sofienberg Church. Norwegian Light Designers (NL) held several events focusing on light and participated in the annual Light festival at Akerselva in October. A mock-up of the historical and medieval Slottsfjell area in Tønsberg was arranged with light setting by Rambøll.

The Stord/Haugesund University College and the Spinae Company (Stord) participated actively in *Skylight: a Global Science Opera.* It was the first-ever such opera production to be written and performed simultaneously by a global educational community in 35 countries.

A photo competition launched in social media by The Norwegian Physical Society and supported by the Department of Physics and Technology, University of Bergen, received 50+ contributions and the winners featured on the Norwegian IYL 2015 blog. The blog was constructed to publish texts on light applications and science in Norway and is to be continued as a resource for the interested public in Norway and for high school teachers in particular. A special issue of the magazine *Fra Fysikkens Verden,* as well as several articles throughout the year, focused on physics of light and light applications and light phenomena.

Third Prize winner in the Photo Competition organized by the Norwegian Physical Society. CREDIT: Jarle H. Moe.

Oman

Primary National Organizer: Oman Astronomical Society

Other National Partners: The National Commission for Education, Culture and Science, Ministry of Education, Sultan Qaboos Higher Center for Science and Culture, Muscat Festival (Muscat Municipality), Science club of the Ministry of Heritage & Culture.

Sponsors: Petroleum Development of Oman (PDO)

Estimated number of IYL 2015 activities organized: 12 events

Number of people reached by IYL 2015 Activities: 1,000,000 persons

General overview of IYL 2015 Activities in Oman

Oman had an early start to the International Year of Light 2015 (IYL 2015) activities with two events in late 2014 to ring in the worldwide celebration of light and light-based technologies. On 27 October 2014, the symposium, *Light: Unifying Theme (International Year of Light 2015),* was held during the *25th General Meeting of the World Academy of Sciences (TWAS).* In addition, there were presentations on IYL 2015 during the *Second Arab-American Frontiers of Sciences, Engineering, and Medicine Symposium* in Muscat 13-55 December 2014.

The official IYL 2015 launch was held over the week 1-7 January 2015. A meeting was held in Muscat, to chalk out the programme of activities in schools and parks. During that week, Oman participated in the *Globe at Night* worldwide initiative for reduction of light pollution and preservation of Starlight Reserves.

Raising awareness of light-pollution was one of the main goals of the International Astronomical Union's (IAU) *Cosmic Light* programme and was supported throughout the country with the organization of activities for school children in the framework of the global activity *International Night of Skyglow Observation* on 12 February 2015.

The chairman of Oman Astronomical Society presented a dedicated IYL 2015 lecture on the 25 March 2015, as part of Science and Innovation Festival in Alshifa bint Amer School. The National Commission for Education, Culture and Science celebrated the IYL 2015, in many school radios, scientific activities, in celebrations and exhibitions.

Another important global initiative celebrated in the country was the *Earth Hour* on 28 March 2015. A dedicated IYL 2015 *Earth Hour Talk* at the Grand Mosque in Muscat attracted many participants to listen to the importance of light regulation to Earth sustainability, scholars' findings, light technologies, and more. The event also included astronomical observations for the public.

Presentations on IYL during the Second Arab-American Frontiers of Sciences, Engineering, and Medicine Symposium, Muscat. CREDIT: Sameen Ahmed Khan.

From 14 January to 16 February 2016, the 1001 Inventions production *Ibn Al-Haytham: A Journey of Science from Darkness into Light* celebrating 11th century scientist Al-Hassan Ibn Al-Haytham, launched at the Muscat Festival. The show featured exhibits, interactive games and the screening of the Ibn Al-Haytham short film.

At Sohar and within the Astronomical Youngster Program, co-organized by the Science Cub of the Ministry of Heritage & Culture and Oman Astronomical Society; a special talk highlighted the important of lights at different scales, the goals of IYL 2015, great role of light technology in our modern lives, how the Holy Quran describe light and associated human enjoyments, etc.

Furthermore, PDO lunched a new show for its mobile planetarium. With collaboration with Oman astronomical society, this new show organized activities within the period from 17-23 November as part of Oman National Celebration. Finally, the IYL 2015 logo vividly shown as part of Astronomical Society online greeting addressing the national happiness of the safe return of His Majesty Sultan Qaboos to his nation and the country.

The number of participants in each of the aforementioned activities varied from a few hundred to thousands. The annual month-long Muscat Festival had about a million visitors. Importantly, some of the activities were extensively covered by newspapers and television stations across Oman. Moreover, the activities were backed by a series of outreach publications, covering the proclamation of IYL 2015; role of photonics in our lives; and Medieval Arab contributions to optics. A book on IYL 2015 was also written in Oman.

Pakistan

Primary National Organizer: National Center for Physics, Quaid-i-Azam University, Islamabad and Pakistan Academy of Sciences

Estimated number of IYL 2015 activities organized: 15 events

Number of people reached by IYL 2015 Activities: 4,000 persons

General overview of IYL 2015 Activities in Pakistan

Pakistan joined the International Year of Light 2015 (IYL 2015) initiative with a programme of activities that included lectures, workshops, symposiums, conferences, and outreach activities for the public and families.

The IYL 2015 was opened with the *Celebrating Light* event in Islamabad 2-3 February. During two days more than 200 students/researchers attended lectures delivered by experts in the field of light/lasers and synchrotron radiation.

The celebration of the IYL 2015 was also part of the International Scientific Spring (ISS-15) jointly organized by the National Centre for Physics and AS-ICTP, Trieste, Italy, from 16- 20 March 2015. This activity was attended by more than 320 young researchers.

A three-day international symposium on *Light and Life* was organized at COMSATS Institute of Information Technology (CIIT) in Islamabad from 14 to 16 October 2015 to celebrate the IYL 2015. This event was intended to provide a platform for discussing advancements in the study of light and light-based technologies, and its role in sustaining and enhancing the quality of life on this planet. The symposium consisted of plenary sessions, invited and contributed talks, poster/workshop sessions, and an exhibition. Renowned scientists and experts on light and light-based technologies from all over the world participated in the symposium.

A three-day symposium on *Lasers and its Applications* was jointly organized by the National Institute of Lasers and Optronics and Pakistan Institute of Engineering and Applied Sciences from 12 to 14 October 2015 to celebrate the IYL 2015. This event was attended by a large number of researchers from different universities and R&D organizations. Lectures about the lasers, light and different aspects of their applications were delivered by the experts.

The University of Malakand, in collaboration with the National Institute of Lasers and Optronics (NILOP), organized the *One Day Conference on the International Year (2015) of Light* in Chakdara on 24 November 2015. Students and faculty members from the different colleges and universities of the area as well as many people from the local community also participated in the event, reaching out to around 1,000 participants.

Participants of the IYL 2015 Walk in Karachi. CREDIT: Prof. Dr. Muhammad Aslam Baig.

The National Centre for Physics, Islamabad, and The Centre for Physics Education, Karachi, jointly organized a regional workshop on Active Learning in Optics and Photonics (ALOP) from 7 - 11 December 2015. The five-day activity was attended by about 15 teachers and researchers from all over Pakistan. Dr. Joseph Niemela, Dr. Souad Lahmer, Dr. Vasudeve Narain Lakshmi, Dr. Deepak Subedi, and Dr. Siti Hendon Abdullah were in charge of the workshop with Dr. David Sokolof as the Keynote speaker.

To say goodbye to IYL 2015, the Center for Physics Education organized a walk for teachers, students, and the general public in Karachi on 30 December 2015.

Panama

Primary National Organizer: Universidad Tecnológica de Panamá

Other National Partners: SENACYT

Sponsors: SENACYT

Estimated number of IYL 2015 activities organized: 2 events

Number of people reached by IYL 2015 Activities: 5,000 persons

General overview of IYL 2015 Activities in Panama

The main activity of the International Year of Light (IYL 2015) in Panama was the Active Learning of Optics and Photonics (ALOP) Workshop: An alternative for improving the teaching of physics in Panama, the event was attended by 35 participants.

The ALOP workshop brought significant changes in the country, for instance, knowledge of the applications of light, which create revolutionary technologies that directly improve the quality of life in the world; taking advantage of optics and photonics generates an important economic engine with the potential to revolutionize the 21st century and therefore improve the quality of life for Panamanians. With the development of the workshop, teachers can apply the skills acquired to obtain information, interpret, and make decisions on social, economic, natural or cultural individually or collectively, within the classroom and outside school.

The ALOP workshop helped train 35 physics teachers, which will provide a significant improvement to the teacher training at the national level. These teachers can help the existing academic community regarding the use of new methodology and the development of new technological applications. Through this project, they interacted directly with international scientists with vast experience in the area of physics education, which will help develop this subject at the national level. It will also help new researchers in the area of physics education and they can participate in national and international science activities, creating a stronger and more robust culture of research in the country. There is no doubt that the development of the ALOP workshop helped to propel the future development and generation of human capital, which will be the seed to generate wealth, and therefore progress through knowledge.

Another interesting activity organized during the IYL 2015 was *InterLumi Panama 2016.* The event was celebrated in Panama City 6-8 July 2016 and was the first international fair on LED illumination in the country that received over 5,000 visitors. The aim of the fair was to foster the development of the lighting industry in Latin America and the Caribbean market.

ALOP Workshop held at the Technological University of Panama. CREDIT: Abdiel Pino.

Peru

GalileoMobile Constellation Project activities in Peru. CREDIT: GalileoMobile.

Primary National Organizer: Pontificia Universidad Catolica del Peru

Estimated number of IYL 2015 activities organized: 3 events

Number of people reached by IYL 2015 Activities: 680 people

General overview of IYL 2015 Activities in Peru

GalileoMobile's Constellation Project started a network of schools in Peru to perform astronomical activities and connected them with schools in other five South American countries. During the International Year of Light (IYL 2015), GalileoMobile worked with the students through an online platform. The second part of the project included the organization of an expedition in the region around Cusco 7-26 November 2015, visiting four schools and five organizations to perform astronomical activities with the students as well as teacher training workshops. In total, GalileoMobile reached 378 students, 150 persons from the general public, and 10 teachers/educators.

In the city of Cajamarca, Peru, a highly acclaimed poetry recital was held that was part of the global event Women Scream International Poetry and Arts Festival on 17 March 2015 on the premises of the Regional Directorate of Culture. The event was organized by the Female Family Association, Healthy Family, Women Writers Association, and was attended by 70 persons.

The third IYL 2015 event registered in the country was a seminar at the Pontificia Universidad Católica del Perú in Lima on 23 June 2015 where Dr. Maxime Jacquot (Université de Franche-Comté, France) described the role of light in modern science. The event was a great success and was attended by 50 persons.

Philippines

Primary National Organizer: National Institute of Physics

Other National Partners: University of the Philippines System, Department of Science and Technology, National Research Council of the Philippines, Samahang Pisika ng Pilipinas, De La Salle Science and Technology Campus

Sponsors: College of Science, UP Diliman

Estimated number of IYL 2015 activities organized: 20 events

Number of people reached by IYL 2015 Activities: 50,000 people

General overview of IYL 2015 Activities in the Philippines

The Philippines celebrated with the rest of the global society in observing the International Year of Light and Light-based Technologies 2015 (IYL 2015).

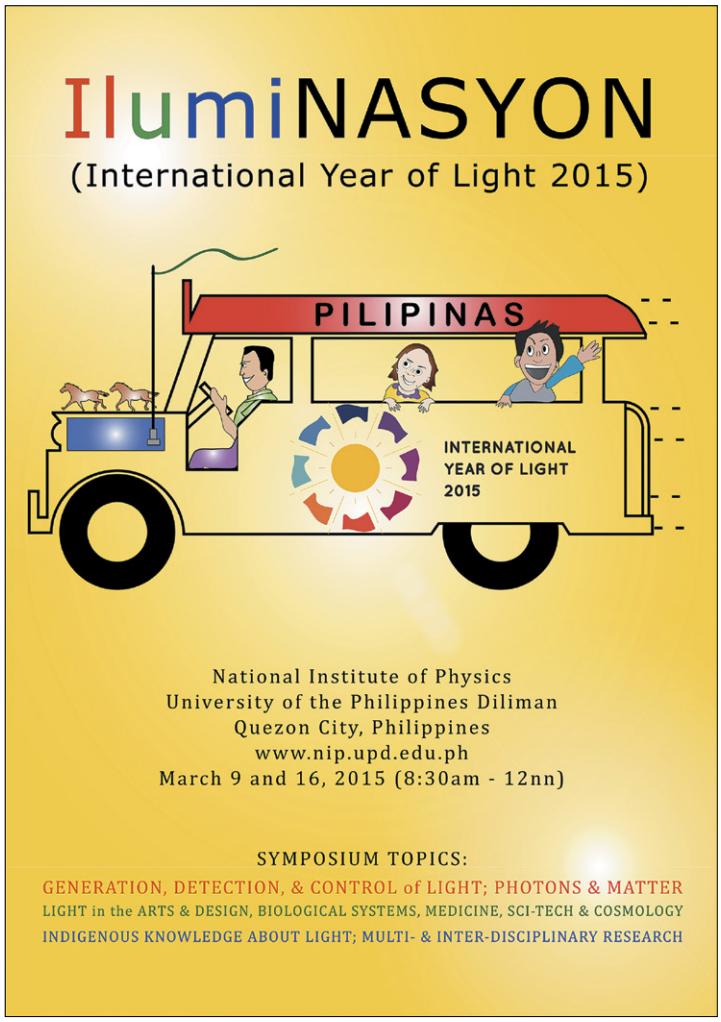
Aligned with the IYL 2015 goal of highlighting the importance of light technologies in people's lives and futures, and for the development of society, the National Institute of Physics, University of the Philippines held a two-day public symposium entitled *IlumiNASYON* on 9 and 16 March 2015. The symposium highlighted optics in the arts (visual choreography, cinematography, and artwork preservation), in Philippine history and culture (symbols, language, dances, community architecture, and indigenous knowledge), and in the basic and applied sciences (education, security, photomedicine, optical materials, evolutionary biology, biochemistry, photonics, atmosphere, and the cosmos). Based on feedback from the over 1,000 participants, the event was especially memorable due to the sharing of insights by experts from the different disciplines and the exchanging of ideas about light for possible future collaborations. Engaging the many stakeholders, we consider *IlumiNASYON* to be our main contribution to the goals of IYL 2015 and towards building an optics and photonics community in our region.

The Mind Museum in Taguig celebrated with a month of activities related to light in November 2015 with demonstrations about the science of light for guests of the museum. These guests included families, friends, and students from pre-school to university level.

The museum also partnered with the Goethe-Institut to host the 2015 Science Film Festival which showcased light and light-based technologies, in celebration of the International Year of Light. The activities reached around 40,000 people during the whole month.

A three-day international, multi- and interdisciplinary conference to celebrate the centennial of Einstein's General Theory of Relativity was held in De La Salle University in Manila and De La Salle University Science and Technology Complex in Laguna. It promoted quality research in all related fields as well as creativity in academics, in honor of Einstein's genius which was not limited to the natural sciences, but also included the arts and humanities, as well as global concerns.

The Photonics Research Laboratory of the National Institute of Physics at the University of the Philippines - Diliman Campus, organized the poetry contest *Light on Love,* receiving 25 entries from 19 scientists working in optics.



IlumiNASYON Poster. CREDIT: IlumiNASYON.

Poland

Primary National Organizer: Photonics Society of Poland

Other National Partners: Warsaw University of Technology, University of Warsaw, Military University of Technology, Białystok Technical University, University of Wrocław, Wrocław University of Technology, Silesian University of Technology in Gliwice, Polish Technological Platform on Photonics, Polish Academy of Sciences: Electronics and Telecommunications Committee, Polish Physical Society

Sponsors: Photonics Society of Poland, SPIE, OSA, Polish Technological Platform on Photonics, City of Warsaw, Polish Physical Society, Int. Liquid Crystals Society

Estimated number of IYL 2015 activities organized: 33 events

Number of people reached by IYL 2015 Activities: 100,000 people

General overview of IYL 2015 Activities in Poland

Throughout the whole of 2015 more than 30 events related to the International Year of Light (IYL 2015) were organized in Poland. However, the inauguration of the IYL 2015 activities in Poland started in 2014 with the celebration of the *Day of Photonics* on 21 October at the Faculty of Physics, Warsaw University of Technology (WUT).

The main international event was the *3rd Photonics Society of Poland (PSP) Symposium* organized in Warsaw over 8-9 April 2015 and was combined with *OPTONexpo - 3rd International Trade for Optoelectronics and Photonics.* The symposium gathered more than 100 PSP members, local government officials, trade exhibitors, students and young people interested in photonics and light-based technologies. Presidents of SPIE, OSA, Italian Society for Optics and Photonics (SIOF), as well the IYL 2015 Steering Committee Chair attended the event.

The PSP Gala took place in the evening of 8 April 2015 in the beautiful and historical building of the Faculty of Physics, WUT. The highest PSP award, the 2015 Prof. Maksymilian Pluta Award, was presented to Eugene Arthurs, SPIE CEO "in recognition of his outstanding and continuous support enabling first steps of a new e-journal *Photonics Letters of Poland.*" Prof. Jan Szmidt, WUT Rector, presented Eugene Arthurs, Philip Russell, and Toyohiko Yatagai gold medals celebrating the 100 Anniversary of the Revival of WUT.

In September 2015, an international conference on Optics of Liquid Crystals was organized in the Grand Hotel Sopot at the Baltic sea-side.

Gardens of Light is an international project whose aim is to promote unique historic gardens and museums from all over the world. The *Gardens of Light* encompassed the *Festival of Light* that took place from 2 to 30 August at the Royal Łazienki Park in Warsaw receiving around 70,000 visitors. Lovers of beauty admired the Chinese Garden illuminated with dozens of red lanterns. In 2015, the *Out of the Darkness* shows were performed at the closing of the Festival of Light. The play of lights and music, which revealed the fleeting beauty of the Royal Łazienki's nature, could be watched in front of the Palace of the Isle.

The IYL 2015 Polish Closing Ceremony for IYL 2015 was held on 17 March 2016 at the Faculty of Physics of the Warsaw University of Technology, in Warsaw, in the context with LIGHTtalk: The Power of Photonics from the LIGHT2015 project where several members of the industry in Poland gathered to discover the endless potential of photonics.

Recent Development in Photonics Symposium. CREDIT: Prof. Tomasz R. Wolinski.

Portugal

IYL 2015 art installation in Oporto. CREDIT: Fhara021.3.

Primary National Organizer: Portuguese Physical Society

Other National Partners: Ciência Viva - National Agency for Scientific Culture, UNESCO National Commission, Portuguese Chemical Society, National Biologist Association and the Portuguese Optics Society

Sponsors: Portuguese Foundation for Science and Technology, Ciência Viva Agency, and Gulbenkian Foundation

Estimated number of IYL 2015 activities organized: More than 1,000 events

Number of people reached by IYL 2015 Activities: More than 1,000,000 people

General overview of IYL 2015 Activities in Portugal

The Portuguese International Year of Light (IYL 2015) Opening Ceremony took place on 16 March 2015 at the Passos Manuel School, in Lisbon, with a lecture and a light show. The IYL 2015 was celebrated all over the country with a variety of scientific, educational, technological, and artistic initiatives.

The focus was on schools, recognizing the relevance of education for a sustainable future. The program *Bringing Light to Schools* promoted researcher's visits to schools for talking about and experimenting with light. It included teacher training in photonics using kits. Several exhibitions took place in Lisbon, Coimbra, Oporto, Aveiro (on holography organized by the national commission), etc. To celebrate not only the IYL 2015 but also the 725th anniversary of the Coimbra University, a video mapping projection was seen by more than 30,000 spectators. There were many light events like the Lumina Festival, in Cascais, light installations (a notable one in Oporto) and astronomy sessions (e.g., in the Alqueva Dark Sky reserve).

Several conferences took place during the IYL 2015, the most important of which was *Let There Be Light: Dialogues Around Light,* held on 15 December 2015 at the Gulbenkian Foundation, Lisbon, and the lecture given by NASA scientist and Nobel laureate John Mather in Oporto.

Three new theater plays and a movie were created.

IYL 2015 Art Show at Ciência Viva in Lisbon. CREDIT: Ciência Viva.

