

Report to IUPAP Council and Commission Chairs Meeting

IUPAP C17: Commission on Laser Physics and Photonics

Singapore, 3-4 May 2018

1. ACTIVITIES SINCE THE LAST C&CC MEETING (OCTOBER 2017)

1.1. UNESCO's International Day of Light 2018 (<https://www.lightday.org/>)

The first ever UNESCO's International Day of Light (IDL) is set on the 16 May 2018. The general ambition of IDL is to expose young minds, particularly high-school students, to advancements in optics and photonics, through open houses in all major institutions, to stimulate these young brains to start imagining innovations in science and technology. Supporting developing nations, and disadvantaged groups within developed nations, to achieve a similar exposure for high-school students, via means that can be resourced and implemented where the children live, can be a positive approach. The connection of IDL aims to the United Nations Sustainable Development Goals, which connects directly with IUPAP's mission.

C17 wishes to play an important role in raising awareness of IDL, its programs and events through the international reach of our channels and networks. Members have been strongly encouraged to support IDL by organizing events as an additional responsibility specific to our commission.

Below are some examples of the IDL events in which C17 and its members are involved, or are badged as a C17 conference:

- Light and Life: A Student Photo Contest (<http://www.phy.iitb.ac.in/en/content/light-and-life-student-photo-contest>) (organized by P. Vasa, member of C17)
- European Photonics Roadshow on Agriculture and Food (<http://www.photonicsroadshow.eu/events/2018-04-05-florence>), 16 - 17 May 2018, Florence, Italy (R. Pini, Secretary of C17, involved in organization)
- FOTONICA 2018 (<https://convegni.aeit.it/fotonica/>), 23-25 May 2018, Lecce, Italy (R. Pini, Secretary of C17, involved in organization)
- Photonics North (<http://www.photonicsnorth.com/en>), 5-7 June 2018, Montreal, Canada (badged as C17 conference after solicitation by T. Ozaki, Chair of C17)
- C. Simpson, member of C17, Deputy Chair of the New Zealand National Committee for IDL
- T. Ozaki, Chair of C17, Member of the Canadian National Steering Committee for IDL

1.2. Articles to the IUPAP Newsletter

To promote visibility of young scientists in Laser Physics & Photonics, C17 has asked the winners of the 2017 IUPAP Young Scientist Prizes (YSP) to contribute articles to the IUPAP newsletter. The two winners were A/Prof. Igor Aharanovich (University of Technology Sydney, Australia) "For his outstanding contributions to research on quantum emitters in wide band-gap semiconductors" (Applied Aspects), and Dr. Mohsen Rahmani (Australian National University, Canberra, Australia) "For his outstanding contributions to light-matter interactions at nanoscale, particularly nonlinear nanophotonics via metallic, dielectric and semiconductor nanostructures and metasurfaces, which have paved the road for extending nonlinear optics to the nanoscale" (Fundamental Aspects). A/Prof. Aharanovich provided us with a short article on his research (see

Appendix B), which was published in the March 2018 edition of the IUPAP Newsletter. Dr. Rahmani has also agreed to provide an article for the June 2018 edition.

1.3. IUPAP Conference support

C17 has started to solicit relevant conferences to be held in 2019 to apply for IUPAP conference support or endorsement. Initial contacts have resulted in several positive responses from the conference organizers. However, many conferences that were contacted did not have information on the 2019 conference, especially those that are planned later in the year.

1.4. Coordinating efforts between C17 and the International Commission for Optics

The Chair of C17 (T. Ozaki) had a discussion with the President of the International Commission for Optics (ICO), Prof. Roberta Ramponi (Istituto di Fotonica e Nanotechnologie, Italy) on how C17 and IUPAP could increase collaborations with ICO. The discussion included the next topics:

Associate Member of C17 representing ICO: C17 currently welcomes Prof. John Harvey (U. Auckland, New Zealand) as an Associate Member representing ICO. The mandate of Prof. Harvey is until the end of 2018, and thus T. Ozaki has asked Prof. Ramponi to start discussions within ICO on the Associate Member for the next triennial (2019-2022). Prof. Ramponi said that she will discuss with Prof. Harvey, as well as others at ICO to nominate a candidate.

