IUPAP Commission on Semiconductor Physics (C8)
Report on Activities in 2017 for the October, 2017 C&CC Meeting
and overview, 2014-2017, for the IUPAP General Assembly

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* replacing Per Olof Holtz who resigned during 2016

Sponsored Conferences in 2017

C8 had one sponsored type-A conference in 2017, the joint conference EP2DS-22/MSS-18 (22nd International Conference on the Electronic Properties of Two dimensional Materials/ 18th International Conference on Modulated Semiconductor Structures), at Penn State University, State College, PA, USA, from July 31 to Aug. 4. With ~260 participants, the meeting was somewhat smaller than usual, but it included 151 non-U.S. participants from 23 countries. IUPAP funds were used to support the travel costs of 14 participants from developing countries.

EP2DS-22/MSS-18 had 38 female attendees, including one plenary speaker, four invited speakers, and eight oral presenters. The International Organizing Committee, the Program Committee, and the Local Organizing Committee had 4, 4, and 3 female members, respectively. EP2DS-22/MSS-18 was also the site of the annual general meeting of C8.

C8 will also have one type-B conference sponsored in 2017, the 18th International Conference on II-VI Compounds and Related Materials, to be held in San Juan, Puerto Rico, USA from Sept. 24 to 29.

C8 Annual General Meeting (AGM) 2017

The annual general meeting of C8 was held during the EP2DS-22/MSS-18 conference on Aug. 1, 2017. The meeting began with a presentation of the statistics for EP2DS-22/MSS-18, presented by the conference organizers. Possible reasons for the lower than normal attendance were discussed.

Related to the lower than normal attendance, no presenters were available to provide updates on future conferences connected with C8. In particular, the organizers of the 34th International Conference on the Physics of Semiconductors (ICPS-34), the premiere conference of C8, which will be held in Montpelier, France, July 29 to Aug. 3, 2018, were not able to attend EP2DS-22/MSS-18. The ICPS-34 website (http://www.icps2018.org) went live just before our meeting, so details of the venue, organization, and committee compositions were available for consideration by C8, but only after being made public. There is a concern that the organizers of sponsored conferences are tending to have decreasing interaction with C8 once their conference has received approval. In future, C8 may need to develop a firm timetable for consultations before formal announcements by sponsored conferences, and make this expectation clear to those bidding for sponsorship.

C8 members were pleased to learn that the organizers of ICPS-34 were planning to retain two very successful innovations introduced earlier in the series. The first, introduced at the Rio ICPS in 2008, is a Nobel prizewinner symposium on the Sunday at the beginning of the conference. This symposium had a very high attendance at the Beijing ICPS, and was followed by a question and answer period which featured remarkably active audience participation. The second innovation, introduced in Beijing in 2016, was to have the two young scientist prizewinners (YSP) in semiconductor physics give plenary (rather than invited) presentations during a plenary awards ceremony immediately preceding the closing ceremonies on Friday. This plenary awards ceremony also included the awarding of a number of student best poster awards. The plenary awards session was very successful and well-attended, and gave the YSP award talks a very high profile.

It was decided at the meeting, and unanimously supported by a poll of those who could not attend, that the conference sponsorship priorities for C8 in 2018 would be: first, to sponsor ICPS-34 as a type-A conference, and second, to sponsor the International Conference of Superlattices, Nanostructures and Nanodevices (ICSNN), to be held in Madrdid, Spain, from July 23 to 27, 2018, as a type-B conference.

The procedures used for the call for nominations and adjudication of the previous C8 YSP were reviewed. It was decided that we would retain the Dec. 31 closing date on the call for nominations, since this had worked very well in the previous round – for the first time in several cycles, there were enough strong nominations at the end of the call period that no extension was necessary. After discussion, it was decided to add a specific reference to achievements in *semiconductor* physics to the body of the call, since previous rounds had resulted in several strong nominations which had, in the

opinion of the C8 members, only a tenuous connection to the specific areas of semiconductor physics.

The next C8 AGM will take place during the 34th ICPS in Montpelier, France, during the week of July 29 to Aug. 3, 2018.