Several books were published: *A Biography of Light* (J. Tito Mendonça); *QED* (2. ed, R. Feynman); *Cosmicomix* (A. Babi and R. Piccioni); *History of Physics in Portugal in the 20th Century* (T. Peña and G. Figueira); *Dark Sky - Alqueva* (M. Claro); *Porto Cartoon World Festival - The Light; Light in books* (A. Campos); and *Let there be light* (3rd ed., J. Calado).

The IYL 2015 was covered by the media, with the help of the national news agency and national and local press. The reference newspaper *Público* published a special issue on the 100th anniversary of Einstein's Theory of General Relativity and published a series of articles (*Light as way and limit*). Public TV broadcast the IYL 2015 spot and interviews appeared in national public TV and radio. There were photo competitions, one organized by the national commission. The Post Office issued stamps on the IYL 2015 and the International Year of Soils.

The IYL 2015 was closed on 21 June 2016 with a lecture by Sir Michael Berry and a concert at Casa da Música, Oporto.

Puerto Rico

Primary National Organizer: Puerto Rico Photonics Institute (Universidad Metropolitana)

Other National Partners: Universidad de Puerto Rico-Río Piedras and Puerto Rico Symphony Orchestra

Sponsors: Puerto Rico Science, Technology and Research Trust, SPIE and OP-TEC

Estimated number of IYL 2015 activities organized: Over 28 events

Number of people reached by IYL 2015 Activities: Over 4,000 people

General overview of IYL 2015 Activities in Puerto Rico

Starting at the end of 2014 and throughout 2015, the Puerto Rico Photonics Institute (PRPI, Universidad Metropolitana) and the University of Puerto Rico (UPR) organized workshops, conferences, and participated in activities all over Puerto Rico with presentations to students, teachers, and the general public about the importance of light and photonics in our everyday life and the significance of 2015 being declared the International Year of Light and Light-based Technologies (IYL 2015).

We estimate more than 4,000 people participated directly in these events, and many more were impacted and attended the exhibitions or listened to or watched the radio and TV appearances related to IYL 2015. This effort was made possible by the efforts of PRPI and UPR, with the sponsorship of:

- Puerto Rico Institutions such as the PR House of representatives, the PR Science, Technology and Research Trust, the PR Symphony Orchestra, and Juvempleo.
- Organizations such as Casa Segura, SRI Arecibo Observatory, the Museum of Art of PR, C3Tec Museum, KV 265, and the PR Symphony Orchestra.
- Local and National Professional Societies, such as SPIE and OP-TEC.
- Other educational institutions such as University of Turabo, Caribbean University, and Ana G. Mendez University System TV Station.

At the state level, the Puerto Rico House of Representatives declared 2015 the International Year of Light and Light-Based Technologies (*Proyecto de la Cámara #2267*[1]) on 1 June 2015. Activities organized included conferences at different institutions, workshops for teachers, mini-workshops for K-12 students at summer camps and schools, visits of schools to the PRPI labs, continuing education programs for engineers and engineering students, development of two videos, radio and TV interviews, participation at STEM events, and exhibitions at libraries, universities, malls, and other venues.

The highlight of the IYL 2015 celebration in Puerto Rico was a three-day event hosted by PRPI that included continuing education and scientific conferences directed at the STEM community; an open house of the first dedicated photonics laboratory in Puerto Rico and the presentation of the first Technical Certificate in Photonics and Lasers; and a concert that merged the music performed by the Puerto Rico Symphony Orchestra with visuals on the science of light.

Dr. Greetchen Diaz of the Puerto Rico Science, Technology and Research Trust checks out the diffraction grating glasses at the Puerto Rico Photonics Institute Open House, celebrating the International Year of Light. CREDIT: Universidad Metropolitana.

Light presentation at the University of Puerto Rico Summer Camp (Rio Piedras Campus) for K-8th grades. Elementary students watch Tania Ortiz from the Puerto Rico Photonics Institute. CREDIT: CREDIT: Ruben Gordillo/Universidad Metropolitana.

1. http://www.tucamarapr.org/dnncamara/Documents/Measures/74c7b55f-3d6f-438f-b6c4-12bdb6db4a3b.pdf

Qatar

Photonics Middle East Conference 2015. CREDIT: TAMUQ Office of Marketing, Communications, and Events.

Primary National Organizer: Qatar University and Arab Scientific Community Organization (ArSCO)

Other National Partners: Qatar National Library, Qatar National Commission to UNESCO and UNESCO Doha Office and AlFaisal Without Borders Foundation

Estimated number of IYL 2015 activities organized: Around 10 events

General overview of IYL 2015 Activities in Qatar

The International Year of Light 2015 (IYL 2015) initiative in Qatar was inaugurated with an official ceremony on 18 February 2015 that was the first in a series of events throughout 2015 to celebrate and understand the importance of light and light-based technologies. The event included talks from Prof. Ilham Al-Qaradawi (Qatar University and IYL 2015 Qatar National Contact) and Dr. Daniel Glaser (Director Science Gallery, London, UK).

As part of the British Festival 2015, on 30 March 2015, the *Shedding Light on the Universe* event was presented. This was a free public science communication event with Dr. Maggie Adernin Pocock MBE, a leading space scientist from the UK and co-presenter of the BBC's *The Sky at Night,* and Prof. Al-Qaradawi. Attendees to this event took a trip through time and space to see how our ideas of the universe have evolved and how light has helped us develop our understanding of the universe.

The Qatar National Library (QNL), Qatar National Commission to UNESCO, and UNESCO Doha Office, with the kind support of the AlFaisal Without Borders Foundation, organized an exhibition on the legacy of the Islamic scholar Ibn Al-Haytham on the sideline of the international conference *Islamic Golden Age of Science for actual knowledge-based society: The Ibn Al-Haytham example* on 14 September at UNESCO HQ in Paris, France. The exhibition included a short film on QNL's efforts to preserve Islamic archives and manuscripts relating to the history of Qatar and the Arab and Islamic world. The exhibition also showcased selections of important texts authored by Ibn Al-Haytham displayed on interactive touch-screens such as *Discourse on Light, The Light of Planets,* and *The Light of the Moon,* as well as manuscripts highlighting the influence of Ibn Al-Haytham in Europe, including an Arabic treatise on a geometrical topic copied in Leiden and a book on Ibn Al-Haytham's optics printed in Basel (Switzerland) in 1572.

On 13-15 December 2015, we hosted one of the crowning IYL 2015 events in the country, the *Photonics Middle East Conference 2015,* the first conference focused on photonics in Qatar. The conference was attended by 100 scientists and encompassed major fields of photonics, including three days of plenary, invited, and contributed lectures, and poster presentations. It brought together world-renowned experts and researchers from the Middle East.

The IYL 2015 was closed with the *Ibn Al-Haytham Days* event 15-16 December 2015. The two-day event targeted school students and teachers with lectures, demonstrations, competitions, and hands-on activities to highlight the great work of Ibn Al-Haytham who established optics as a science and authored the first book on optics.

At the international level, Qatar also joined the celebration of World Metrology Day on 20 May 2015.

Republic of Korea

IYL 2015 proclamation ceremony and commemoration seminar held in the National Assembly of Korea. CREDIT: Prof. Jeong Weon Wu, Prof. Byoungho Lee.

Primary National Organizer: Optical Society of Korea (OSK)

Other National Partners: Korea Research Institute of Standards and Science, The Korean Information Display Society, The Korean Physical Society, Gwangju National Science Museum

Sponsors: Ministry of Science, ICT and Future Planning, Ministry of Trade, Industry and Energy, Korean National Commission for UNESCO, LG Innotek, Korea Foundation for the Advancement of Science and Creativity, Korea University Research and Business Foundation, Busan Metropolitan City, Korea Institute of Machinery and Materials, Gyeongsangbuk-do, The Korea Federation of Science and Technology Societies, The Korean Academy of Science and Technology

Estimated number of IYL 2015 activities organized: 50 events

Number of people reached by IYL 2015 Activities: 30,000 people

General overview of IYL 2015 Activities in the Republic of Korea

The International Year of Light 2015 (IYL 2015) activities in Republic of Korea were a great success with 50 events involving more than 30,000 people all over the county.

The activities were composed of light exhibitions, light photo competition, IYL 2015 special seminars, international scientific conferences with IYL 2015 special sessions, public lectures, school activities, and student competitions on light science and engineering.

The IYL 2015 in Korea was officially opened with passing the Resolution in Support of the IYL 2015 at the National Assembly of Korea on 16 February 2015. The declaration ceremony was held on 11 March 2015 at the National Assembly to celebrate the resolution. The ceremony was attended by nearly 200 people including science and technology policy makers and leading optical scientists and engineers. The opening ceremony discussed the major themes of the year, paying special attention to the education and importance of photonics for the country.

Starting from this resolution, a variety of IYL 2015 activities were planned and activated.

Some of the events in the year-long program included the *LED/OLED Expo and LED Industry Forum* in Kintex, Ilsan on 23-26 June 2015, the *Summer Conference of OSK* celebrating both the 25th Anniversary of OSK and the IYL 2015 in Gyeongju on 13-15 July 2015, and the *Conference on Lasers and Electro-Optics Pacific Rim (CLEO PR)* in Busan on 24-28 August 2015.

At the *OSK Conference* in Gyeongju, leaders of major foreign societies participated as panelists in the discussion on the future of light science and technologies. At CLEO PR, there were IYL 2015 special lectures by Prof. Hiroshi Amano, 2014 Nobel Laureate in Physics and others. More than 900 people attended the conference and lectures.

One of highlights of the IYL 2015 was the *Creative Optical Experiments Program* for middle and high school students and instructors, which aimed to popularize interesting optical experiments by publishing a handbook of optical experiments and performing those experiments with high school students. Also, there was a separate nation-wide competition program for high school students for experiments that show the importance of the use of light for our lives.

Besides these, other IYL 2015 activities were organized all over the country and major mass media reported on these activities many times during the year.

The closing ceremony of the IYL 2015 activities in the Republic of Korea was held on 20 January 2016 in Daejeon at the Winter Meeting of OSK. The ceremony summarized the major activities organized during the IYL 2015.

Republic of Moldova

Primary National Organizer: Academy of Sciences of Moldova

Other National Partners: Alecu Russo State University of Balti, Technical University of Moldova and Institute of Applied Physics

Sponsors: State Agency on Intellectual Property of the Republic of Moldova, Alexander von Humboldt Foundation, European Optical Society, Center for Outreach in Photonics

Estimated number of IYL 2015 activities organized: 7 events

Number of people reached by IYL 2015 Activities: 500 people

General overview of IYL 2015 Activities in the Republic of Moldova

The International Year of Light (IYL 2015) was celebrated in the Republic of Moldova with seven events involving around 500 persons.

The first organized event was the conference *Light and Photonics: Science and Technologies* held on 20 May 2015 at the Alecu Russo State University of Balti, attended by scientists from Moldova and Romania. Scientists from 16 research institutions and universities from the Republic of Moldova and Romania gave three plenary and 40 oral presentations at three conference sessions dedicated to scientific, technological, and educational aspects of the light and light-based technologies. The reports focused on involving light in the study of materials, the impact of solar light on the ionospheric and ionosphere processes, and strengthening the scientific base for practical application of light and light-based technologies in various fields. An important feature of the conference was the massive participation of young researchers. More than 70% of presentations were given by researchers under 30 years of age, demonstrating continuity in the research process.

A Humboldt Workshop on the topic *Science and Society: The Use of Light* was held in Chisinau on 22-26 September, and included reports by scientists from Moldova, Germany, Romania, and other countries. A light show was organized at the end of the workshop for the general public.

A workshop entitled *Light in Life* was organized by the Institute of Applied Physics, where the scientific community and industry engineers gathered to bring forward and discuss various applications of photonics, their significance and impact to our everyday life while highlighting innovative, pioneering, and efficient technological applications present in Moldavian photonics research and industry.

Moldova also participated in IYL 2015 events at the international level such as the *SPIE MicroTechnologies Conference,* Barcelona, Spain, 4-6 May 2015. Prof. Ion Tiginyanuthe, Prime-vice president of the Academy of Sciences of Moldova, served as Chairman of the conference. He also edited the proceedings of the conference – *Proc. SPIE 9519, Nanotechnology VII.*

A team from the Republic of Moldova participated at the *11th international conference Micro- to Nano-Photonics IV-ROMOPTO 2015,* 1-4 September 2015 in Bucharest, Romania, which was dedicated to IYL 2015.

Opening of the conference Light and Photonics: Science and Technologies on 20 May 2015 at the Alecu Russo State University of Balti, Moldova. CREDIT: Dr. Habilitate Veaceslav Ursachi.

Romania

Primary National Organizer: The Romanian Academy

Other National Partners: The National Institute of Physics and Nuclear Engineering, The Physics Department of the University in Bucharest, and The UNESCO Chair at Horia Hulubei Foundation, The Cultural Centre of Bucharest - ARCUB and Bucharest City Hall

Estimated number of IYL 2015 activities organized: 45 events

Number of people reached by IYL 2015 Activities: 150,000 people

ROMOPTO 2015 International Conference. CREDIT: Academician Ionel Valentin VLAD.

General overview of IYL 2015 Activities in Romania

The International Year of Light (IYL 2015) was celebrated in Romania with several international conferences and workshops at advanced levels, with conferences, round tables and various outreach activities, at a popular science level, and by a variety of activities developed by astronomy clubs all over the country.

The most important international conferences and workshops organized under the aegis of the IYL 2015 were:

- The Congress *Lights of the World,* Bucharest, 29 October-1 November 2015 was hosted by the Romanian Parliament Palace, the second largest building in the world after Pentagon. The congress was one of the biggest events devoted to the IYL 2015 in Southeastern Europe. A total of 342 participants from around the world, outstanding personalities from science, cultural, and education, researchers, managers, politicians, and opinion leaders joined the congress. This complex event consisted of plenary talks and presentations in parallel sessions on science, education, culture, space, society, sustainable development; a gale of movies and short films, multimedia presentations; shows demonstration of sound and light; book trade, exhibitions of artistic photography and other cultural values.
- The *International Workshop on Advances in Nanophysics and Nanophotonics,* Magurele, Bucharest, 31 August-2 September 2015, featured several sections devoted to nanophotonics, laser physics, solar energy conversion, and thermonuclear fusion. The workshop was organized by The National Institute of Physics and Nuclear Engineering, The Physics Department of the University of Bucharest, and The UNESCO Chair at Horia Hulubei Foundation. The workshop was attended by about 100 researchers and specialists in nanophotonics from Italy, Macedonia, Bulgaria, Serbia, Moldova and Romania from these countries.

The Bucharest Centre for Cultural Projects (ARCUB) organized the first edition of *Spotlight - The International Bucharest Light Festival* with IYL 2015. The event integrated a number of artworks, installations, architectural lighting and video mapping systems. Much of the projects of the Romanian artists were made especially for this event. The partnership with the Signal Festival of Prague ensured the presence of some international artists. More than 130,000 people celebrated together with Bucharest City Hall and ARCUB's first edition of Spotlight. The event was free for all visitors.

ASTROFOTO is a national event organized every two years since 2000. The 8th edition was celebrated in 2015 (not in 2014) to celebrate the IYL 2015 under the slogan "the Light: less from us, more from stars!" There was a national contest for astrophotography in two categories: young people (with 4 sections) and seniors; also, a special category of time-lapse and video for both; the winners gala show was broadcast live at TV Columna Romania.

Amateur astronomers were very much involved and devoted their activities to the IYL 2015, including public observations of the solar eclipse on 20 March 2015. Several summer schools were organized by some astro clubs, for instance in Barlad (June 2015) and Galati (August 2015), the last one followed by the *Deep-Sky Astronomy Campus,* organized in Luncavita, Macin Mountains, one of the most suited regions for astronomical observations in Romania.

A number of outreach activities devoted to the IYL 2015 took place during the European Researchers Night (25 September 2015), in about 20 towns in Romania.

Russian Federation

Primary National Organizers: Russian Academy of Sciences (RAS), Lomonosov Moscow State University (MSU), St. Petersburg Academic University (SPbAU RAS) and St. Petersburg University of Information Technologies, Mechanics, and Optics (ITMO University)

Estimated number of IYL 2015 activities organized: Over 50 events

Number of people reached by IYL 2015 Activities: Over 7,800,000 people

General overview of IYL 2015 Activities in Russia

The International Year of Light 2015 (IYL 2015) attracted great interest in the Russian Federation, with the Russian Academy of Sciences, Moscow City Administration, and major universities all over the country joining in the celebrations of this international event. The events targeted different audiences, including young researchers and prominent scientists as well as children and the general public, and were fully in harmony with the aims of the IYL 2015.

A major highlight of the Year was the lecture *2015: Year of Light. Efficient Light Generation and Conversion* by Nobel Laureate and Rector of the St. Petersburg Academic University, Zhores Alferov, (the first IYL 2015 event in 2015 in Russia). Prof. Alferov gave the lecture first at his university and then in the Russian Parliament and in universities and schools in Kaliningrad, Moscow, Samara, Sevastopol, Simferopol, and Sochi.

Education and outreach were the main aims of the exhibition *Light: Beyond the Bulb,* the science festival *September the zeroth* (Krasnoyarsk), the festival *LumiFest* and film and light installation competitions accompanying the *Lighting Design 2015* conference (ITMO University).

Paying a tribute to Russian optical physicists was a constant of many events including the *16th International Feofilov Symposium* (ITMO University, Kazan University, and Ioffe Physico-Technical Institute), the *39th Symposium on Luminescence in memory of Sergey Vavilov* (Lebedev Physical Institute of the RAS) and the *10th International Symposium on Display Holography ISDH 2015,* held in Russia for the first time, in memory of Yuri Denisyuk.

Another highlight was the *Charitable College on Physics and Education in Laser Science and Optics* (Lomonosov Moscow State University) aimed at bringing light into the souls of gifted children who for various reasons are unable to realize/perceive the grandeur of optical science and laser physics.

Optics and Spectroscopy, the leading Russian academic journal in these fields, dedicated its September and October issues to the IYL 2015 with review and original articles on contemporary optics and its fundamental and applied significance, adapted to beginner researchers.

Another IYL 2015-dedicated event was the literary competition *Words & Light,* which gathered over 430 entries from all over the world.

Finally, major events in the country became a part of the IYL 2015 including the *12th International Workshop on Quantum Optics* (Moscow State Pedagogical University and Institute for Spectroscopy of the RAS), the *4th National Congress of Young Scientists,* the *9th International Conference of Young Scientists and Specialists Optics 2015,* the *National Optical Engineering Olympiad* (ITMO University), the *4th International Forum on Energy Efficiency and Energy Saving* (Moscow), the trade fairs *Interlight Moscow* powered by *Light+Building 2015* and *ElectroTech Siberia* (Novosibirsk), the *Industrial Lighting 2015 exhibition* (St. Petersburg), and the iconic *10th Circle of Light Moscow* international festival.

Bolshoy Theatre in Moscow illuminated during the Circle of Light Moscow International Festival 2015. CREDIT: Circle of Light Moscow International Festival 2015.

Saudi Arabia

Primary National Organizer: AMOP division and Saudi Physical Society

Other National Partners: Al-Jouf, Jazan, KAUST and Al-Imam Universities, Mishkat and KACST

Sponsors: Saudi Physical Society, Al-Jouf, Jazan, KAUST and Al-Imam Universities, Mishkat and KACST

Estimated number of IYL 2015 activities organized: 10 events

Number of people reached by IYL 2015 Activities: Around 3,850 people

General overview of IYL 2015 Activities in Saudi Arabia

Celebrating the International Year of Light (IYL 2015) started off during the 2nd International Atomic, Molecular, and Optical Physics (AMOP) Meeting, which took place at the main campus at Al-Jouf University in the Al-Jouf Region of Saudi Arabia, 31 March–1 April, 2015. This meeting was jointly organized by The Saudi Physical Society (SPS), AMOP division and Al-Jouf University and included a special session devoted to the setting up of the international workshop *Ibn Al-Haytham* to highlight the optics contributions of Arab scholars in the Islamic golden age for IYL 2015. This was followed by number of activities including conferences, competitions, festivals, exhibitions, and workshops.

Here is a list of major activities in the country:

- The Jazan University organized a conference as well as a photo and poster contest. The theme of this contest was, "A World of Light: The Vital Role That Light and Light-Based Technologies Play in Daily Life."
- Al-Imam Mohammad Ibn Saud University organized a seminar about the nature of light, a student competition, and also an exhibition.