C17/IUPAP - ICO Joint Workshops and Conferences: Prof. Ramponi and T. Ozaki have agreed that organizing a joint workshop would be beneficial for both C17/IUPAP and ICO. Several possibilities on the theme of such a workshop was discussed, and it was agreed that each will start discussions within their commission to identify opportunities.

Promoting gender equality: Prof. Ramponi and T. Ozaki had discussions on how the two commissions could work together to strongly promote gender equality. Several suggestions were made, and it was decided that further discussions should first start within each commission.

1.5. Discussions on the C17 In-person Meeting for 2018 and 2019

Communications and meetings of C17 have been primarily electronic, via emails. However, past history of our commission has shown the need for in-person meetings to allow much deeper discussions.

Our most recent in-person meeting was held in Singapore on the 1 August 2017. This was in parallel with the CLEO-Pacific Rim conference, where the award ceremony for our commission's Young Scientist Prizes was also held. To follow this tradition, C17 has decided that the best site for the 2019 C17 in-person meeting as well as the YSP award ceremony would be CLEO-Europe (June 2019, Munich, Germany). Negotiations with the organizers of CLEO-Europe have started.

For the 2018 in-person meeting, members of C17 were in favour of holding it at a different, more compact location, where commission members could sit down and exchange ideas on C17 business in depth. A proposal has been forwarded by G. Valusis, member of C17, to organize this meeting in Vilnius, Lithuania, in Q4 of 2018. Discussions on this 2018 in-person C17 meeting has just started.

1.6. Discussions on Joint C17/IUPAP-ICO Workshops

Following exchanges with the President of ICO, Prof. Ramponi, discussions within C17 have started on a possible joint C17/IUPAP-ICO workshop in 2019.

2. PLANNED ACTIVITIES FOR 2018

2.1. IUPAP Conference support

Capitalizing on their network and connections, members of C17 will continue to identify conferences that could be supported or endorsed by IUPAP, and to solicit the organizers to apply.

2.2. Articles for Newsletter

C17 members will be asked to provide articles relevant to IUPAP and the field. Examples of the contents of these articles include (i) significant scientific results and innovative applications; (ii) public and industrial initiatives related to C17 topics; (iii) *in memoria* of great scientists, tributes, anniversaries, selected prize winners.

2.3. C17 in-person Meeting

The location and dates of the C17 in-person meeting will be voted and determined. The officers will work closely with the local organizers to prepare the agenda and the C17 business to be discussed. Some points that would need to be discussed are associate member renewal (section 2.4), activities to promote gender equality (section 2.5), preparations for the C17 YSP in 2019 (section 2.6), preparations to promote IDL in 2019 (section 2.7), joint activities between C17/IUPAP and ICO (section 1.4) and joint C17/IUPAP-ICO workshop (section 1.6).

2.4. Associate member renewal

The mandate of the three Associate members of C17 (see Appendix A) will finish at the end of 2018. We will hold discussions in the 2018 C17 in-person meeting to determine the organization that the commission wishes to extend invitation to for C17 Associate membership. Once decision is made, we will contact these organizations to propose their representative, who will serve as Associate member of C17 for the 2019-2021 period.

2.5. Activities to promote Gender Equality

Discussions among C17 members on activities to promote gender equality in physics have started. The commission will identify actions to be taken, and the C17 members will be asked to take measures accordingly.

2.6. Preparations for the C17 YSP in 2019

The deadline for application for the C17 YSP for 2019 is projected to be at the end of December 2018. C17 members will be asked to advertise the YSP and solicit applications from young scientists in our field. C17 members will also be informed of the guidelines for ranking the applications and choosing the YSP winners, one on Fundamental aspects, and the other on Applied aspects.

2.7. IDL 2019

Since many of the current members of C17 were newly appointed in January 2018, there was not enough time to prepare for the IDL in 2018 (on the 16 May). Members of C17 will be asked to communicate and work with the IDL national node of their country to promote IDL events, and to badge them as C17 and IUPAP events as well.