C8 Overview, 2014 to 2017

The business of C8 is very much tied to the annual general meetings, which in even years are always held in conjunction with the International Conference on the Physics of Semiconductors (ICPS), the premiere meeting sponsored by C8, and the only conference over which C8 exercises direct control over the award of future conferences in the series. The C8 Young Scientist Prizes are also announced two at a time, at the ICPS conferences. During the 2014 to 2017 term there was only one ICPS, in Beijing China from July 31 to August 8, 2017. In odd years, the C8 meetings have recently been held during the joint conferences on the Electronic Properties of Two dimensional Materials (EP2DS) and on Modulated Semiconductor Structures (MSS). The 2017 conference EP2DS-22/MSS-18 has been mentioned in the previous sections, and in 2015 C8 met at EP2DS-21/MSS-17, which took place in Sendai, Japan, from July 26 to 31.

Attendance at EP2DS-21/MSS-17 was good, with over 525 submitted abstracts and nearly 500 registered attendees from 27 countries. Attendance by female scientists was unfortunately rather low, at 10%, which was perhaps related to the fact that almost 50% of those attending were from the host country. It was noteworthy that attendance form the USA was surprisingly low, at 3%, perhaps reflecting increasing difficulty in securing travel funding.

Attendance at ICPS-33 in Beijing was excellent, with over 1025 attendees from 35 countries. Female scientists accounted for 19.7% of the attendees and 20% of the student poster award winners, but only 12.4% of oral presentations. The program included nearly 300 oral contributions, more than 80 plenary and invited talks, and almost 800 posters. The Nobel Symposium which began the conference on Sunday was a particular success, with animated participation from the audience.

The commission was gratified that the ICPS-33 organizers gave the IUPAP Young Scientist Prizes particularly high exposure, with a Plenary Awards Session on Friday immediately before the closing ceremonies. The organizers also reinstituted the Student Poster Awards, 34 of which were given out during the Plenary Awards Session. These awards were adjudicated by the ICPS Program Committee, and the financial component of the awards were supported in equal part by C8 and the 33rd ICPS.

Two IUPAP Young Scientist Prizes (YSP) in semiconductor physics were awarded at the 33rd ICPS, to Prof. Kimberly Thelander, Lund University, “for her work to control and understand growth of nanowires, including three-dimensional structures, superlattices, crystal phase engineering and bandgap design”, and to Dr. Sam Stranks, MIT, “for

pioneering discoveries in the field of perovskite solar cells and optoelectronics through spectroscopy". Both winners gave excellent plenary talks on their work during the very well attended awards session.

Also, the 17th International Conference on II-VI Compounds and Related Materials, Paris, France, Sept. 13-18, 2015 was sponsored as a Type B conference.

C8 has made an effort to make fuller use of the new IUPAP conference endorsement procedure, both as a prelude to conferences which will later request sponsorship, but also to endorse bona-fide conferences to help distinguish them from the plethora of unknown conferences which appear in everyone's inbox these days. C8 has requested and received endorsement for ICPS-34 in Montpellier, 2018, ICPS-35, tentatively in Sydney, Australia, 2020, and the 20th International Conference on Electron Dynamics in Semiconductors, Optoelectronics and Nanostructures (EDISON 2017), held in Buffalo, USA, July 16-21, 2017.

Semiconductor physics continues to be an incredibly active area of both fundamental and applied research. The ubiquity of computing and communications power in our everyday lives is undeniable, and the drive towards smaller, faster, cheaper and lower power computing devices continues, followed by the question "what comes after silicon?" Solar energy and photovoltaics is also a major driver of research, with a constant search for new materials to make thinner, cheaper, higher efficiency, and longer-lasting devices.

The vibrancy of fundamental research in semiconductor physics is evidenced by recent Nobel Prizes, including for the quantum Hall effect (1985), the fractional quantum Hall effect (1998), microelectronics (2000), the CCD sensor (2009), graphene (2010), the blue LED (2014) and topological phases of matter (2016). The promise of quantum computing and quantum communication is driving widespread new efforts to harness these topological phases of matter, such as anyons in two-dimensional electron gasses, or Majorana fermions associated with semiconductor-superconductor devices. It is also driving renewed interest in fields previously considered to be 'mature', spanning donor spins in silicon, quantum dots in semiconductor heterostructures, and color centres in diamond and related materials.