Activities in Noor Festival in Riyadh city. CREDIT: Ibn Al-Haytham International Working Group.

- The Saudi Quality Council organized the *6th Measurement Forum,* as part of the World Metrology Day 2015 theme "Measurements and Light."
- Another interesting activity was the *Noor Festival,* organized by the Mishkat Interactive Center for Atomic and Renewable Energy in Riyadh city. The *Noor Festival* provided enjoyment through learning for school students, families, and visitors in Riyadh City. It offered a unique opportunity to see light from a new perspective, to understand it through a modern concept combined with the festivity of exploration.
- The Computer, Electrical, and Mathematical Science and Engineering Division (CEMSE), and Physical Science and Engineering Division (PSE) of King Abdullah University of Science and Technology (KAUST) celebrated the IYL 2015 with a special program to promote the deeper understanding of the latest achievements in light research and explore the history of light.
- In Yanbu, educational workshops were organized for schools. The main focus was on the basic principle of light and its importance in our lives.

Senegal

Primary National Organizer: LAM Network and Laboratoire Atomes Lasers

Other National Partners: Institut Panafricain de Stratégie, Association des Astronomes du Sénégal, Orange Sonatel and Ministère Enseignement Superieur

Sponsors: ICTP, IUPAP, ISP, SPIE, Institut Panafricain de Stratégie, University Cheikh Anta Diop, Lam Network and Sonatel orange individuals

Estimated number of IYL 2015 activities organized: 2 events

Number of people reached by IYL 2015 Activities: More than 500 people

General overview of IYL 2015 Activities in Senegal

To celebrate the International Year of Light 2015 (IYL 2015) in Senegal, the National Committee organized two main events in the country:

- From 18 to 27 November 2015 in Saly, the LAM 11 international workshop to celebrate the IYL 2015 was held featuring optics, photonics, and lasers in science and technology. In addition, during the same periods, we also organized the *African Spectral Imaging Network* workshop on laser microscopy. This scientific meeting consisted of invited and contributed papers, poster sessions, exhibitions, and laboratory demonstrations.
- The national campaign *Light to the People:* This campaign consisted of bringing light to schools in remote areas of Senegal that have no access to electricity. This campaign in different regions in Senegal was really a great success as it gave children the opportunity to study at night. It consisted of the LAM Network in collaboration with the Institut Panafricain de Strategies, the Association of Senegalese Astronomers, Orange Sontel cell phone company, and civil society in Senegal to deliver solar lamps to be used also as cell phone chargers, to schools and people in remote villages. We were able to reach many regions in Senegal and the LAM network will continue the campaign with the possibility of extending the programme to other African countries in the future.

LAM 11 international workshop in Saly, Senegal. CREDIT: Prof. Ahmadou Wagué.

Serbia

Primary National Organizer: Optical Society of Serbia

Other National Partners: Vinča Institute of Nuclear Sciences, Radijus Vektor, Marker CRM, Faculty of Mathematics, Faculty of Physics, University of Belgrade, Center for the Promotion of Science and Institute of Physics Belgrade

Sponsors: Radijus Vektor and Marker CRM

Estimated number of IYL 2015 activities organized: 37 events

Number of people reached by IYL 2015 Activities: 10,000 people

Workshops *Shimmering* and *Light Walk 2015*: Workshops on the topic of light were organized in collaboration with several school institutions and art and dance studios in Belgrade. Results of this program and children's luminous creations were presented on the October 3rd, in the Light Walk through Belgrade's city center, as celebration of the IYL 2015. CREDIT: Milovan Milenkovic.

General overview of IYL 2015 Activities in Serbia

The International Year of Light (IYL 2015) celebrations in Serbia were attended by around 10,000 people all over the country.

Numerous activities were successfully carried out, including various popular and academic lectures about the importance of light and light-based technologies in science, life, and art; seminars and workshops; exhibitions; open-days for laboratories and universities; summer schools; competitions for the best experiments in optics and the best photo; and an IYL 2015 commemorative stamp. The authors of the best experiments went on to participate in the *LightFest* in Birmingham, UK.

Traveling exhibition Spectra: The exhibition dedicated to light covering six ranges of electromagnetic radiation, made its two month journey across Serbia. Each range is a showcase for itself and consists of several interactive exhibits where visitors can try out and test the properties of electromagnetic waves. CREDIT: Neda Mojsilovic.

The opening ceremony for the IYL 2015 took place in the Museum of Science and Technology in Belgrade and discussed the major themes of the IYL 2015, paying special attention to the benefits that photonics can bring to the developments of the country.

The central activity of the IYL 2015 in Serbia was the International School and Conference on Photonics: *PHOTONICA 2015,* held in August 2015 in Belgrade. Lectures were given by top experts in optics. Within the framework of the regular conference program, we organized three workshops for students.

The event *Belgrade of Light,* a multidisciplinary platform, was dedicated to the promotion and development of a culture of light, encouraging discussion, integration and exchange of experience and knowledge in the areas of contemporary art expression, architecture, and design that use light as a media. Workshops on the topic of light were organized in collaboration with several school institutions and art and dance studios in Belgrade. Results of this program and children's luminous creations were presented on 3 October, during the *Light Walk* through the Belgrade's city center.

Citizens of Serbia joined the *iSPEX-EU* campaign to measure air pollution with smartphones as part of the EC-funded *LIGHT2015* project. The Serbian national committee organized the exhibition *Light: Beyond the Bulb* in several cities in Serbia for almost two months (1 July to 15 August 2015), which was seen by thousands of people. During this period, on 10 July, there was a National Day of Science in Serbia, and the whole day was dedicated to the promotion of the exhibition, supported with science busking.

The IYL 2015 was closed with a ceremony in Belgrade and included a two-storey scientific truck which contained room for experiments, popular lectures, workshops, and other activities for visitors of all ages.

Singapore

Primary National Organizer: Nanyang Technological University

Other National Partners: IEEE Photonics Society Singapore Chapter, OSA Singapore Section, The Photonics Institute (TPI), CNRS International-NTU-Thales Research Alliance (CINTRA), LUX Photonics Consortium

Sponsors: School of EEE, Nanyang Technological University

Estimated number of IYL 2015 activities organized: 60 events

Number of people reached by IYL 2015 Activities: 1,800 people

General overview of IYL 2015 Activities in Singapore

Nanyang Technological University is an International Year of Light 2015 (IYL 2015) Gold Sponsor. With the support of various regional organisations and societies it organised more than 40 technical and 20 social events in Singapore.

Both the *Photonics Global Conference* and the *Photonics Global Student Conferences* were organised in Singapore and Prof. John Dudley was invited as keynote speaker. An IEEE Photonics Society Chapter Forum was hosted in Singapore for the first time.

IYL 2015 helped to bring awareness of light and light-based technologies to Singapore. Many technical and social events were organised to allow students/researchers/professionals in this area to meet and collaborate. The *Photonics Global Conference* and the *Photonics Global Student Conference* were very successfully organised in 2015.

Various training workshops and industry networking sessions were organized to provide platform for students, researchers, and academics to meet and exchange ideas on photonics.

The *LUX Photonics Consortium* was established in 2015 to create a platform to promote translational research and industry collaborations in Singapore. The *LUX Photonics Consortium* has progressed at a rapid pace since its inception. We have since organised members' networking events, partnered with The Photonics Institute to organize the TPI Conference, and participated in our first industry event—IoT ASIA recently which received good media coverage.

IEEE Photonics Society Student Chapter Members. CREDIT: IEEE Photonics Society Student Chapter.

Slovakia

Primary National Organizer: International Laser Center (ILC)

Other National Partners: Slovak University of Technology in Bratislava, SOVVA, CVTI, Nuit Blanche, Slovak National Museum, Slovak National Theatre and Old Town of Bratislava

Sponsors: Kvant and LEDeco solution

Estimated number of IYL 2015 activities organized: Around 50 events

Number of people reached by IYL 2015 Activities: 150,000 people

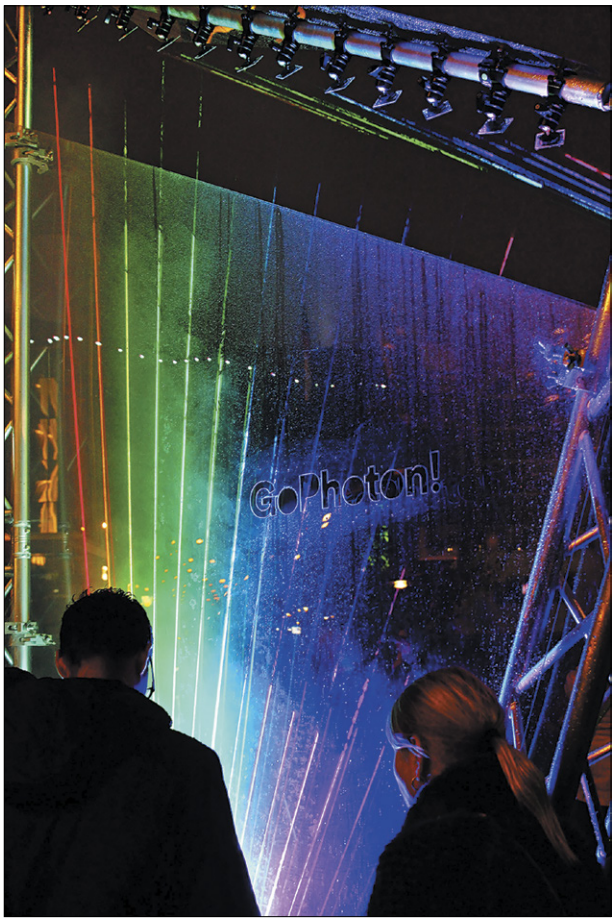
General overview of IYL 2015 Activities in Slovakia

The total estimated number of International Year of Light (IYL 2015) events that have been organized in Slovakia is around 50. A dedicated website[1] was created as a hub for different events, such as science and art festivals, lectures, conferences, exhibitions, workshops, light-shows, school and public science activities, etc. More than 150,000 people all over Slovakia benefited from collaborative efforts of partners from academic, industry, art, and public sectors. The activities were supported by three EC projects: *GoPhoton!, Photonics4all,* and *LIGHT2015,* and many local sponsors and supporters.

The IYL 2015 in Slovakia was based on several key events accompanied by many smaller activities. The annual national-scale science festivals *European Researchers' Night* (25 September 2015) and the *Week of Science and Technology* (9-13 November) highlighted photonics and light-based technologies with exhibitions, shows, and interactive stands prepared by International Laser Centre. For the first time, the art festival *Nuit Blanche*[2] was organized in Bratislava (10 October 2015) and together with the new *Festival of Light*[3] (10-12 October 2015) brought more than 100,000 people to the streets of the Slovak capital. Another highlight of the IYL 2015 was the Photonics Splash week, organized by ILC with support of *GoPhoton!*[4] and *Photonics4all*[5], providing workshop for teachers, a student's congress on photonics, hands-on activities, scientific lectures, and light shows, including the annual event *Day of Photonics*[6] organized under the EPIC framework and reaching out to several hundred people.

Among other interesting activities organized by industrial partners and sponsors, were *Light Expo*[7] and the festival *Light and Shadow*[8] in Banska Bystrica, the photo contest of the Slovak Association of Astronomers and the *Laserlab-Europe*[9] user training workshop on light-based technologies in Trnava.

The closing ceremony for IYL 2015 activities in Slovakia was celebrated on 11 February 2016 during the annual conference Fotonika 2016, summarizing the major activities organized during the IYL 2015.



Laser Harp activity during the Photonics Splash Week organized by the project GoPhoton! CREDIT: GoPhoton!

Tower of Light. CREDIT: P. Trojan Kvant.

1. www.roksvetla.sk
2. www.bielanoc.sk
3. www.artoflight.eu
4. www.gophoton.eu
5. www.photonics4all.eu
6. www.epic-assoc.com/advocacy/day-of-photonic
7. www.light-expo.eu
8. www.svetlo-tien.sk
9. www.ilc.sk/training/laserlab/trnava

Slovenia

Primary National Organizer: Lighting Engineering Society of Slovenia

Other National Partners: University of Ljubljana, Faculty of Electrical engineering and Slovene Society for Photomedicine and Photobiology

Sponsors: Bioptron, Votan, Semos, Tomy FE, Fervital, PVR Center, Hartmann, Lumenia, GE, Vigred, Javna razsvetljava and Zumtobel

Estimated number of IYL 2015 activities organized: 15 events

Number of people reached by IYL 2015 Activities: 800 people

General overview of IYL 2015 Activities in Slovenia

In Slovenia, we organised around 15 activities in connection with the International Year of Light 2015. The activities were mainly organised by the Lighting Engineering Society of Slovenia[1] and the Faculty of Electrical Engineering at the University of Ljubljana. A Slovenian IYL 2015 national website[2] was created with all relevant information about IYL 2015 and about activities in Slovenia.

On 20 March 2015, we had an official opening of IYL 2015 events at the Faculty of Electrical Engineering in Ljubljana. Seven distinguished Slovenian professors from different fields of light and photonics were invited to the event. After the lectures, there was also a small reception with opportunities to exchange different opinions about light. On the same day, it was also possible to observe a partial solar eclipse from different locations in Slovenia. The biggest event was organised by DMFA[3] in one of the major squares in centre of Ljubljana.

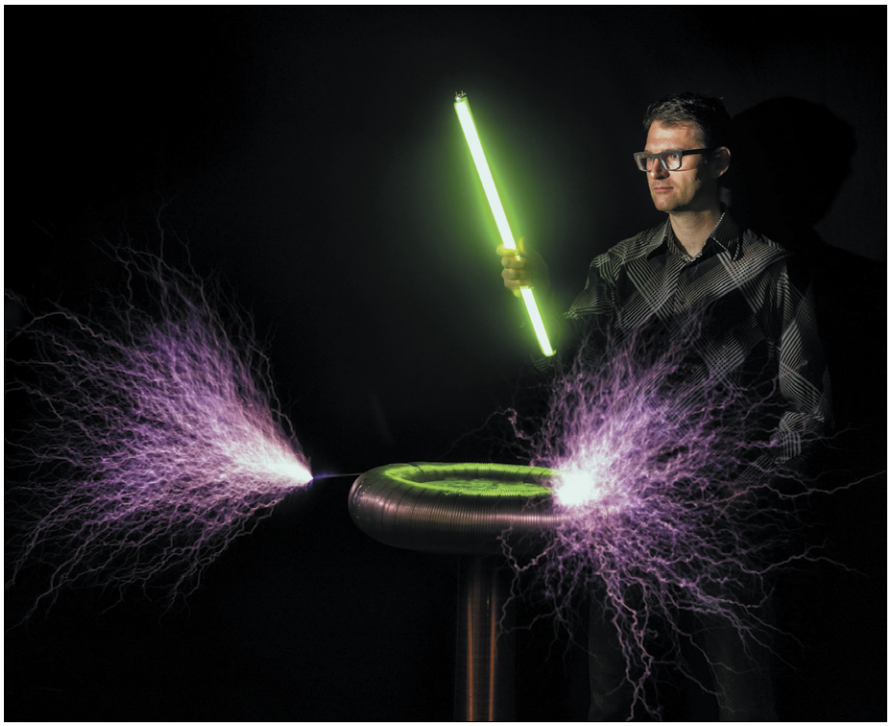
During all of 2015, there were several events in the Technical Museum of Slovenia[4]. They organised the lecture *The Universe Inspires Me,* the workshops *Days of Electrical Engineering* and *Days of Physics* and the event *Days of the Planetarium*.

At the Faculty of Electrical Engineering in Ljubljana we organised the *22nd Conference on Optical Communications* and an Open lab day. On Open Lab Day, it was possible to visit two laboratories—dark rooms with different measurement equipment and various hands-on experiments.

The Lighting Engineering Society of Slovenia also organised the two-day conference, *Lighting Engineering 2015*. On the first day of the conference there were invited lectures mostly from the fields of human centric lighting and biologically active lighting. SDR also organised several workshops in schools and kindergartens. As reported by the workshop organisers, those were some of the best activities and events organised in the scope of IYL 2015. Children were really amazed by what you can do with light.

Many activities were also organised by *Svetlobna Gverila*[5] (Lighting Guerrilla Program). This program is part of the international project Spectrum: Light interaction in Public Spaces. Every year, including in 2015, they create lighting installations in various locations in public spaces.

We are sure that there were many more events and activities in Slovenia, but unfortunately organisers did not report them to the IYL 2015 official website or to the Slovenian IYL 2015 website.



Tesla Coil at the Faculty of Electrical Engineering, University of Ljubljana. CREDIT: Arne Hodalic.

1. http://www.sdr.si
2. http:/iyl2015.fe.uni.lj.si
3. http://www.dmfa.si
4. http://www.tms.si
5. http://www.svetlobnagverila.net

South Africa

Laser projection at the New Year's Eve party at the V&A Waterfront in Cape Town, South Africa. CREDIT: Andrew Forbes.

Primary National Organizer: University of the Witwatersrand

Other National Partners: Department of Science and Technology, CSIR National Laser Centre, U. Stellenbosch, University of Pretoria and NSTF

Sponsors: Department of Science and Technology

Estimated number of IYL 2015 activities organized: over 90 events

Number of people reached by IYL 2015 Activities: 170,000 people

General overview of IYL 2015 Activities in South Africa

South Africa carried out just over 40 formal events throughout the International Year of Light 2015 (IYL 2015), and in addition, hosted approximately one public or school lecture per week throughout the year, amounting to a total of over 90 events. The target audience in many instances was school children and the public, with some specialist talks and events for university students and professionals. It is estimated that a minimum of 20,000 school children and members of the public were "reached" directly, with a further 150,000 at the major New Year's Eve closing event at a popular tourist spot. On top of this, the IYL 2015 was covered extensively by local media in print (44%), online (43%) and through radio and television broadcasts (13%), with over 100 news stories featuring the IYL 2015 as a dedicated story and even more as companion stories to National Science Week (65 mentions), the Minister of Science speeches (31 mentions), Scifest (14 mentions) and through the University of the Witwatersrand media releases (13 mentions). The media stories were covered in seven languages, five of them African, and across all regions of the country.

Notable achievements of the IYL 2015 in South Africa were the country-wide nature of the activities—something not often experienced because of the rural nature of some areas—and the legacy that the IYL 2015 has left through educational material now made available to schools and teachers. For example, a special issue of the educational magazine, *QUEST*, was put together with tutorial articles on light.

Some examples of activities are given below:

OUTREACH

As an example of outreach under the IYL 2015, a year-long programme was run in Mamelodi, a previously disadvantaged region of South Africa. Five local schools were targeted, reaching over 400 pupils. As part of the programme, staff were trained in the teaching of "Light" and materials for educational purposes were

established at a local training centre. A unique feature of this initiative was the outreach not only to scholars but to community members, too. A Sun Stove competition was run and 23 unemployed community members were taught how to build their own solar heating systems. The impact of the Mamelodi programme is expected to be felt for years to come.

WORKSHOPS

Many workshops were held during the IYL 2015 at various locations across the country, targeting audiences in physics, chemistry, education, medicine, and biology. The main event for the year was the workshop on *Fibre Optics: Light in action from science to technology,* which took place successfully from 28 September – 2 October 2015 at the University of Fort Hare (Alice, Eastern Cape) with delegates housed in the nearby town of Hogsback. The tutorial/technical talks were given by established and emerging experts in the field in a format of one tutorial talk on the basics of the field, followed later by one technical talk highlighting the current state-of-the-art.

In total, the workshop hosted just over 50 student delegates and 10 invited delegates, plus several University of Fort Hare staff members as well as a local artist. The total delegate count was approximately 80, of whom 37 were non-South Africans from over 25 countries. The location was chosen to celebrate the legacy this particular university has left Africa through educating its leaders, e.g., Nelson Mandela.

A second workshop was held in the Eastern Cape for educators in analytical chemistry where attendees built their own spectrophotometer. The device is a low cost version of commercial systems and is suitable for teaching purposes. The Eastern Cape is one of the poorest regions of South Africa. This device and the teaching around it won an international education award in 2015. Each educator was able to return to their home institute with the built device to continue with the implementation of teaching spectroscopy using practical devices.

The annual physics conference was used as a platform to promote the IYL 2015 through a workshop on light hosted by the photonics division, as well as a special laser performance at the closing of the conference. The occasion was used to give a public lecture to young students on light-based technologies, and to distribute information on careers in physics.