APPENDICES

Appendix A - Officers and Members of C17 (as of January 2018)

Officers:

Chair: Tsuneyuki Ozaki (2014) (2017)

Email: ozaki@emt.inrs.ca

Vice-Chair: Qihuang Gong (2011) (2014) (2017)

Email: qhgong@pku.edu.cn

Secretary: Roberto Pini (2014) (2017)

Email: roberto.pini@cnr.it

Past Chair: Deborah Kane (2011) (2014)

Email: deb.kane@mq.edu.au

Members:

Kai-Mei Camilla Fu (2017)

Email: kaimeifu@uw.edu

Alexey Kalachev (2017)

Email: a.a.kalachev@mail.ru

Kathy Lüdge (2017)

Email: kathy.luedge@tu-berlin.de

Andre Luiten (2017)

Email: andre.luiten@adelaide.edu.au

Kevin F. MacDonald (2017)

Email: kfm@orc.soton.ac.uk

Ci-Ling Pan (2011) (2017)

Email: clpan@phys.nthu.edu.tw

M. Cather Simpson (2017)

Email: c.simpson@auckland.ac.nz

Yoshiro Takahashi (2017)

Email: yitk@scphys.kyoto-u.ac.jp

Gintaras Valušis (2017)

Email: gintaras.valusis@ftmc.lt

Parinda Vasa (2017)

Email: parinda@iitb.ac.in

Arkadiusz Wójs (2014) (2017)

Email: arkadiusz.wojs@pwr.edu.pl

Associate Members (mandate until end of 2018):

Nicholas P. Bigelow (representing the Joint Council of Quantum Electronics)

Email: nbig@lle.rochester.edu

John Harvey (representing the International Commission for Optics)

Email: j.harvey@auckland.ac.nz

John Dudley (representing the International Year of Light legacy)

Email: john.dudley@univ-fcomte.fr

Appendix B - Contribution by Dr. Aharonovich (2017 C17 YSP winner) to the IUPAP Newsletter (March 2018).

Single Emitters in Wide Bandgap Semiconductors

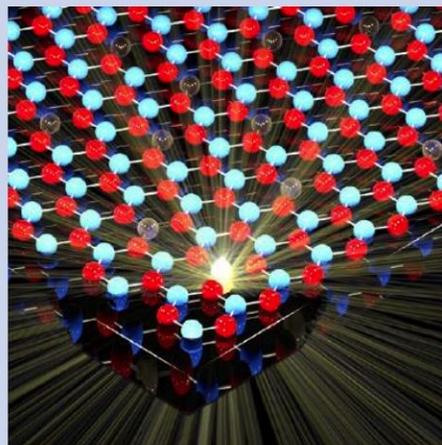
Dr. Igor Aharonovich (2017 C17 YSP winner)

Photonic technologies revolutionized many aspects of our daily lives. Spanning from ultra bright LEDs and lasers, optical communications that power the internet to novel biomarkers for imaging and sensing in health and diagnostics. A new research frontline is, engineering non classical – quantum light sources, also known as single photon emitters (SPEs). These emitters are in the heart of many quantum technologies as information carriers for secured communications, quantum nodes and building blocks for quantum metrology and quantum repeaters.

My research is focused on developing new (SPE). There are many criterion for an ideal SPE, including low multiphoton events, brightness and polarization. Over the last few years my lab has been focusing on studying defects in wide band gap materials – such as diamond, silicon carbide and gallium nitride. We have identified and investigated many sources that emit in the visible as well as in the infrared spectral range. More recently, we embarked on studying emitters in 2D materials, namely, hexagonal boron nitride (hBN). hBN is a wide bandgap material that can be exfoliated into a single monolayer. Identifying SPEs in a monolayer is advantageous as it eliminates scattering, internal reflection and offers promising attributes for integration with plasmonic and photonic cavities.

Currently, the group is focused on exploring these defects in 2D materials and implementing them in new modalities, such as,

super resolution imaging or non linear optics. In the near future, we aim to realize a fully integrated quantum photonic chip based solely on a wideband gap material hosting a high performance quantum emitter.



hBN single defect glass rays