Finally, in Johannesburg, a workshop was held at the University of Johannesburg to promote the use of lasers in the medical and clinical sciences. The audience of more than 100 were given introductory lectures by national and international experts.

ART

A feature of the South African programme was the inclusion of a strong "art and science" aspect by artist Marcus Neustetter. The art and science programme covered remote regions of the country such as Sutherland (Karoo), derelict buildings and construction sites in downtown Johannesburg, Kaboega, and Hogsback, and results in several very visual exhibits featuring light.

The Art and Science of Light, courtesy of artist Marcus Neustetter. Delegates from across the globe gathered in the remote town of Hogsback in South Africa. At the opening of the workshop the delegates explored the world of art and light with Marcus. CREDIT: Marcus Neustetter.

PUBLIC AWARENESS

In order to close the IYL 2015 with a bang, South Africa hosted two laser projection shows at the V&A Waterfront site in Cape Town on New Year's Eve 2015. The public could see the spectacular displays and were encouraged to "follow the light" to the source. At the source, they found the story of the IYL 2015 and the impact of light-based technologies, with students and staff on hand to explain what it all meant. Leading up to New Year's Eve, the V&A Waterfront embraced the concept and provided free promotion via live slideshows running continuously in the public amphitheatre from the 16 December through to the end of 2015, with hundreds of thousands of onlookers. It is estimated that over 150,000 people passed through the V&A site on New Year's Eve only.

Spain

IYL 2015 Opening Ceremony in Spain. CREDIT: ICFO.

Primary National Organizer: Spanish IYL 2015 National Committee

Other National Partners: Sociedad Española de Óptica (SEDOPTICA), Real Sociedad Española de Física (RSEF), Asociación de Profesionales del Diseño de la Iluminación (APDI), Centro de Láseres Pulsados de Salamanca (CLPU), Comité Español de Iluminación (CEI), Fundación Española de Ciencia y Tecnología (FECYT), Instituto de Óptica (CSIC), Instituto de Investigación en Energía de Cataluña (IREC), Institut de Ciències Fotòniques (ICFO), Universitat Autònoma de Barcelona, Universitat de Barcelona, Universidad Complutense de Madrid, Universidad de Granada, Universidad Miguel Hernández (UMH), Universidad Nacional de Educación a Distancia (UNED), Real Academia de Ciencias Exactas Físicas y Naturales de Madrid, Reial Academia de Ciencies i Arts (RACAB), Sincrotrón ALBA and Southern European Cluster in Photonics (SECPhO)

Sponsors: Iberdrola, Red Eléctrica de España, AMBILAMP, Lasing S.A. and MTB Tecnología de Precisión

Estimated number of IYL 2015 activities organized: 1,000 events

Number of people reached by IYL 2015 Activities: 1,000,000 people

General overview of IYL 2015 Activities in Spain

The coordination of activities related to the International Year of Light (IYL 2015) celebration started in Spain in May 2014, when the Spanish Committee of the IYL 2015 was constituted in Barcelona under the leadership of Prof. María Josefa Yzuel. Soon after, the national webpage[1] was launched. On 16 February 2015, the Spanish opening ceremony took place in the Poliorama Theatre of the Royal Academy of Sciences and Arts of Barcelona with the participation of 500 attendees.

The IYL 2015 Spanish Committee assembled various business and institutional support. To highlight, the creation of the Spanish Committee of Honor of the IYL 2015 was composed of important personalities from the academic and business worlds, and chaired by Her Majesty Queen Letizia of Spain.

Several companies, such as Red Eléctrica of Spain, Iberdrola, Lasing, Ambilamp, and MTB Lasing Precision Technology, collaborated with the Spanish Committee of International Year of Light through the sponsorship program provided for this purpose.

Since the beginning of 2015, more than a thousand events have been organized all over the country to attract media attention on the cultural aspects of light (science, technology, and art). The activities have been very diverse: conferences (> 100), seminars, exhibitions, workshops, industry meetings, educational, and citizen science activities (> 200), light-focus artistic events (around 40), competitions, special awards, etc. Also there has been extensive dissemination through articles published in newspapers (> 40) and broadcast on TV interviews and radio (around 40). Finally, a multitude of resources have been generated in all types of media to bring the phenomenon of light and its associated technologies to society. Examples of this are 57 informative posters (free download), 37 popularizing articles published in print and online press (>40), informative videos (around 30) and 10 special publications issued on the occasion of this anniversary.

The IYL 2015 closing ceremony in Spain took place at the Auditorium of the Spanish National Research Council (CSIC) on Tuesday, 24 November. The Chairman of the International Steering Committee of the International Year of Light, John Dudley, attended to the ceremony.

1. www.luz2015.es

Sudan

Participants at the IYL 2015 Closing Ceremony in Sudan. CREDIT: UNESCO.

Primary National Organizer: The Sudanese Committee of Atomic, Optics, and Laser Sciences

Estimated number of IYL 2015 activities organized: 3 events

Number of people reached by IYL 2015 Activities: 500 people

General overview of IYL 2015 Activities in Sudan

On 30 March 2016, the UNESCO Representative to Sudan, Dr. Pavel Kroupkine, participated in the closing ceremony for the International Year of Light 2015 (IYL 2015) in Sudan, organized by the Sudanese National Commission for Education, Science, and Culture. The ceremony brought together physicists from different Sudanese universities, who made significant contributions to its warm atmosphere. Welcoming speeches were delivered by the General Secretary of the National Commission, Dr. Abdulgader Noureddin, by the Chair of the Science Committee in the National Commission, Prof. Ali ElTahir Sherifeldin, by the Deputy General Secretary of the National Commission, Dr. Wafaa Sidahmed, and by the Head of the Khartoum office and UNESCO Representative to Sudan, Dr. Pavel Kroupkine. After the speeches, the participating physicists made several presentations about different aspects of the science of light.

Sweden

Primary National Organizer: Photonic Sweden and the Swedish National Resource Centre for Physics Education

Other National Partners: Royal Academy of Sciences, Alingsås kommun, Linköpings kommun, Lund Laser Center, Lund University, Belysningsbranschen, Ljuskultur, Stockholms university, Royal Institute of Technology, Nordita, Vetenskapens Hus, Oskar Klein Centrum, Albanova universitetscentrum, Chalmers, Thorlabs, Swedish Physical Society, Rymdstyrelsen and PhotonicSweden

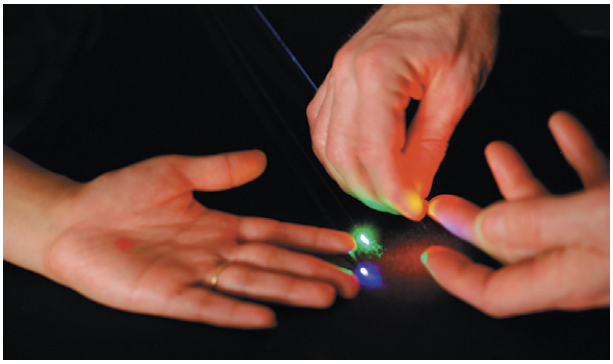
Sponsors: Royal Academy of Sciences, Alingsås kommun, Linköpings kommun, Lund Laser Center, Lund University, Belysningsbranschen, Ljuskultur, Stockholms university, Royal Institute of Technology, Nordita, Vetenskapens Hus, Oskar Klein Centrum, Albanova universitetscentrum, Chalmers, Thorlabs, Swedish Physical Society, Rymdstyrelsen, PhotonicSweden and Swedish National Resource Centre for Physics Education

Estimated number of IYL 2015 activities organized: 65 events

Number of people reached by IYL 2015 Activities: 150,000 people

General overview of IYL 2015 Activities in Sweden

Over 60 events have been carried out during the International Year of Light (IYL 2015) in Sweden. The initiative brought together people with many different backgrounds, including physicists from different areas, science educators from schools, university and science centers, artists, event managers, photonic industry representatives, experts on indoor and outdoor lighting, for planning meetings in August 2014. The diversity reflects that the IYL 2015 is about so many more things than any single group can imagine.



High school students playing with optical fibers and various LED light sources, to investigate the wavelength dependence of the absorption and strong scattering of light in tissue. CREDIT: Nina Reistad.

Light is magic. It is invisible when travelling and is revealed only when interacting with matter. CREDIT: Christian Vildinge.

Since no earmarked funding was available for the Swedish celebrations, we decided to include light-related themes or activities in festivals, magazines, teacher conferences, and lecture series, and use a dedicated website[1] to collect information about the various activities. Monthly themes, featuring suggested observations, experiments and links to more material, included: lighting the environment, light for health and life, invisible light, sunlight, radiation safety, light in the service of research, tips for the summer holidays, and light and art. A Facebook page[2] was created to share activities, articles, photos, movies, and other interesting links, as well as a YouTube channel to present researchers working on different aspects of light, from fundamental properties to applications in a wide variety of fields.

The activities included light-shows, school activities, teacher workshops and a photonics breakfast, lectures, conferences, festivals, and open-days at laboratories. MAX-IV arranged teacher days, and light was also the theme for Lise-Meitner days for upper-secondary students arranged by the Swedish Physical Society. The Royal Academy of Science arranged a 275 year Jubilee symposium in Lund. Large-scale outreach events included: *Physics in the Kungsträdgården,* Stockholm; *Lights in Alingsås, Light Festival in the Dome of Visions; Light Day in the Gustavium Museum,* Uppsala; *The Night of the Light in the Nobel Museum;* and *Winter Lights,* Linköping.

In addition, light-related articles were written in a number of magazines, and a special issue of *Fysikaktuellt,* "Year of Light," was distributed to secondary schools. Preschool teachers were invited to present their explorations of light with children and parents, and a prize was awarded during a national preschool science teaching conference.

The IYL 2015 has given all of us expanded networks that will influence future work. The year of light has come to an end, but will remain with us through the years to come.

1. www.ljus2015.se
2. https://www.facebook.com/ljus2015/?fref=ts

Switzerland

Primary National Organizer: Swiss Physical Society and Swissphotonics

Other National Partners: Universities and Photonic Companies

Sponsors: Swiss Physical Society, Swissphotonics, Universities and Photonic Companies

Estimated number of IYL 2015 activities organized: 100 events

Number of people reached by IYL 2015 Activities: 6,000 persons

General overview of IYL 2015 Activities in Switzerland

The International Year of Light 2015 (IYL 2015) celebrations in Switzerland were organized in all German-, French-, and Italian-speaking cantons by the Swiss Physical Society (SPS), addressing the academic side and by Swissphotonics contacting the industry. Consequently, the majority of events occurred within the fields of science, technology, and science education, while contributions from culture, art, museums, theatres, concerts, and schools were organized more by individuals or other networks. All together, we counted more than 50 officially registered IYL 2015 actions, but we estimate at least twice as many events were organized outside our field of scientific and technical view.

We had to learn rather early how to efficiently reach the mass media such as newspapers, journals, and television. A group of physicists and engineers prepared a special press kit, which was distributed by many photonic firms in our network to their local public media. Each firm pointed out the opportunities of modern photonics to create new jobs. This nationally coordinated and regionally focused action, using companies to relay the IYL 2015 message, successfully increased the public awareness of IYL 2015. As special highlights we mention:

- In the SPS-Communications, we published a first-hand account of Emil Wolf and the emergence of the theoretical framework of photonics in 1959[1], one year before the laser was invented. Both nearly simultaneous events catapulted optics to its modern variant, photonics.
- On 7 November 2015, the École Polytechnique in Lausanne (EPFL) proposed a special day dedicated to light for 7 to 13 years old youngsters and the general public. During the whole day, youngsters had the opportunity to attend physics and chemistry hands-on workshops. They attended a conference on the Northern Lights, where all participants got a certificate.
- The IYL 2015 closing event in Switzerland was organised at EPFL under the title *The Power and Wonder of Light*[2] under the sponsorship of many international companies. About 500 participants attended lectures by many prestigious speakers as well as speeches by the President of the European Physical Society, of the Swiss Photonics Networks, and the Swiss Physical Society.

The enthusiastic youngsters at the EPFL after spending half a day on hands-on experiments. CREDIT: EPFL - Murielle Gerber.

1. http://www.sps.ch/en/articles/history-of-physics/recollections-of-max-born-14
2. http://www.light2015.ch

Thailand

Opening celebration of LED-Expo 2015: a series of National Colloquia on Light seminars. CREDIT: Keattisak Sripimanwat.

Primary National Organizer: ECTI Association

Other National Partners: IEEE Communication Society Thailand chapter, and National Astronomical Research Institute of Thailand

Sponsors: BTFP – NBTC and RASA

Estimated number of IYL 2015 activities organized: 42 events

Number of people reached by IYL 2015 Activities: 50,000 people

General overview of IYL 2015 Activities in Thailand

The International Year of Light (IYL 2015) celebrations in Thailand were a great success involving more than 50,000 people all over the country. Statistics were collected from 25 reports out of 42 registered events. About half of the total were organized by primary national organizer of national partners, others were from individual organizers.

The activities included lectures, multi-day conferences, exhibitions, festivals, public observations, light-shows, competitions, school activities, telescope and solar cell donations and implementations, books distribution, science camps, workshops, colloquiums, and special seminars. Academic and R&D institutions, associations, as well as public companies and schools, were the main hosts.

The kick-off for IYL 2015 in Thailand was with the first seminar of a series on *Visible Light Communications (VLC),* organized with the annual LED-Expo 2015 in May.

A number of events and non-registered events for IYL 2015 were organized individually before 2015 and throughout the year. IYL 2015 was successfully promoted via various news channels, it then motivated people to set up their own activities nation-wide in order to join IYL 2015.

One of the highlights was at the closing of IYL 2015 in Thailand. It was celebrated on 22 December 2015 together with the Hanoi (Viet Nam) contact node, in a special seminar entitled *Visible Light Communication (VLC) Seminar: Toward ASEAN VLC consortium.* This went along with the establishment of the ASEAN Economic Community (AEC) for Southeast Asian Countries integration on the final day of IYL 2015.

Tunisia

Primary National Organizer: Optical Society of Tunisia STO

Other National Partners: Physical Society of Tunisia STP, Astronomical Society of Tunisia SAT, Faculty of Sciences of Tunis FST and Engineering School of Communication of Tunis SUPCOM

Sponsors: UNESCO, ICTP, ICO, SPIE, OSA, ALC, ELSEVIER, Ministry of Higher Education and Scientific Research, Ministry of Education

Estimated number of IYL 2015 activities organized: 23 events

Number of people reached by IYL 2015 Activities: Around 3,500 people

General overview of IYL 2015 Activities in Tunisia

The International Year of Light (IYL 2015) celebrations in Tunisia started in December 2014 with a UNESCO-endorsed workshop entitled *Shedding Light on the Contributions of Muslim Scholars to Science and Technology* which, in the framework of the IYL 2015 early-bird events, aimed to shed light on research and innovations that have been carried out by the Muslim scholars and polymaths of the golden era of Islamic sciences. It is worth noting that the Tunisian Academy of Sciences considered this workshop as a major activity in its 2014 calendar of activities and kindly accepted to host the event in the Beït Al-Hikma palace in Carthage. This event served as the opening ceremony of IYL 2015 in Tunisia. The activities continued throughout the entire year and included public lectures, scientific conferences, courses, workshops, student competitions, and school activities.

Efforts were dedicated to the organisation of hands-on activities in more than six secondary schools in marginalized regions of Tunisia. The participants were given a fundamental introduction to innovative topics in optics and photonics and their applications—especially in communications (optical fibers and wavelength multiplexing). Young students (under 15 years) were motivated to start a successful career in science or engineering using low-cost equipment. Another interesting activity was the organisation of the one-week workshop *Lighting UP Africa* to provide experience in the use of the active learning methods and methodology in optics and photonics, including the use of experiments and hands-on exercises, class and group discussions, and conceptual evaluation. Participants from more than 10 African countries were introduced to novel, low-cost experiments based on lasers, LEDs, optical fibres, photodetectors, etc. to build their own setup. Great efforts had been made to ensure the implementation and sustainable use of the experiments at the African universities involved in the workshop. The 2015 OSA President Prof. Philip Russell and SPIE CEO Dr. Eugene Arthurs were among the speakers.

Tunisia was also involved in the organisation of the IYL 2015 opening and closing ceremonies as well as in helping to coordinate IYL 2015 activities celebrating Ibn Al-Haytham's work in optics.

IONS Tunis 2015 Conference. CREDIT: IONS Tunis Conference.

Turkey

Primary National Organizer: Selçuk Aktürk

Other National Partners: Aydınlatma Türk Milli Komitesi and Türk Atronomi Derneği

Estimated number of IYL 2015 activities organized: 50 events

Number of people reached by IYL 2015 Activities: 20,000 people

General overview of IYL 2015 Activities in Turkey

Turkey had a vibrant celebration atmosphere during the International Year of Light 2015 (IYL 2015). There was a broad spectrum of participants from diverse fields ranging from academia to arts, and high schools to industries. The number of major events and announcements registered in the national website[1] exceed 50, with estimated participants of around 20,000. There were also large number of events organized by local individuals (high school teachers, science museums etc.) in various cities.

The activities included multiday scientific conferences, symposia, industrial exhibitions, academic seminar series, photography contests, art exhibitions, competitions, workshops, and various other school-related events.

Camera obscura demonstration in the Museum of History of Islamic Science and Technology, Istanbul. CREDIT: Light and Shadow Conference.

The participants of summer school *Light and Shadow*. CREDIT: Light and Shadow Conference.

1. http://isik2015.fe.itu.edu.tr

Group photo from FOTONIK 2015. CREDIT: Fotonik 2015.

One of the major light events in Turkey is the *Annual Optics, Electro-Optics, and Photonics Workshop,* or *FOTONİK Çalıştayı* in the local language. IYL 2015 had coverage in both 2014 and 2015 meetings held in Kocaeli and Ankara. National Node Selçuk Aktürk made opening speeches for IYL 2015. These workshops were attended by nearly 500 people from academia, industry, and government organizations. Other scientific conferences in which IYL 2015 was represented include the *National Astronomy Meeting; Congress on Molecular Sciences; Congress of Optics, Electro-optics and Photonics; Photodynamic Therapy Day;* and many others. Many universities organized seminar series in the broad field of light sciences.

A particularly interesting event was the conference on the history of light, a week-long event held in Istanbul. The participants had a chance to hear about contributions of great optical scientists such as Ibn Al-Haytham and also visit the Museum of the History of Islamic Science and Technology, where a model of Al-Haytham's "camera obscura" was demonstrated.

IYL 2015 also made big impact in light-related industries. Industry-related events include the *LED Lighting Fair, Day of Photonics,* and *CIE GOLD - Global Open Lab Days* and *Lighting Congress.*

High school students were involved in many IYL 2015 activities. These include photography contests, reducing light pollution project competitions, and open-lab days. The National Ministry of Energy sponsored a week of efficiency, where thousands of students participated, competed, and learned about the opportunities that light presents for solving global efficiency challenges.

Finally, numerous art-related events were organized with special emphasis on light. These include youth photography contests (in Bursa, Kocaeli, Istanbul, etc.) and art exhibitions using the theme of light.

United Arab Emirates

Primary National Organizer: United Arab Emirates University

Other National Partners: Dubai International Film Festival and Abu Dhabi International Book Fair

Sponsors: 1001 Inventions and Science Film Festival

Estimated number of IYL 2015 activities organized: 10 events

General overview of IYL 2015 Activities in United Arab Emirates

The International Year of Light (IYL 2015) was widely celebrated throughout the United Arab Emirates (UAE).

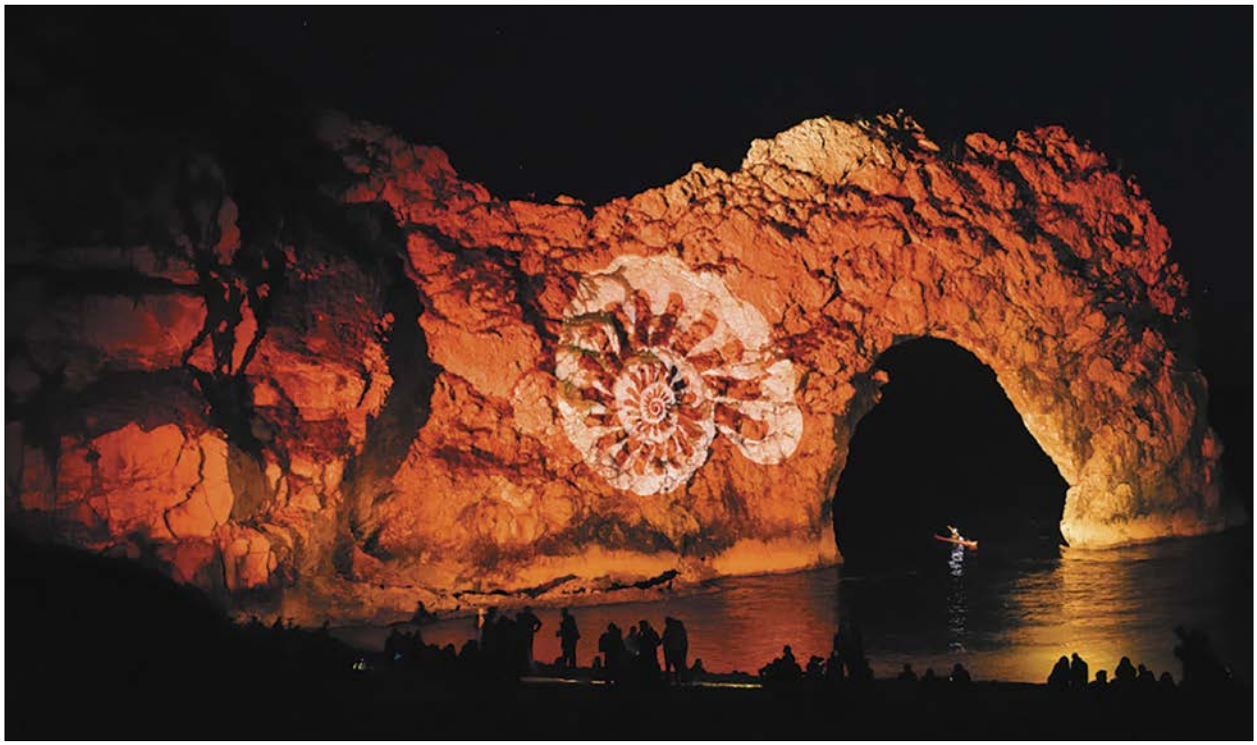
Light Middle East is the largest dedicated trade event for urban, architectural, theatrical, and retail lighting in the Middle East to spotlight innovative product development, current design trends and invaluable technical know-how. The *10th edition of Light Middle East* was organized 6-8 October 2015. The event featured 370 exhibitors from 33 countries and received over 6000 visitors from 85 different countries throughout the three days.

A two-day Light Festival was hosted at the UAE University in Al Ain 2-3 November. A light exhibition was featured as a key component of the festival. Showcasing student projects on various applications and experiments related to light and optics, the exhibition included a visual representation of sound, water level indicators, dark-detecting LEDs, and bending of light. The event also hosted activities such as colour, light and brain tests, light painting, light quiz night, LED Throwie Board, and an astronomy observation night. As part of the agenda, a series of talks and presentations under the theme "Lighting our Future" were conducted to examine a spectrum of topics ranging from science and technology to motivation and inspiration. The festival also hosted a workshop for students of different age groups.

The organization 1001 Inventions celebrated the achievements of Ibn Al-Haytham with two events. First, the world premiere of the short-film *1001 Inventions and the World of Ibn Al-Haytham* was held at a red carpet event during the 12th edition of the Dubai International Film Festival in December 2015. 1001 Inventions also introduced a children's book about Ibn Al-Haytham at the Abu Dhabi International Book Fair (ADIBF) on 27 April 2016. This launch was part of a special show organised by 1001 Inventions in partnership with ADIBF to honour Ibn Al-Haytham in celebration of its main theme "Reading the Past to Define the Future."

In the UAE, the *Science Film Festival 2015,* which had a theme around light to celebrate IYL 2015, was organized in cooperation with SciFest Dubai and Children's City in Dubai as a joint festival. Visitors to the festival could discover the different potentials of light and the many ways light applications affect our daily lives. More than 1000 children and teenagers attended the six-day long festival at Children's City Dubai. On 9 and 10 October 2015, the Science Film Festival was presented at the Fujairah Science Club by invitation from the Fujairah Culture and Media Authority. Students from various schools of the Emirate Fujairah watched scientific films and jointly engaged in experiments and activities. In November, the festival was presented by the Sheikh Mohammed Bin Khalid Al Nahyan Cultural Centre on its premises in Al Ain. During the three-week long festival, a total of 1500 children and teenagers visited the centre. For students of the UAE University in Al Ain, the film on OLED, the light-technology of the future, was offered at a special screening, followed by a discussion with experts.

United Kingdom of Great Britain and Northern Ireland



The Jurassic Coast UNESCO World Heritage Site, illuminated during the Night of Heritage Light, a project organised by the Society of Light and Lighting on 1 October 2015. CREDIT: Night of Heritage Light.

Primary National Organizer: Institute of Physics

Other National Partners: AWE, Engineering and Physical Sciences Research Council, Fraunhofer UK, Imperial College, Knowledge Transfer Network, Royal Astronomical Society, Science and Technology Facilities Council, SPIE, Scottish Universities Physics Alliance and Wellcome Trust

Sponsors: Scottish Government, Society of Light and Lighting, Ogden Trust, South East Physics Network, South of England Photonics Network, ER Productions, Bosca, European Optical Society and European Physical Society

Estimated number of IYL 2015 activities organized: 400 events

Number of people reached by IYL 2015 Activities: Almost 2 million (media coverage reached over 5 million)

General overview of IYL 2015 Activities in the United Kingdom of Great Britain and Northern Ireland

The 400 events organised during the International Year of Light 2015 (IYL 2015) in the UK targeted a wide range of audiences and took many forms, including scientific conferences, mixed science-and-arts events for the general public, talks, workshops, and resources specifically aimed at school children and their teachers.

IYL 2015 in the UK focused on five key objectives:

1. Promote light technologies for improved quality of life. Nearly 2 million participants in events, and over 5 million reached through the media, were exposed to the key message of the IYL 2015—the importance of light and light-based technologies. Some events were specifically designed to carry this message directly to politicians and opinion formers.
2. Promote women's empowerment in science. Some events focused specifically on career prospects for women (e.g. the *Women in Optics Workshop* held at City University in April 2015).
3. Promote education amongst young people. "Education" was reported as the purpose of 41% of events for which details were available. In addition,

a portfolio of educational resources for teachers and students was curated for the national committee

4. Promote sustainable development. UK partners strongly supported the aims of IYL 2015's *Study after Sunset* project, to help over 1.5 billion people in the developing world with no access to grid electricity, for whom sunset means darkness or reliance on a kerosene lamp. During 2015, IOP worked closely with UK charity SolarAid to support their work in distributing solar lanterns in rural Africa
5. Energise existing public engagement networks and create new cross-discipline collaborations that will thrive after 2015. Cross-disciplinary collaboration has been the hallmark of the IYL 2015 in the UK, bringing together academia, industry, and the arts. "Arts" events represented 29% of events for which details were available.

Highlights of the year, which give a flavour of the extent and variety of events, included:

- The launch event, hosted in St James' Palace by His Royal Highness the Duke of York, patron of IYL 2015 in the UK. The event highlighted applications of light, in particular the work of SolarAid, a UK charity which distributes solar lanterns in rural Africa. Launch events were also held in Scotland, Wales, and Northern Ireland.
- *GoPhoton!,* an EU-funded project run throughout 2015 at Imperial College London, which aimed to raise awareness of photonics among the general public.
- *Light Works,* an outdoor exhibition of images taken with different wavelengths of electromagnetic radiation, created by the Royal Photographic Society. Light Works toured a number of venues around the UK.
- The *Light in our Lives* film festival, commissioned and digitally hosted by IOP's member magazine *Physics World,* on international applications of light and light-based technologies.
- *Maxwell's Torch,* an illuminated mobile artwork created by the Institute of Physics in Scotland with funding from the Scottish Government.
- STFC's *Incredible Power of Light* roadshow, which toured venues around the UK to highlight UK expertise in laser science and its application.
- Commemorative stamps issued by Royal Mail for IYL 2015 as part of their *Inventive Britain* series. The stamps commemorated the invention of fibre optics and catseyes.
- The award of a special prize for a light-related project at the Big Bang Fair, supported by the Ogden Trust.
- Two separate events organised by the Parliamentary and Scientific Committee, to highlight IYL 2015 and raise awareness of the photonics sector, sponsored by the Department for Business, Innovation, and Skills and the Photonics Leadership Group.

A garden of light, specially designed for the Royal Horticultural Society's Tatton Park Flower Show in July 2015. CREDIT: University of Southampton.

- *On Light,* a festival run jointly by the Wellcome Collection and University College London in May 2015.
- *Light Fantastic,* a summer exhibition at the National Media Museum in Bradford, supported by Arts Council England.
- *Harwell Open Week,* organised in July 2015 by STFC and opened by HRH The Duke of York, which included many light-themed activities.
- Three *Year of Light Gardens,* at the Royal Horticultural Society's Tatton Park Flower Show in July 2015, which were featured by gardening broadcaster Monty Don in BBC coverage.
- *iSPEX-EU,* a Europe-wide citizen science project organised in the UK by the IOP and the University of Manchester, enabling participants to measure atmospheric pollution using smartphones.
- *Night of Heritage Light,* a project organised by the Society of Light and Lighting to illuminate nine World Heritage Sites across the UK on 1 October 2015.
- *Light and Dark Matters,* a series of cross-cultural events organised collaboratively between the IOP and Tate Modern in November 2015.
- The UK closing ceremony in January 2016, with events for primary and secondary school children, an outdoor laser display, and a reception addressed by HRH The Duke of York.

United States of America

Primary National Organizer: SPIE, the international society for optics and photonics

Other National Partners: American Institute of Physics (AIP), American Physical Society (APS), IEEE Photonics Society (IPS), the Optical Society (OSA), and the National Science Foundation (NSF)

Estimated number of IYL 2015 activities organized: 277 events

Number of people reached by IYL 2015 Activities: 320,000 people

General overview of IYL 2015 Activities in the United States of America

NSF Director France Córdova welcoming guests to the Light for a Better World Celebration of US Innovation at the National Academy of Sciences. CREDIT: Jason Bardi, AIP.

The International Year of Light 2015 (IYL 2015) effort in the United States of America was led by a group of scientific Societies. Each partner society organized and funded independent events and participated in a collaborative event in Washington, DC, with the support of the National Science Foundation (NSF). Many professional societies, conference organizers, universities, regional clusters, science centers, art organizations, libraries, and government agencies participated in the celebration of light and light-based technologies throughout the year, organizing 277 activities that touched over 320,000 people. Events included artists and technologists developing renewable energy art, photography competitions, and laser shows as well as talks, lab tours, and science demonstrations on microscopy, holography, and polarization.

The IYL 2015 had great political support in the country, for instance, the IYL 2015 was highlighted to the United States Senate with a statement that appears in the US Congressional Record for 17 December 2015.

On 12 September 2015, two events were held in the

Light Beyond the Bulb Exhibit in the US Senate Rotunda. CREDIT: Krisinda Plenkovich, SPIE.

Wonders of Light Family Science Fun event at the Smithsonian National Museum of the American Indian. CREDIT: Krisinda Plenkovich, SPIE.

nation's capital, Washington, DC that drew 1,000 participants. These events were organized by the national partner societies and funded by the National Science Foundation. The Smithsonian National Museum of the American Indian hosted *The Wonders of Light: Family Science Fun,* a daytime educational event featuring demonstrations on light science for school-age children and parents. Hands-on activities at the event included, among the 17 displays, an LED-light Radiance Orb provided by Light at Play Inc. that changed color with music or motion, an interactive video game that used sensors, and a green screen science reporter experience. In the evening, the US National Academy of Sciences hosted *Light for a Better World: A Celebration of US Innovation.* The event began with NSF Director, France Córdova as the lead speaker, and featured talks by 2014 Nobel Prize winners Shuji Nakamura (Physics) and Eric Betzig (Chemistry), GE Lighting Manager Gerald Duffy, and AIM Photonics CEO Michael Liehr.

The *Light: Beyond the Bulb* exhibition, curated by the Chandra X-ray Center/Smithsonian Astrophysical Observatory program was used extensively in the United States as a tool for informing the general public about IYL 2015 with over 60 documented events. The exhibit showcased 75 professionally curated images with descriptive captions covering a variety of light-based topics from microbiology to astronomy and creating connections with physics, optics, photonics, atmospheric and earth sciences, and astrophysics. Exhibit locations included the O'Hare Airport in Chicago, Illinois; the Intel Science Fair in Pittsburgh, Pennsylvania; and the US Senate Rotunda in Washington, DC.

The 2015 Fitzpatrick Institute for Photonics Annual Meeting from 9-10 March 2015 in Raleigh, North Carolina, included Nobel Laureate speakers and many panel discussions covering themes in science and development.

Uruguay

Photo exhibitions in the Rodó Park in Montevideo. CREDIT: Florencia Veres.

Primary National Organizer: Uruguayan Physical Society

Other National Partners: Universidad de la República

Sponsors: Agencia Nacional de Investigación e innovación and ANII

Estimated number of IYL 2015 activities organized: 8 events

Number of people reached by IYL 2015 Activities: Around 100,000 persons

General overview of IYL 2015 Activities in Uruguay

First Price of the Photo.Fisica photo contest 2015. CREDIT: Florencia Veres.

As part of the International Year of Light (IYL 2015), the Uruguayan Society of Physics carried on various activities such as lectures, competitions, and photo exhibitions, as well as exhibition of experiments in student fairs demonstrating phenomena related to light.

A photographic competition (*photo.Fisica*) was aimed at schoolchildren and high school students across the country. Students from more than 30 institutions around the country participated in this event.

The Municipal Planetarium in Montevideo organized a series of talks aimed at reaching a broad public. The topics of the invited speakers were focused on the IYL 2015: astronomy, environment, medical applications, agronomy, etc. Some of the presentations were broadcast to the general public and can be found on YouTube.

The Uruguayan Society of Physics also participated in the organization of photographic exhibitions on topics related to the IYL 2015. In particular, they sought to convey to the public the importance of understanding physical phenomena through natural phenomena. Another photo exhibition was organized by the Centro de Fotografia de Montevideo and the authors showed examples of the use of optical technology in different regions of the electromagnetic spectrum, from the lowest frequency infrared radio, microwave, terahertz and, through the visible spectrum, up to higher frequencies ultraviolet and X-rays.

Venezuela (Bolivarian Republic of)

Primary National Organizer: Venezuelan Institute for Scientific Research (IVIC)

Other National Partners: Humboldt Planetarium

Sponsors: IVIC, ULA, and UCV

Estimated number of IYL 2015 activities organized: 8 events

Number of people reached by IYL 2015 Activities: 1,500 people

General overview of IYL 2015 Activities in Venezuela

In summary, the International Year of Light 2015 (IYL 2015) was celebrated in Venezuela with various activities such as seminars, games associated with astronomy and planetary studies, and general activities for young people and children with the aim of promoting space science and astronomy in ways that would inspire new generations of scientist in our country.

In March 2015, The IYL 2015 Venezuelan National Committee organized a talk given by Dr. Miriam Rengel, a Venezuelan astronomer working at the Max Planck Institute for Solar System research in Germany, who spoke about *The Rare Chemistry of Titan,* and the most recent observations made with the Herschel Telescope. People were very interested in planetary systems and they shared their concerns and questions with Dr. Rengel.

In April 2015, the event *Night with the Stars* was organized, where people learned how to use an optical telescope, how to identify stars in the sky, and—using games and entertaining tales of astronomers—learned about the history of humankind.

In August 2015, the general public was invited to enjoy building water-based rockets. They spent some time with games and watching these rockets flying around.

In 25 September 2015, we invited the community to observe the solar photosphere and sunspots with our Reflector Orion Skyview 8'' telescope, and people were able to see this spectacular phenomenon with their own eyes. On 27 September 2015, we organized an observation of the total lunar eclipse, with a NexImage Celestron camera and children and families enjoyed the experience.

During all of 2015, we organized a series of talks, *Ciencia contigo,* where researches from several fields of science, including astronomy, shared their scientific experiences with a general audience, including students and young people, inspiring them to get interested in space exploration, and learn about the Universe, its origin, its large scale point of view, and different bands of the electromagnetic spectrum. *Ciencia contigo* was a great success and lot of people enjoyed the activities.

Rocket bottle activities with children. CREDIT: Dr. Jose M Ramirez.

Viet Nam

Primary National Organizer: Viet Nam National University, Hanoi

Other National Partners: Radio and Electronics Association of Viet Nam, Goethe Institut

Sponsors: Viet Nam National University

Estimated number of IYL 2015 activities organized: 10 events

General overview of IYL 2015 Activities in Viet Nam

In Viet Nam, the International Year of Light 2015 (IYL 2015) activities included conferences, workshops, exhibitions, and seminars.

The 4th International Conference on Applied and Engineering Physics. CREDIT: Dr. Hoang Nam Nguyen.

Viet Nam played a key role during the IYL 2015 Official Opening Ceremon—held at UNESCO HQ in Paris, France, 19-20 January 2015—with the participation Keynote speaker Dr. Thanh Nga Tran, co-founder of the Viet Nam Vascular Anomalies Center, a not-for-profit humanitarian organization dedicated to the care of underserved children with vascular anomalies, pigmented birthmarks, scars, and wounds in Viet Nam.

The *8th International Conference on Photonics and Applications (ICPA-8)* was held in Da Nang 12-16 August 2015. The ICPA conference series is organized in different cities of Viet Nam every two years, and is a very important event for photonic R&D activities in the Asia-Pacific region. Per ICPA rules, outstanding scientists from around the world are invited to give talks at the ICPA-8 Plenary Session to present the newest advances and achievements in optics, photonics, and their applications. In particular, these speakers present new techniques, instruments, and applications as well as new scientific research based on nano-photonics, bio-nano photonics, biomedical physics, photonic materials, and devices. The ICPA-8 meeting was successfully directed and organized by the international board of scientists in the field of photonics and was attended by 250-300 participants.

In Viet Nam, the *Science Film Festival*—organized by the Goethe-Institut—took place between 11 October and 6 December 2015. Science-related films were shown at schools in eight different areas: Hà Nội, Vĩnh Phúc, Thái Nguyên, Thái Bình, Đà Nẵng, Quảng Nam-Hội An, Đak Lak, Hồ Chí Minh City. For the Activity Days on 18 October and 15 November 2015, all children, adolescents, and adults were invited to the Goethe-Institut to join in and discover science and technology related to light with their own hands.

The *Visible Light Communication (VLC) seminar: toward ASEAN VLC consortium* was organized in Hanoi on 22 December 2015 by Dr. Nam-Hoang Nguyen, lecturer at the University of Engineering and Technology, Viet Nam National University Hanoi, Viet Nam in cooperation with Dr. Keattisak Sripimanwat, ECTI Thailand. In the seminar, Dr. Nguyen introduced the overview of VLC research activities in the world to VNU-UET staff and students. A round table discussion included topics such as the future research plans and tentative plans of the establishment of the ASEAN VLC consortium.

INTERNATIONAL
YEAR OF LIGHT
2015

CREDIT: Shutterstock/Lisa Kolbasa.

Activities in Countries without IYL 2015 National Nodes

We also have identified around 220 activities in 50 countries without IYL 2015 National Nodes. It was not possible to set up national structures in all countries of the world because of the lack of scientific networks in the photonics fields. However, this did not keep people from participating in the global celebrations, showing the truly volunteer spirit of the initiative. We summarize the major highlights in each country as follows:

Azerbaijan

Azerbaijan joined two global initiatives to celebrate IYL 2015. The city of Baku hosted a *Light: Beyond the Bulb* exhibition at ADA University 15-16 October. The other relevant activity in Baku was the organization of an international seminar about measurements and light for World Metrology Day on 20 May 2015. The seminar was organized by the State Committee for Standardization, Metrology, and Patent of the Republic of Azerbaijan.

Belarus

From 1 September to 31 December 2015, the Minsk Planetarium organized activities on their premises and around Minsk related to the main IYL 2015 themes and topics. The programme of activities included a photo exhibition, Full Dome Films, lectures, astronomical observations with telescopes in the observatory, and a traveling photo exhibition.

Bahamas

From 13-15 July 2015, *IEEE organized the 2015 IEEE Photonics Society Summer Topical Meeting Series* in Nassau. The Topical Meetings of the Photonics Society are the premier conference series for exciting, new areas in photonic science, technology, and applications; creating the opturnity to learn about emerging fields and to interact with research and technology leaders in an intimate environment. The event was focused on "Emerging Material and Integrated Optical Systems."

Burkina Faso

The *Science Film Festival* took place for the first time in Burkina Faso from 16-18 November 2015. The event was organised by the Goethe-Institut and the Institut de Recherche pour le Developpement (IRD) in cooperation with the University of Ouagadougou. The films, which followed the theme of light in celebration of the IYL 2015, were screened at the university and at the Goethe-Institut in the city of Ouagadougou. After the screenings, lively discussions ensued amongst the predominantly student audience. In total, over 200 visitors attended the screenings.

Bahrain

From 1-2 May 2015, the organization 1001 Inventions brought the global education campaign *1001 Inventions and the World of Ibn Al-Haytham* to Bahrain. The event included weekend activities with hands-on light and visual demonstrations and workshops for children as well as screening of the *1001 Inventions and the World of Ibn Al-Haytham* film. The celebrations also included mesmerising dance and theatrical performances depicting the story of Ibn al-Haytham and his scientific journey of discovery.

Cambodia

The *Science Film Festival* in Cambodia was organised by the Goethe-Institut Thailand in cooperation with the NGO Khmer Youth and Social Development (KYSD), Mlup Baitong organization, Royal University of Agriculture (RUA), American Intercon Institute/School (AII & AIS), Pour Un Sourire d'Enfant organization, and The Westline School. A selection of five films were screened from 1 November to 15 December 2015 at RUA, AII & AIS, Pour Un Sourire D'enfant organization and The Westline School in Phnom Penh, reaching out to over 5,000 people.

Macao, China

In the framework of the IYL 2015, Nobel Prize Laureate Shuji Nakamura gave a lecture on the development, application, and future prospects of blue LEDs at the Macao Science Center on 24 April 2015. The event also included the opening of an exhibition about blue LEDs to promote the contribution and application of blue LEDs in the area of modern lighting and communications among the public. The Blue LED Exhibition covered the invention, principles, and applications of Blue LED, and the development of Blue LED technology in recent years. It remained opened to public with free admission until 6 May 2015.

Week of Science activities in Kinshasa, Democratic Republic of Congo. CREDIT: Investing in People ASBL.

Democratic Republic of the Congo

The IYL 2015 was celebrated in the Democratic Republic of the Congo with the Week of Science activities that was organized in Kinshasa from 16-17 April 2015 and was attended by 3,500 persons. The theme of this edition was *Light and Energy*. The aim of this event was to promote science and technology among young people and the public in the Democratic Republic of the Congo. The event consisted of three types of activities: experiments to learn while having fun; exhibitions with universities, research centers, enterprises, and NGOs; and conferences with excellent speakers.

Ethiopia

The main IYL 2015 event in the country was a workshop focused on photonics research for African development organized in the city of Addis-Ababa on 16 September 2015 in the framework of the *IEEE AFRICON 2015*. This is IEEE's flagship conference on the African continent and provides a platform for academics and industry professionals from all over the world to share ideas and present their latest research. The special workshop on the IYL 2015 discussed specifically how light-based technology can be used as an effective lever for green innovation. Topics covered included the major challenges of photonics in Africa, the economic importance of light-based technologies for the continent, and identification of actions at the national and regional levels that can enhance investment in education and research, and that can facilitate entrepreneurship. The workshop was attended by 50 students from Ethiopia, Kenya, Cameroon, Zimbabwe, and South Africa. Ethiopia also participated in global IYL 2015 initiatives such as *World Metrology Day 2015* and the activity *SkyLight: a Global Opera*.

Feria de la Luz in Quetzaltenango, Guatemala.

Guatemala

We have identified two different IYL 2015 events celebrated in Guatemala. One was an exhibition of educational projects for the teaching of optics and light for university students in the city of Quetzaltenango on 16 May 2015 and the other involved public observations of the Sun on 26 April 2015, the day when the Sun can be observed exactly on the zenith, in the city of Guatemala. Around 340 people were able to check how the zenithal sun does not make them cast any shadow at noon. Other activities included solar observations using different astronomical filters as well as building sundials.

Guinea

On 21 April 2015, the Lycée Albert Camus in Conakry opened their doors to students, parents, and partner schools to celebrate the IYL 2015 by organizing exhibitions and performing hands-on activities about light and photonics and artistic activities involving light. The programme also included a talk about the origin and expression of light in the thinking of the 19th century.

Haiti

On 29 March 2015, as part of the *5th edition of The Woman Scream International Poetry and Arts Festival 2015,* the feminist group D'Elles / As Art presented Voix Unies pour le cri, a dramatic reading of different pieces by Shelove Duperier, Cassandra-Erica Alexis, and Darline Gilles in Port-au-Prince.

Jordan

The IYL 2015 celebrations reached over 40,000 people in Jordan with around 13 events identified in the city of Amman. The activities included public lectures, hands-on activities, and competitions to raise awareness about the importance of light in our daily lives. The LAMBDA Physics Group at the University of Jordan—a group of physics students supervised by Dr. Hanan Sa'adeh—organized several public lectures, hands-on activities, and competitions. One of the highlights of the IYL 2015 was the *Colours Program* organized by the The Children's Museum Jordan. Throughout the months of January, February, and March 2015, they were visited by around 36,000 children and allowed them to explore the world of colours and its connection to light in daily programs of storytelling, science shows, art activities, and tinkering projects.

Kazakhstan

The Light Painting World Alliance organized a special event dedicated to the IYL 2015 in the city of Astana from 4-6 July 2015 attended by around 4,000 visitors. The exhibition was curated by local artists and included 80 artworks from 60 artists from 18 countries. The event included a light painting photo booth, where visitors could learn how to paint with light. The event was part of the Astana City Celebration Day, and was part of a big national *ArtFest* with the theme "Future Energy: Solar Fire, Earth, Wind and Water."

Kenya

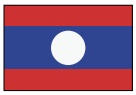
The *Solar Lights for Learning project* organized an activity in a school in Nairobi to explain the process of energy transformation from solar to light energy with the participation of 100 students. The students learnt how to use solar cells, rechargeable batteries and LEDs to build their own light for reading. In addition, students who did not have electricity in their homes were given mobile LED lanterns to take home so they could study during the evening and improve their education. The lanterns have 30 hours of power and can be then recharged at the schools. Schools in Kenya were also involved in the *SkyLight: a Global Opera activity*.

Children participating in the Colours Program in Jordan. CREDIT: Colours Program.

Kuwait

Families and children celebrated the 1,000-year anniversary of Ibn Al-Haytham's work in science during the weekend of 27-28 February 2015. The event was part of the global educational campaign *1001 Inventions and the World of Ibn Al-Haytham* that was produced by 1001 Inventions. The fun-packed event featured engaging workshops, experiments, live shows, competitions, and the short-film *1001 Inventions and the World of Ibn Al-Haytham*. The celebrations also included mesmerising dance and theatrical performances depicting the story of Ibn al-Haytham and his scientific journey of discovery. In addition, Kuwait was also one of the countries participating on the *SkyLight: a Global Opera* initiative as part of the IAU's IYL 2015 Cosmic Light Programme.

Lao People's Democratic Republic



In 2015, the *Science Film Festival* reached 14,887 viewers in 42 schools and communities across four provinces in the country. The NGO DOKLAO/PADETC has successfully organised the *Science Film Festival* in the country since 2012 in cooperation with the Cinema Department of the Ministry of Information, Culture, and Tourism and the Goethe-Institut.

Winners of the poster competition 1001 Nights of Lights in Lebanon. CREDIT: Ibn Al-Haytham International Working Group.

Lebanon

Three IYL 2015 events were celebrated in Lebanon. Most notably, there was a dedicated IYL 2015 activity at the *21st International Conference of the Lebanese Association for the Advancement of Science (LAAS)* from 15-17 April 2015 in Beirut. The LAAS International Science Conference is an annual conference organized in 2015 in cooperation with the Saint Joseph University in Beirut and the Lebanese National Council for Scientific Research. Moreover, the poster competition *1001 Nights of Lights*—organized by the Faculty of Sciences of the Saint-Joseph University in Beirut and the Lebanese National Commission of UNESCO in collaboration with the Ibn Al-Haytham International Working Group—celebrated the achievements of Arab scholars throughout history. More than 50 high school students submitted entries and the award ceremony took place on 17 April 2015 with the participation of Prof. Zahida Darwiche Jabbour, Secretary General of the Lebanese National Commission for UNESCO, Prof. Toufic Rizk, Dean of the Faculty of Sciences of the Saint Joseph University, and Prof. Azzedine Boudrioua, coordinator of the UNESCO Ibn Al-Haytham International Working Group. The award ceremony was followed by a panel discussion as part of the LAAS Conference where researchers, university professors, doctors, and engineers exposed light's abilities to provide solutions to contemporary challenges such as energy, education, communication, agriculture, industry, health, and even culture.

Lesotho

Two main IYL 2015 activities were identified in Lesotho. In the city of Maseru, the Machabeng College community commemorated UN Day on 30 October 2015, with activities to raise awareness of light and light-based technologies through presentations on the various aspects of light and its importance. The other main activity was the celebration of World Metrology Day 2015 by the Department of Standards and Quality Assurance of Lesotho by holding workshops in Mohale's Hoek. Presentations in these workshops focused on status of metrology in Lesotho, measurements and light, and legal metrology regulations.

Libya

The *Spectrum of Light* series at Misurata University in the city of Misrata consisted of public seminars in the framework of the IYL 2015 that explored the role of light in science and culture. The seminars were held on 25 June and 2 July 2015 and had around 200 attendees.

Liechtenstein

Around 11 IYL 2015 events were organized in Liechtenstein, reaching out to around 200 people. Conferences and discussions were organized on different themes related to IYL 2015. An exhibition about IYL 2015 with a collection of 18 posters was organized by students of the Liechtenstein Gymnasium as well as a round table at the Integration Club Real. There were several similar events at other educational institutions in the Principality. The Liechtenstein Scientific Society issued the first IYL 2015 postage stamp in the world back in 2014. In early 2015, the Society had organized a contest to design a commemorative IYL 2015 postage stamp. The winner was invited by the government to create the official IYL 2015 stamp that was issued on 3 March 2015. In November, the stamp won the prestigious *Red Dot Award*. As the symbolic conclusion of the IYL 2015 in the country, the society issued a commemorative postcard as well.

Public Lecture organized in Bamako (Mali) on the theme "Light in Organic Chemistry Analysis" by the UNESCO Office in Bamako. CREDIT: UNESCO.

Luxembourg

The *Woman Scream International Poetry and Arts Festival 2015* in Luxembourg, organized by Miriam R. Krüger, poet ambassador of MPI Women Poets International Movement with the support of CLEA, the movement Terre Poets, and the newspaper Bom dia radio Latina Luxembourg, was held on 15 March 2015 as part of the 15th Book and Cultures Fair of Luxembourg. The event brought together the poets and writers Antoine Cassar, Sylvie Ptitsa, Francis Kirps, Olinda Beja, Carla Pais, Corina Moscovich, Paula Sá Carvalho; who read their texts in French, German, Maltese, English, Spanish, and Portuguese. During the event, a painting especially created for the festival by Portuguese painter Edite Melo was unveiled.

Malta

The main activity during IYL 2015 in Malta were the seven *Light: Beyond the Bulb* exhibitions held in the cities of Luqa, Qormi, Siġġiewi, and Żebbuġ. These images illustrate the incredible variety of light-based science being researched today across the electromagnetic spectrum, across scientific disciplines, and across technological platforms. The exhibitions were intended to inform the students and general public about the relevance of light and light-based technologies in everyday life. The printing of posters was sponsored by the EU commission representation in Malta. It is estimated that around 3,000 people visited the exhibitions. To promote IYL 2015 to a wider audience, Malta also issued a commemorative IYL 2015 stamp.

Mali

As part of the celebration of the IYL 2015, the UNESCO Office in Bamako, in cooperation with the Mali National Commission for UNESCO, organized a public lecture on the theme *Light in Organic Chemistry Analysis,* to raise awareness on new light-based analytical techniques of organic chemistry and their contribution to sustainable development. The conference, hosted by Pr. Amidou Doucouré, brought together teachers, students, resource people from civil society, and leading experts who discussed the role of light in organic chemistry analysis. The series of lectures during the conference held at the University of Science, Techniques, and Technologies of Bamako showcased the involvement of the Malian science community, including students, the IYL 2015.

Montenegro

The main IYL 2015 activity in Montenegro was the *Knowledge Factory* event organized from 22-23 September 2015 in Podgorica. Knowledge Factory is a science fair that promotes new technologies and their roles in education. In 2015, for the first time, photonics was its central topic. During the two-day event, around 1,800 participants attended several interactive optics experiments, several talks/lectures on light phenomena and applications, and visited a colorful exhibition, including the *Light: Beyond the Bulb* panels, with lots of posters and video materials. Another important activity in the country was the participation on the World Metrology Day 2015. The Montenegrin Bureau of Metrology organized Open Days, from 11-15 May 2015, and over 200 students from primary and high schools had the opportunity to visit the Bureau's premises.

Mozambique

On the occasion of the 128th anniversary of the foundation of the city of Maputo, 10 November 2015, different activities were organized in the city inspired by the IYL 2015. An exhibition was held at the Fortaleza de Maputo, one of the most important landmarks of the city, and included images, historical documents, and different forms of illumination registered in the city from the XVI century to present day. The programme also included several talks about the importance of IYL 2015 in the country, activities for children, poetry recitals, and other artistic performances. Another interesting activity in the framework of the IYL 2015, was a concert featuring the Mozambican pianist Melita Matsinhe on 13 November 2015 in Maputo. One part of the concert was dedicated to the IYL 2015 and the pianist joined forces with the poet Eduardo Quive to highlight the overlap between women, light, and words.

Myanmar

The *Science Film Festival 2015* brought the IYL 2015 themes and topics to Myanmar. The fourth edition of the *Science Film Festival* in Myanmar was organised by the Goethe Institut Myanmar in cooperation with the Ministry of Education, the Embassy of the Federal Republic of Germany, YMCA, KMC Private School, Wesley Clinic, Metta Foundation, and Shan Cultural Centre. The opening of the festival took place at Goethe Villa on 14 November 2015 with over 90 participants from local orphanages and schools. Three screenings were held outside in the garden and the activities were led by volunteers in the main building. In total, 31 screenings were presented during the festival period from 14 November to 9 December 2015. The screenings were organised by volunteers in Yangon Division, Bago Division, Mandalay Division, Sagaing Division, Mon State, Karen State, Shan State, and in Kachin State. Over 17,000 viewers saw the films in government, monastic, and private schools; in youth development centres, cultural centres, churches, and orphanages.

Namibia

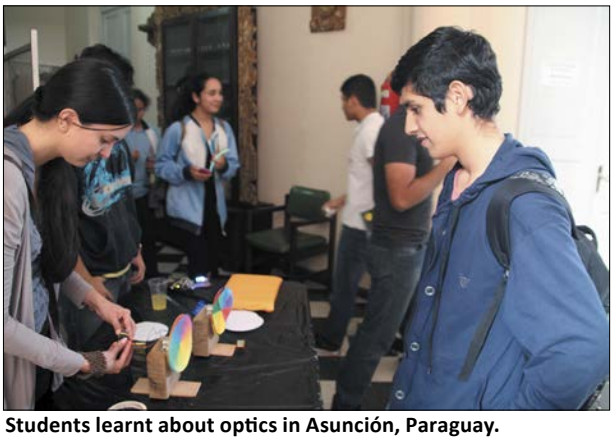
The University of Namibia (UNAM) celebrated the International Year of Light 2015 by organizing the *International Conference on Light Science and Applications* from 26–28 October 2015 in Windhoek. The main objectives of this conference were to create awareness, share and gain knowledge in light sciences, educate rural dwellers to use solar applications, and develop advanced research and technology in Namibia in light sciences.

Palestine

In Palestine, the *Science Film Festival 2015* reached more than 9,300 visitors. It was co-organized by the Goethe- Institut Palestinian Territories, the A. M. Qattan Foundation, the Institut Français, the Al Nayzak Foundation, and the Ramallah Municipality. The festival was hosted by *Science Days Palestine 2015*. The official opening of the festival took place on October 12 in the Alharajeh Market in Ramallah. Screenings and hands-on activities were organised from 12 October to 12 November 2015 in six different educational and cultural institutions as well as additionally in 30 other locations in 20 Palestinian cities, towns, and villages.

Paraguay

The IYL 2015 events in Paraguay were centered in the city of Asunción and included astronomical competitions inviting people to capture the beauty of the Moon and the design of a sundial by students that was installed in a square in the city of Asunción. Over the IYL 2015, there were up to four *Light: Beyond the Bulb* exhibitions. The Benjamin Franklin Science Corner organized two events aimed at raising awareness among young people of the importance of light and light-based technologies by using hands-on activities. The first event—organized together with the Information and Resource Center of the United Nations—was attended by a group of 80 students who learned how optics are essential in our everyday life and saw demonstrations on astronomy, biology, and physics. On 12 September 2015, the Benjamin Franklin Science Corner, in cooperation with the US Embassy, the Paraguayan Scientific Society, Colegio del Sol, and Stael Ruffinelli de Ortiz English, held the second Tinkering and Maker Faire where volunteers from the Science Club showed experiments about the IYL 2015 to 500 students.



Students learnt about optics in Asunción, Paraguay.

The Former Yugoslav Republic of Macedonia

Nine hands-on activities celebrated the IYL 2015 in the Former Yugoslav Republic of Macedonia to highlight the role and importance of light in everyday life, science, and art in the world. From March to May 2015, Macedonian Montessori Association and Montessori Centre participated in the celebration of the IYL 2015 with the implementation of the programme *The Light - A Window to the Universe.* The programme included eight educational, creative, and unique workshops where children were introduced to the role and importance of light in everyday life, science, and art. Experimenting and performing there, the children discovered a series of regularities related to light. In addition, from 22-23 December 2015, the Society of Physicists of Macedonia organized the activity The Light Fantastic. Different experimental setups were used to explain basic and advanced optical phenomena to the general public. High school students and the public had a first-hand experience in performing different scientific procedures using optics. Overall, around 200 people were reached in the city of Skopje.

Saint Lucia

As part of World Metrology Day 2015 celebrations on 20 May 2015, the Saint Lucia Bureau of Standards conducted awareness activities in the country.

Sao Tome and Principe

The island of Principe was one of the places where Einstein's General Theory of Relativity was confirmed for the first time on 29 May 1919 by an expedition to observe a solar eclipse by the British astronomer Sir Arthur Eddington. To commemorate the 96th anniversary of such an important event in the history of science, a week of activities around the theme of light was organized. The programme of activities involved the participation of around 100 young students. On the day of the anniversary, the astronomy educator Rosa Doran (Núcleo Interactivo de Astronomia) gave a talk where she discussed the role of light in astronomy. The event was followed by astronomical public observations. Over the week, she organized interactive hands-on activities with students in Principe and they participated in activities from both the international projects *SkyLight: a Global Opera* and *Black Holes in my School.* Moreover, teachers were trained to use inquiry-based techniques to teach science education in the framework of the international Galileo Teacher Training network, a legacy from the International Year of Astronomy 2009.

Sierra Leone

On 20 May 2015, the Sierra Leone Standards Bureau (SLSB) joined countries around the world to celebrate *World Metrology Day* with the theme "Measurement and Light," aligning with the IYL 2015. The SLSB spearheaded the celebration with a workshop that attracted stakeholders from the Sierra Leone Institute of Engineers, University of Sierra Leone, members of the Consumer Protection Agency, manufacturers, and exporters among others and discussed about the significance of the science of measurement in daily lives and the IYL 2015. Sierra Leone also issued a commemorative stamp to celebrate the proclamation of IYL 2015.

Syrian Arab Republic

The National Standards and Calibration Laboratory (NSCL) and the Syrian Atomic Energy Commission/National Radiation Metrology Laboratory (AECS-NRML) joined the celebrations of World Metrology Day in 2015. A seminar was held around the theme of "Measurements and Light" at Damascus University on May 25 2015.

The United Republic of Tanzania

The *Woman Scream International Poetry and Arts Festival 2015* in the United Republic of Tanzania took place on 28 March 2015 at Nkrumah Hall, at the University of Dar-es-Salaam, in Dar-es-Salaam. The festival was visited by numerous artists who raised their voices amongst the student community of the University of Dar-es-Salaam, raising awareness, building the culture of activism, and bringing hope to survivors in the university community, which also faces its share of incidences of violence against women.

Trinidad and Tobago

The Art Society of Trinidad and Tobago decided to choose the United Nations' IYL 2015 as an ideal theme for the annual Members Exhibition in May. In total, 74 artists in Trinidad and Tobago responded to the call to create a piece of art for the exhibition *Light in Nature and Culture.* Interestingly, most artists received the theme as an inspiration for the subject of their art work, over the choice of their medium. Most artists opted for traditional paintings with all the inherent options to represent and play with light. Mixed media, fabric, digital painting, photography, and even latex with ink offered welcome variation. The way artists interpreted and associated the theme of light in their works was more refreshing. While art in Trinidad and Tobago traditionally tends to the repetitive conventions of land- and seascapes, architecture, and portraits, this time many more subjects passed in review. Diversity in flora, fauna, and natural optical phenomena, but also abstract and symbolic elements contributed to an inspired collection. So many personal interpretations and statements were inspiring for the visitors of all ages, and opened their eyes for new forms of light. Awareness of beauty comes with the wish to care for it. In this way art can be an important stimulant for conservation and expansion, both in nature and in culture. Therefore, the Art Society of Trinidad and Tobago decided to continue using the International Years of the United Nations as a theme for the May Members Exhibitions in future years.

Ukraine

The main activity in Ukraine was the online landscape lighting competition *LIGHT YOUR GARDEN* organized from 18 September to 24 October 2015. The first Ukrainian online competition about landscape lighting was dedicated to the development of lighting designers, the lighting industry and the lighting design profession in Ukraine. Around 60 people participated in the competition that concluded with the final *LIGHT YOUR GARDEN* weekend and an award ceremony held on 24 October in Dnepropetrovsk. Another activity in the country related to IYL 2015, was the *European Science Photo Competition* that aimed to engage scientists in sharing their work and help increase the number of pictures in scientific articles in Wikipedia. Around 193 participants uploaded their media files during the contest and 168 of them were newcomers who had never contributed to Wikimedia Commons before. A total of 1,221 images were uploaded which exceeded the expectations of the organisers greatly. The best images varied from single molecules seen with a scanning tunneling microscope to different cell lines and archaeological expeditions to astronomy images. The award ceremony was held on 10 November 2015, World Science Day for Peace and Development, at the Bogomoletz Institute of Physiology (Kyiv).

Zambia

During 2015, a Zambian school and university took part in the IYL 2015, as part of the first Global Science Opera Production, *SkyLight*. Together with schools, universities, operas, and science institutions from around the globe, the pupils from Elim School in Kitwe in the Copperbelt Province, created and performed a global opera. The pupils, who were guided by Prospery Simpemba (Copperbelt University \ Southern African Regional Office of Astronomy for Development) and a music teacher at Elim School wrote and composed a wonderful scene in the opera, which included dialogue and a song about the solar system. The scene was performed during the school assembly and a video was created for the global science project. This project was supported by the Elim School administration and the Physics Department of Copperbelt University.

A fisherman in Batangas, Philippines, uses a makeshift headlight to navigate his way through the shallow waters and to attract fish in the dying sunlight. CREDIT: Robert John Cabagnot.

ANNEXES

الأمم المتحدة

A/RES/68/221

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12 February 2014

الجمعية العامة

الدورة الثامنة والستون
البند ٢١ (ب) من جدول الأعمال

قرار اتخذته الجمعية العامة في ٢٠ كانون الأول/ديسمبر ٢٠١٣

[بناء على تقرير اللجنة الثانية (*A/68/440/Add.2*)]

٢٢١/٦٨ – السنة الدولية للضوء وتكنولوجيات الضوء، ٢٠١٥

إن الجمعية العامة،

إذ تؤكد من جديد قراريها ١٩٩/٥٣ المؤرخ ١٥ كانون الأول/ديسمبر ١٩٩٨ و ١٨٥/٦١ المؤرخ ٢٠ كانون الأول/ديسمبر ٢٠٠٦ المتعلقين بإعلان السنوات الدولية، وقرار المجلس الاقتصادي والاجتماعي ٦٧/١٩٨٠ المؤرخ ٢٥ تموز/يوليه ١٩٨٠ المتعلق بالسنوات الدولية واحتفالات الذكرى السنوية، ولا سيما الفقرات من ١ إلى ١٠ من مرفقه المتعلق بالمعايير المتفق عليها لإعلان السنوات الدولية، وكذلك الفقرتان ١٣ و ١٤، اللتان تنصان على أنه ينبغي ألا تعلن سنة دولية قبل إجراء الترتيبات الأساسية لتنظيمها وتمويلها،

وإذ تسلم بأهمية الضوء وتكنولوجيات الضوء في حياة سكان العالم وفي تنمية المجتمع العالمي في المستقبل على كثير من المستويات،

وإذ تشدد على أن الرفع من مستوى الوعي والتثقيف على الصعيد العالمي بعلوم الضوء وتكنولوجياته أمر بالغ الأهمية للتصدي لعدد من التحديات، من قبيل التنمية المستدامة والطاقة والصحة المجتمعية، وكذلك لتحسين نوعية الحياة في كل من البلدان المتقدمة النمو والبلدان النامية،

وإذ تضع في الاعتبار أن تطبيقات علوم وتكنولوجيات الضوء بالغة الأهمية فيما يحرز حاضرا واستقبالا من تقدم في عدد من المجالات، منها الطب والطاقة والمعلومات والاتصالات والألياف الضوئية والزراعة والتعدين وعلم الفلك والهندسة المعمارية والحفريات الأثرية والترفيه والفن والثقافة، وكذلك في العديد من الصناعات والخدمات الأخرى، وأن

تكنولوجيات الضوء تسهم في تحقيق الأهداف الإنمائية المتفق عليها دوليا، بطرق منها توفير إمكانية الحصول على المعلومات والرفع من مستوى الصحة والرفاه في المجتمعات،

وإذ تضع في اعتبارها أيضا أن التكنولوجيا وأعمال التصميم يمكن أن تؤدي دورا هاما في زيادة كفاءة الطاقة، ولا سيما من خلال الحد من إهدار الطاقة، وفي تخفيض التلويث بالضوء، الذي يعد عاملا أساسيا في الحفاظ على ظلمة السماء،

وإذ تلاحظ أن عام ٢٠١٥ يصادف ذكرى عدد من التطورات البارزة في تاريخ علوم الضوء، من قبيل أعمال ابن الهيثم في مجال البصريات في عام ١٠١٥؛ وقول فرينل في عام ١٨١٥ بنظرية الموجات الضوئية؛ والنظرية الكهرمغنطيسية لانتشار الضوء التي ابتدعها ماكسويل في عام ١٨٦٥؛ وقول أينشتاين في عام ١٩٠٥ بنظرية الظاهرة الكهرضوئية وقيامه في عام ١٩١٥ بإدخال الضوء في نظرية تفسير الكون من خلال النسبية العامة؛ واكتشاف بينزياس وويلسن للمويجات الخلفية الكونية في عام ١٩٦٥ والإنجازات التي حققها كاو في السنة ذاتها فيما يتعلق بنقل الضوء في الألياف من أجل الاتصال الضوئي،

وإذ تضع في الاعتبار أن الاحتفال في عام ٢٠١٥ بذكرى هذه الاكتشافات سيتيح فرصة مهمة لإبراز طابع الاستمرارية في الاكتشافات العلمية بمختلف سياقاتها، مع التركيز بوجه خاص على تمكين المرأة في قطاع العلوم والتشجيع على تعليم العلوم في أوساط الشباب، ولا سيما في البلدان النامية،

وإذ تلاحظ أن المجلس الاقتصادي والاجتماعي ركز أعماله في دورته الموضوعية لعام ٢٠١٣ للاستعراض الوزاري السنوي على موضوع ”تسخير العلم والتكنولوجيا والابتكار والإمكانيات الثقافية لتعزيز التنمية المستدامة وتحقيق الأهداف الإنمائية للألفية“،

وإذ تؤكد من جديد الوثيقة الختامية، المعنونة ”المستقبل الذي نصبو إليه“[(١)]، لمؤتمر الأمم المتحدة للتنمية المستدامة الذي عقد في ريو دي جانيرو، البرازيل، في الفترة من ٢٠ إلى ٢٢ حزيران/يونيه ٢٠١٢،

وإذ تشير إلى تأييد المجلس التنفيذي لمنظمة الأمم المتحدة للتربية والعلم والثقافة في دورته التسعين بعد المائة لمبادرة إعلان عام ٢٠١٥ السنة الدولية للضوء[(٢)]، واعتماد المؤتمر العام هذه المبادرة في دورته السابعة والثلاثين، في ١٩ تشرين الثاني/نوفمبر ٢٠١٣[(٣)]،

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(١) القرار ٦٦/٢٨٨، المرفق.

(٢) منظمة الأمم المتحدة للتربية والعلم والثقافة، الوثيقة 190 EX/Decisions، المقرر ٤٧.

١ - **تقرر** أن تعلن عام ٢٠١٥ السنة الدولية للضوء وتكنولوجيات الضوء؛

٢ - **تدعو** منظمة الأمم المتحدة للتربية والعلم والثقافة إلى تيسير تنظيم وإحياء السنة الدولية، مع مراعاة الأحكام الواردة في مرفق قرار المجلس الاقتصادي والاجتماعي ٦٧/١٩٨٠، وبالتعاون مع الحكومات، والمؤسسات المعنية في منظومة الأمم المتحدة، والمجلس الدولي للعلوم وغيره من المنظمات الأكاديمية والمنظمات غير الحكومية المعنية؛

٣ - **تؤكد** أنه ينبغي تغطية تكاليف جميع الأنشطة التي قد تنشأ عن تنفيذ هذا القرار بما يتجاوز نطاق الأنشطة التي تندرج حاليا ضمن ولاية الوكالة الرائدة من التبرعات التي تقدمها مختلف الجهات، بما في ذلك القطاع الخاص؛

٤ - **تشجع** جميع الدول ومنظومة الأمم المتحدة وجميع الجهات الفاعلة الأخرى على الاستفادة من السنة الدولية للتشجيع على اتخاذ إجراءات على جميع المستويات، بما في ذلك من خلال التعاون الدولي، وزيادة الوعي لدى الجمهور بأهمية علوم الضوء والبصريات وتكنولوجيات الضوء، وتوسيع نطاق الوصول إلى المعارف الجديدة وما يتصل بذلك من أنشطة؛

٥ - **تطلب** إلى منظمة الأمم المتحدة للتربية والعلم والثقافة، أن تقدم، مع مراعاة أحكام الفقرتين ٢٣ و ٣٧ من مرفق قرار المجلس الاقتصادي والاجتماعي ٦٧/١٩٨٠، تقريرا إلى الجمعية العامة في دورتها الحادية والسبعين بشأن تنفيذ هذا القرار، بما في ذلك تفاصيل عن جملة أمور منها تقييم هذه السنة الدولية.

الجلسة العامة ٧١
٢٠ كانون الأول/ديسمبر ٢٠١٣

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(٣) المرجع نفسه، وثائق المؤتمر العام، الدورة السابعة والثلاثون، باريس، ٥-٢٠ تشرين الثاني/نوفمبر ٢٠١٣، المجلد ١، القرارات، الفرع الخامس، القرار ٢٥.

联合国 A/RES/68/221

大 会

Distr.: General
12 February 2014

第六十八届会议
议程项目 21(b)

2013 年 12 月 20 日大会决议

[根据第二委员会的报告(A/68/440/Add.2)通过]

68/221. 2015 光和光基技术国际年

大会，

重申关于宣布国际年的 1998 年 12 月 15 日第 53/199 号和 2006 年 12 月 20 日第 61/185 号决议，以及经济及社会理事会关于国际年和周年纪念的 1980 年 7 月 25 日第 1980/67 号决议，特别是该决议附件中关于宣布国际年商定标准的第 1 至 10 段以及规定在为国际年的组织工作和经费筹措作出基本安排之前不应宣布国际年的第 13 和 14 段，

认识到光和光基技术对世界民众的生活以及全球社会多层面未来发展的重要性；

强调指出提高全球对光科学技术的认识和加强这方面的教育，对于发达国家和发展中国家应对可持续发展、能源、社区保健和提高生活质量的挑战至关重要；

考虑到光科学技术的应用对除其他外医药、能源、信息和通信、光纤学、农业、采矿业、天文学、建筑、考古、娱乐、艺术和文化以及许多其他行业和服务业的已有和未来进步至关重要，考虑到光基技术提供获取信息的机会，增进社会健康和福祉，有助于实现国际商定的发展目标；

又考虑到技术和设计可在提高能效，特别是通过限制能源浪费提高能效方面，并在对保护暗色天空至关重要的减少光污染方面发挥重要作用；

注意到 2015 年恰值光科学历史上一系列重要成就周年纪念，包括 1015 年伊本·海赛姆的光学著作、1815 年菲涅尔提出的光波概念、1865 年马克斯韦尔提出的光电磁传播理论、1905 年爱因斯坦的光电效应理论和 1915 年通过广义相对论

13-45270 (C)

将光列为宇宙学的内在要素、1965 年彭齐亚斯和威尔逊发现宇宙微波背景以及高锟同年在光通信纤维光导方面取得的成就；

考虑到 2015 年为这些发现举办周年纪念活动将提供一个重要的机会，可突出宣传不同领域科学发现的连续性，特别强调在科学部门增强妇女权能以及在青年特别是发展中国家的青年中推广科学教育；

注意到经济及社会理事会 2013 年实质性会议已在“科技创新和文化潜力促进可持续发展和实现千年发展目标”主题下安排其年度部长级审查工作；

重申 2012 年 6 月 20 日至 22 日在巴西里约热内卢举行的可持续发展大会题为“我们希望的未来”的成果文件；[1]

注意到联合国教育、科学及文化组织执行局在其第 190 届会议期间赞同关于宣布 2015 年为国际光年的倡议，[2] 并注意到教科文组织大会第三十七届会议于 2013 年 11 月 19 日通过了该倡议；[3]

1. **决定**宣布 2015 年为光和光基技术国际年；

2. **邀请**联合国教育、科学及文化组织考虑到经济及社会理事会第 1980/67 号决议附件的规定，与各国政府、联合国系统有关组织、国际科学理事会和其他相关学术组织和非政府组织合作，协助组织和落实该国际年；

3. **强调指出**，除牵头机构目前在其任务规定范围内开展的活动外，因执行本决议而可能产生的所有活动费用应由自愿捐款包括私营部门的自愿捐款支付；

4. **鼓励**所有国家、联合国系统和所有其他行为体利用该国际年推动在各级采取行动，包括开展国际合作，并提高公众对光科学、光学和光基技术，以及推广新知识和相关活动的重要性的认识；

5. **请**联合国教育、科学及文化组织考虑到经济及社会理事会第 1980/67 号决议附件第 23 至 27 段的规定，向大会第七十一届会议通报本决议执行情况，除其他外，说明对该国际年的评价。

2013 年 12 月 20 日
第 71 次全体会议

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[1] 第 66/288 号决议，附件。

[2] 联合国教育、科学及文化组织，第 190 EX/Decisions 号文件，决定 47。

[3] 同上，《大会记录，第三十七届会议，2013 年 11 月 5 日至 20 日，巴黎》，第一卷，《决议》，第五节，第 25 号决议。

United Nations A/RES/68/221

General Assembly

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12 February 2014

Sixty-eighth session
Agenda item 21 (*b*)

Resolution adopted by the General Assembly on 20 December 2013

[*on the report of the Second Committee (A/68/440/Add.2)*]

68/221. International Year of Light and Light-based Technologies, 2015

The General Assembly,

Reaffirming its resolutions 53/199 of 15 December 1998 and 61/185 of 20 December 2006, on the proclamation of international years, and Economic and Social Council resolution 1980/67 of 25 July 1980 on international years and anniversaries, particularly paragraphs 1 to 10 of the annex thereto, on the agreed criteria for the proclamation of international years, as well as paragraphs 13 and 14, which state that an international year should not be proclaimed before the basic arrangements for its organization and financing have been made,

Recognizing the importance of light and light-based technologies in the lives of the citizens of the world and for the future development of global society on many levels,

Stressing that enhanced global awareness of and increased education in the science and technologies of light are vital for addressing challenges such as sustainable development, energy and community health, as well as for improving the quality of life in both developed and developing countries,

Considering that the applications of light science and technology are vital for existing and future advances in, inter alia, medicine, energy, information and communications, fibre optics, agriculture, mining, astronomy, architecture, archaeology, entertainment, art and culture, as well as many other industries and services, and that light-based technologies contribute to the fulfilment of internationally agreed development goals, including by providing access to information and increasing societal health and well-being,

Considering also that technology and design can play an important role in the achievement of greater energy efficiency, in particular by limiting energy waste, and in the reduction of light pollution, which is key to the preservation of dark skies,

Noting that 2015 coincides with the anniversaries of a series of important milestones in the history of the science of light, including the works on optics by Ibn Al-Haytham in 1015, the notion of light as a wave proposed by Fresnel in 1815,

13-45271 (E)

the electromagnetic theory of light propagation proposed by Maxwell in 1865, Einstein's theory of the photoelectric effect in 1905 and of the embedding of light in cosmology through general relativity in 1915, the discovery of the cosmic microwave background by Penzias and Wilson and Kao's achievements concerning the transmission of light in fibres for optical communication, both in 1965,

Considering that the celebration of the anniversaries of these discoveries in 2015 would provide an important opportunity to highlight the continuous nature of scientific discovery in different contexts, with particular emphasis on women's empowerment in the science sector and on promoting science education among young people, especially in developing countries,

Noting that at its 2013 substantive session, the Economic and Social Council organized its work for the annual ministerial review under the theme "Science, technology and innovation, and the potential of culture, for promoting sustainable development and achieving the Millennium Development Goals",

Reaffirming the outcome document of the United Nations Conference on Sustainable Development, held in Rio de Janeiro, Brazil, from 20 to 22 June 2012, entitled "The future we want",[1]

Noting the endorsement by the Executive Board of the United Nations Educational, Scientific and Cultural Organization at its 190th session of the initiative to proclaim 2015 the International Year of Light and the adoption of that initiative by the General Conference at its thirty-seventh session, on 19 November 2013,[2]

1. *Decides* to proclaim 2015 the International Year of Light and Light-based Technologies;

2. *Invites* the United Nations Educational, Scientific and Cultural Organization, mindful of the provisions of the annex to Economic and Social Council resolution 1980/67, to facilitate the organization and implementation of the International Year, in collaboration with Governments, relevant organizations of the United Nations system, the International Council for Science and other relevant academic and non-governmental organizations;

3. *Stresses* that the costs of all activities that may arise from the implementation of the present resolution above and beyond activities currently within the mandate of the lead agency should be met from voluntary contributions, including from the private sector;

4. *Encourages* all States, the United Nations system and all other actors to take advantage of the International Year to promote actions at all levels, including through international cooperation, and to increase awareness among the public of the importance of light science, optics and light-based technologies and of promoting widespread access to new knowledge and related activities;

5. *Requests* the United Nations Educational, Scientific and Cultural Organization, mindful of the provisions of paragraphs 23 to 27 of the annex to Economic and Social Council resolution 1980/67, to inform the General Assembly

[1] Resolution 66/288, annex.

[2] United Nations Educational, Scientific and Cultural Organization, *Records of the General Conference, Thirty-seventh Session, Paris, 5 – 20 November 2013*, vol. 1, *Resolutions*, sect. V, resolution 25.

at its seventy-first session on the implementation of the present resolution, elaborating, inter alia, on the evaluation of the International Year.

71st plenary meeting
20 December 2013

Nations Unies A/RES/68/221

Assemblée générale

Distr. générale
12 février 2014

Soixante-huitième session
Point 21 *b*) de l'ordre du jour

Résolution adoptée par l'Assemblée générale le 20 décembre 2013

[*sur la base du rapport de la Deuxième Commission (A/68/440/Add.2)*]

68/221. Année internationale de la lumière et des techniques utilisant la lumière (2015)

L'Assemblée générale,

Réaffirmant les dispositions de ses résolutions 53/199 du 15 décembre 1998 et 61/185 du 20 décembre 2006 sur la proclamation d'années internationales, et la résolution 1980/67 du 25 juillet 1980 du Conseil économique et social sur les années internationales et anniversaires, en particulier les paragraphes 1 à 10 de l'annexe énumérant les critères applicables pour la proclamation d'années internationales ainsi que les paragraphes 13 et 14 qui précisent qu'une année ne doit pas être proclamée avant que les arrangements de base nécessaires à son organisation et à son financement aient été pris,

Considérant que la lumière et les techniques utilisant la lumière sont essentielles dans la vie des citoyens du monde et qu'elles joueront un rôle éminent, à de nombreux égards, dans le développement futur de la société mondiale,

Soulignant qu'il est primordial de sensibiliser davantage et de mieux former la communauté internationale aux sciences et techniques de la lumière pour relever des défis tels que le développement durable, l'énergie et la santé des collectivités et pour améliorer la qualité de vie tant dans les pays développés que dans les pays en développement,

Considérant que les applications des sciences et techniques de la lumière sont capitales pour les progrès actuels et futurs dans des domaines tels que la médecine, l'énergie, l'information et les communications, les fibres optiques, l'agriculture, les industries extractives, l'astronomie, l'architecture, l'archéologie, le divertissement, l'art, la culture et bien d'autres industries et services, et que les techniques utilisant la lumière contribuent à la réalisation des objectifs de développement arrêtés au niveau international, notamment en ce qu'elles donnent accès à l'information et améliorent la santé et le bien-être des sociétés,

Considérant également que ces techniques et leur conception peuvent jouer un rôle important dans l'utilisation plus rationnelle de l'énergie, notamment en limitant le gaspillage d'énergie, et dans la réduction de la pollution lumineuse, essentielle à la préservation du ciel nocturne,

13-45272

Notant que 2015 coïncide avec les anniversaires d'une série d'événements importants dans l'histoire des sciences de la lumière, notamment les travaux sur l'optique d'Ibn Al-Haytham en 1015, la théorie ondulatoire de la lumière avancée par Fresnel en 1815, la théorie électromagnétique de la propagation de la lumière avancée par Maxwell en 1865, les théories d'Einstein sur l'effet photoélectrique en 1905 et sur les liens entre lumière et cosmologie mis en évidence par la relativité générale en 1915, et la découverte du fond diffus cosmologique par Penzias et Wilson de même que les travaux de Kao sur la transmission de la lumière dans les fibres pour la communication optique en 1965,

Considérant que la célébration des anniversaires de ces découvertes en 2015 serait une excellente occasion de souligner le caractère continu des découvertes scientifiques dans différents domaines, l'accent étant mis en particulier sur l'autonomisation des femmes dans le secteur scientifique et sur la promotion de l'éducation scientifique des jeunes, surtout dans les pays en développement,

Notant qu'à sa session de fond de 2013, le Conseil économique et social a décidé que l'examen ministériel annuel aurait pour thème « La science, la technologie et l'innovation, ainsi que les perspectives ouvertes par la culture, au service de la promotion du développement durable et de la réalisation des objectifs du Millénaire pour le développement »,

Réaffirmant les conclusions du document final intitulé « L'avenir que nous voulons »[1], qui a été adopté à l'issue de la Conférence des Nations Unies sur le développement durable, tenue à Rio de Janeiro (Brésil) du 20 au 22 juin 2012,

Notant que l'initiative visant à proclamer 2015 Année internationale de la lumière a été approuvée par le Conseil exécutif de l'Organisation des Nations Unies pour l'éducation, la science et la culture à sa cent quatre-vingt-dixième session, et adoptée par la Conférence générale à sa trente-septième session, le 19 novembre 2013[2],

1. *Décide* de proclamer l'année 2015 Année internationale de la lumière et des techniques utilisant la lumière;

2. *Invite* l'Organisation des Nations Unies pour l'éducation, la science et la culture, en ayant à l'esprit les dispositions énoncées à l'annexe de la résolution 1980/67 du Conseil économique et social, à faciliter l'organisation et la célébration de l'Année internationale, en collaboration avec les gouvernements et les organismes compétents des Nations Unies, ainsi que le Conseil international pour la science et les autres établissements d'enseignement supérieur et organisations non gouvernementales concernés;

3. *Souligne* que toutes les activités qui, au-delà de celles relevant actuellement du mandat de l'organisme chef de file, pourraient découler de l'application de la présente résolution, devraient être financées au moyen de contributions volontaires provenant notamment du secteur privé;

4. *Engage* tous les États, les organismes des Nations Unies et toutes les autres parties intéressées à mettre à profit la célébration de l'Année internationale pour encourager à tous les niveaux des initiatives, notamment par le biais de la coopération internationale, pour faire prendre davantage conscience au public de

[1] Résolution 66/288, annexe.

[2] Organisation des Nations Unies pour l'éducation, la science et la culture, *Actes de la Conférence générale, trente-septième session, Paris, 5-20 novembre 2013*, vol. 1, *Résolutions*, sect. V, résolution 25.

l'importance des sciences de la lumière, de l'optique et des techniques utilisant la lumière et pour assurer un large accès aux nouvelles connaissances et aux activités dans ce domaine ;

5. *Prie* l'Organisation des Nations Unies pour l'éducation, la science et la culture de lui présenter, à sa soixante et onzième session, des informations sur l'application de la présente résolution, en gardant à l'esprit les dispositions des paragraphes 23 à 27 de l'annexe à la résolution 1980/67 du Conseil économique et social et notamment un bilan de l'Année internationale.

71e séance plénière
20 décembre 2013

Организация Объединенных Наций A/RES/68/221

Генеральная Ассамблея

Distr.: General
12 February 2014

Шестьдесят восьмая сессия
Пункт 21 *b* повестки дня

Резолюция, принятая Генеральной Ассамблеей 20 декабря 2013 года

[*по докладу Второго комитета (A/68/440/Add.2)*]

68/221. Международный год света и световых технологий в 2015 году

Генеральная Ассамблея,

вновь подтверждая свои резолюции 53/199 от 15 декабря 1998 года и 61/185 от 20 декабря 2006 года о провозглашении международных годов и резолюцию 1980/67 Экономического и Социального Совета от 25 июля 1980 года о международных годах и годовщинах, особенно пункты 1–10 приложения к ней о согласованных критериях объявления международных годов, а также пункты 13 и 14, в которых говорится, что международный год не следует провозглашать до принятия основных мер, необходимых для его организации и финансирования,

признавая важность света и световых технологий для жизни граждан всего мира и для будущего развития глобального общества на многих уровнях,

подчеркивая, что повышение осведомленности и углубление образования во всем мире в области науки о свете и световых технологий играют исключительно важную роль в решении таких задач, как устойчивое развитие, энергообеспечение и здравоохранение, а также в повышении качества жизни как в развитых, так и в развивающихся странах,

полагая, что внедрение в жизнь прикладных достижений науки о свете и световых технологий имеет исключительно большое значение для современных и будущих достижений, в частности в медицине, энергетике, информационно-коммуникационной технике, оптоволоконной технике, сельском хозяйстве, горнодобывающей промышленности, астрономии, архитектуре, археологии, индустрии развлечений, искусстве и культуре, а также во многих других отраслях промышленности и сферы услуг, и что использование световых технологий, в частности для получения доступа к информации и повышения уровня здоровья и благополучия общества, способствует достижению согласованных на международном уровне целей в области развития,

полагая также, что технико-конструкторские разработки могут сыграть важную роль в повышении энергоэффективности, прежде всего за счет уменьшения энергопотерь, и в уменьшении светового загрязнения, что крайне важно для сохранения ночного неба темным,

отмечая, что 2015 год будет юбилейным для целого ряда важных вех в истории науки о свете, включая написание Ибн аль-Хайсамом работ по оптике в 1015 году; введение понятия световой волны, предложенного Френелем в 1815 году; появление электромагнитной теории распространения света, предложенной Максвеллом в 1865 году; появление теории фотоэлектрического эффекта, предложенной Эйнштейном в 1905 году, и введение в космологию понятия света благодаря общей теории относительности в 1915 году; и открытие Пензиасом и Вильсоном космического микроволнового фонового излучения, а также успехи, достигнутые Као в области волоконно-оптической связи на основе передачи света, в 1965 году,

полагая, что празднование годовщин этих открытий в 2015 году откроет обширные возможности для того, чтобы отметить непрерывный характер процесса научного познания в различных областях, уделив особое внимание расширению возможностей женщин в научной отрасли и популяризации естественно-научного образования среди молодежи, особенно в развивающихся странах,

отмечая, что в качестве основной темы ежегодного обзора на уровне министров в ходе своей основной сессии 2013 года Экономический и Социальный Совет выбрал «Подключение науки, техники и инноваций, а также потенциала культуры к содействию устойчивому развитию и достижению целей в области развития, сформулированных в Декларации тысячелетия»,

вновь подтверждая принятый на Конференции Организации Объединенных Наций по устойчивому развитию, состоявшейся 20–22 июня 2012 года в Рио-де-Жанейро, Бразилия, итоговый документ под названием «Будущее, которого мы хотим»[1],

принимая к сведению тот факт, что Исполнительный совет Организации Объединенных Наций по вопросам образования, науки и культуры на своей 190-й сессии поддержал идею провозглашения 2015 года Международным годом света и что 19 ноября 2013 года Генеральная конференция на своей тридцать седьмой сессии одобрила эту идею[2],

1. *постановляет* провозгласить 2015 год Международным годом света и световых технологий;

2. *предлагает* Организации Объединенных Наций по вопросам образования, науки и культуры, памятуя о положениях приложения к резолюции 1980/67 Экономического и Социального Совета, в сотрудничестве с правительствами, соответствующими организациями системы Организации Объединенных Наций, Международным советом по науке и другими соответствующими научно-образовательными и неправительственными организациями содействовать организации и проведению Международного года;

[1] Резолюция 66/288, приложение.

[2] Организация Объединенных Наций по вопросам образования, науки и культуры, Отчеты Генеральной конференции, тридцать седьмая сессия,Париж, 5-20 ноября 2013 года, том 1, Резолюции, раздел V, резолюция 25.

3. *подчеркивает*, что расходы на все мероприятия, которые могут возникнуть в связи с осуществлением настоящей резолюции, помимо расходов на мероприятия, предусмотренные в настоящее время мандатом упомянутого учреждения-исполнителя, должны покрываться за счет добровольных взносов, в том числе от частного сектора;

4. *рекомендует* всем государствам, системе Организации Объединенных Наций и всем другим заинтересованным сторонам воспользоваться проведением Международного года для содействия принятию мер на всех уровнях, в том числе по линии международного сотрудничества, и для более глубокого осознания общественностью значимости науки о свете, оптики и световых технологий и важности поощрения широкого доступа к новым знаниям и соответствующей деятельности;

5. *просит* Организацию Объединенных Наций по вопросам образования, науки и культуры, принимая во внимание положения пунктов 23–27 приложения к резолюции 1980/67 Экономического и Социального Совета, информировать Генеральную Ассамблею на ее семьдесят первой сессии об осуществлении настоящей резолюции, уделив особое внимание оценке проведения Международного года.

71-е пленарное заседание,
20 декабря 2013 года

Naciones Unidas A/RES/68/221

Asamblea General

Distr. general
12 de febrero de 2014

Sexagésimo octavo período de sesiones
Tema 21 *b*) del programa

Resolución aprobada por la Asamblea General el 20 de diciembre de 2013

[*sobre la base del informe de la Segunda Comisión (A/68/440/Add.2)*]

68/221. Año Internacional de la Luz y las Tecnologías Basadas en la Luz, 2015

La Asamblea General,

Reafirmando sus resoluciones 53/199, de 15 de diciembre de 1998, y 61/185, de 20 de diciembre de 2006, relativas a la proclamación de años internacionales, y la resolución 1980/67 del Consejo Económico y Social, de 25 de julio de 1980, relativa a los años y aniversarios internacionales, en especial los párrafos 1 a 10 del anexo de esa resolución, sobre los criterios convenidos para la proclamación de años internacionales, así como los párrafos 13 y 14, en los que se establece que no debe proclamarse año alguno sin que se hayan hecho antes los arreglos básicos necesarios para su organización y financiación,

Reconociendo la importancia de la luz y las tecnologías basadas en la luz para la vida de los ciudadanos del mundo y para el desarrollo futuro de la sociedad mundial en muchos niveles,

Destacando que el aumento de la conciencia mundial y un fortalecimiento de la enseñanza de la ciencia y las tecnologías de la luz son esenciales para abordar retos tales como el desarrollo sostenible, la energía y la salud de las comunidades, así como para mejorar la calidad de vida en los países desarrollados y en desarrollo,

Considerando que las aplicaciones de la ciencia y la tecnología de la luz son esenciales para los avances ya alcanzados y futuros en las esferas de la medicina, la energía, la información y las comunicaciones, la fibra óptica, la agricultura, la minería, la astronomía, la arquitectura, la arqueología, el ocio, el arte y la cultura, entre otras, así como en muchos otros sectores industriales y servicios, y que las tecnologías basadas en la luz contribuyen al logro de las metas de desarrollo convenidas internacionalmente, entre otras cosas al proporcionar acceso a la información y aumentar la salud y el bienestar de la sociedad,

Considerando también que la tecnología y el diseño pueden desempeñar un papel importante en el logro de una mayor eficiencia energética, en particular al limitar el despilfarro de energía, y en la reducción de la contaminación lumínica, que es fundamental para la conservación de cielos oscuros,

13-45274

Observando que el año 2015 coincide con los aniversarios de una serie de hitos importantes en la historia de la ciencia de la luz, entre ellos la labor sobre la óptica de Ibn Al-Haytham en 1015, la noción del carácter ondulatorio de la luz propuesta por Fresnel en 1815, la teoría electromagnética de propagación de la luz formulada por Maxwell en 1865, la teoría de Einstein del efecto fotoeléctrico en 1905 y de la incorporación de la luz en la cosmología mediante la relatividad general en 1915, el descubrimiento del fondo de microondas del cosmos por Penzias y Wilson y los logros alcanzados por Kao en la transmisión de luz por fibras para la comunicación óptica, ambos en 1965,

Considerando que la celebración de los aniversarios de estos descubrimientos en 2015 ofrecería una importante oportunidad para destacar la continuidad de los descubrimientos científicos en diferentes contextos, haciendo especial hincapié en el empoderamiento de las mujeres en el ámbito científico y la promoción de la enseñanza de las ciencias entre los jóvenes, especialmente en los países en desarrollo,

Observando que en su período de sesiones sustantivo de 2013, el Consejo Económico y Social organizó su labor para el examen ministerial anual en relación con el tema "Ciencia, tecnología e innovación y potencial de la cultura para promover el desarrollo sostenible y la consecución de los Objetivos de Desarrollo del Milenio",

Reafirmando el documento final de la Conferencia de las Naciones Unidas sobre el Desarrollo Sostenible, celebrada en Río de Janeiro (Brasil) del 20 al 22 de junio de 2012, titulado "El futuro que queremos"[1],

Observando el respaldo que ha dado el Consejo Ejecutivo de la Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura, en su 190ª reunión, a la iniciativa de proclamar el año 2015 Año Internacional de la Luz, y la aprobación de esa iniciativa en la 37ª reunión de la Conferencia General el 19 de noviembre de 2013[2],

1. *Decide* proclamar el año 2015 Año Internacional de la Luz y las Tecnologías Basadas en la Luz;

2. *Invita* a la Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura, teniendo presentes las disposiciones del anexo de la resolución 1980/67 del Consejo Económico y Social, a que facilite la organización y la observancia del Año Internacional, en colaboración con los gobiernos, las organizaciones competentes del sistema de las Naciones Unidas, el Consejo Internacional para la Ciencia y otras organizaciones académicas y no gubernamentales competentes;

3. *Destaca* que los costos de todas las actividades que puedan derivarse de la aplicación de la presente resolución distintas de las que se incluyen actualmente en el mandato del organismo coordinador deberán sufragarse con cargo a contribuciones voluntarias, incluso del sector privado;

4. *Alienta* a todos los Estados, al sistema de las Naciones Unidas y a todos los demás agentes a que aprovechen el Año Internacional para promover medidas a todos los niveles, incluso mediante la cooperación internacional, y aumenten la

[1] Resolución 66/288, anexo.

[2] Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura, *Actas de la Conferencia General, 37ª reunión, París, 5 a 20 de noviembre de 2013*, vol. 1, *Resoluciones*, secc. V, resolución 25.

conciencia del público sobre la importancia de las ciencias de la luz, la óptica y las tecnologías basadas en la luz y de promover un amplio acceso a los nuevos conocimientos y actividades conexas;

5. *Solicita* a la Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura, teniendo presentes las disposiciones de los párrafos 23 a 27 del anexo de la resolución 1980/67 del Consejo Económico y Social, que, en su septuagésimo primer período de sesiones, la informe sobre la aplicación de la presente resolución, con una evaluación detallada del Año Internacional, entre otras cosas.

71ª sesión plenaria
20 de diciembre de 2013

UNITED NATIONS NATIONS UNIES

THE SECRETARY-GENERAL

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MESSAGE FOR THE OPENING CEREMONY
OF THE INTERNATIONAL YEAR OF LIGHT
Paris, 19-20 January 2015

Light is a unifying symbol that signifies wisdom and excites the imagination across the world.

Paintings and murals in all cultures show how artists have used light, shade and colour to illustrate mood and create atmosphere. Light is used in some therapies to promote health, and in religious ceremonies as aid to worship and reflection.

On the most fundamental level through photosynthesis, light is necessary to the existence of life itself. Light science has revolutionized medicine, agriculture and energy, and optical technologies are part of the basic infrastructure of modern communications.

For these reasons and more, light sciences are a cross-cutting discipline in the 21st century. As we strive to end poverty and promote shared prosperity, light technologies can offer practical solutions to global challenges. They will be particularly important in advancing progress towards the Millennium Development Goals, achieving the future sustainable development goals and addressing climate change.

As part of our efforts to spread the availability of light, my Sustainable Energy for All initiative aims to dramatically increase energy access, energy efficiency and the use of renewables by the year 2030. This will mean more light in homes, hospitals and enterprises – and that will translate into a safer, healthier and more productive future.

Our chief source of light as a planet – the sun – is being harnessed in new and exciting ways through solar power that offers a clean alternative to other sources.

The International Year of Light can be used to expand scientific cooperation, especially in developing countries, advance education in the basic sciences, and engage talented young minds in our efforts to build lives of dignity for all.

Let there be a year of light.

Ki Moon Ban

BAN Ki-moon

UNITED NATIONS NATIONS UNIES

THE SECRETARY-GENERAL

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MESSAGE TO CLOSING CEREMONY OF
THE INTERNATIONAL YEAR OF LIGHT AND LIGHT-BASED TECHNOLOGIES
Merida, Mexico, 4 February 2016

I am pleased to send greetings to the closing ceremony of the International Year of Light and Light-based Technologies, declared by the United Nations General Assembly.

From the dawn of our history, humanity has been fascinated by light. Its magic and beauty has inspired poems, music and art. And with this International Year, we have celebrated our global efforts to understand light and harness its potential.

Light is the driver of photosynthesis and is the main source of energy for most living creatures. It holds the key to major advances in medicine, engineering and communications. By celebrating light, this International Year has celebrated life.

I thank UNESCO and all its partners, as well as the Steering Committee, for their commitment to this International Year. The efforts under this initiative to foster education and communication on this theme have lit a beacon to illuminate our future.

The Year has shown how the science of light, photonics and related technologies can promote sustainable development in many fields, including climate change and energy, agriculture, health and education.

Light, in all its applications, will be essential to advance the 2030 Agenda for Sustainable Development, as well as the objectives of the Paris Agreement on climate change.

The International Year has catalyzed and strengthened partnerships between the public and private sectors, and among civil society and academic institutions.

It has also provided an opportunity to mark the anniversaries of ground-breaking discoveries – such as Ibn Al-Haytham's first investigations in optics, Fresnel's 1815 proposal that light is a wave, Maxwell's electromagnetic theory of light in 1865, Einstein's work in photoelectric effect and relativity in 1905 and 1915, and Kao's 1965 invention of the optical fibre that has enabled the Internet and opened up global communications.

This illustrious history indicates that the science of light will continue to create new knowledge and innovation for the benefit of all humanity.

I thank you all once again for your commitment and wish you a successful gathering.

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