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LUX to support Industry Alignment Fund

The LUX Photonics Consortium will form work groups on a few areas for the Industry Alignment Fund (Industry Collaboration Projects), shared LUX Chairman, Prof Tjin Swee Chuan, at its Members' Networking Event on 27 March.

The four work groups are 1) Infrastructure: Structural Health Monitoring, 2) Food Security Technologies, 3) Fiber Laser System and 4) Silicon Photonics. Some of the technology areas such as fiber technology (sensor, laser), imaging process & metrology and laser source were identified as part of the Lasers and Optics Joint Industry Sector Planning Roundtable.

*Prof Tjin shared that Minister Heng had highlighted LUX in his Budget 2019 Speech – the latter had said: "I recently visited LUX Photonics Consortium, which brings together researchers in NTU, NUS, A*STAR, and the industry to translate cutting-edge photonics research into practical applications."*

The Industry Alignment Fund is governed by the Singapore Economic Development Board / Enterprise Singapore, A*STAR and the National Research Foundation Singapore (NRF), and supports public research performers in strategic R&D projects with companies.

During his address at the event at NTU's Nanyang Executive Centre, Prof Tjin also spoke about Deputy Prime Minister and NRF Chairman Mr Heng Swee Keat's visit to NTU and the LUX Photonics Consortium earlier this year.

Then, LUX had showcased two research collaborations between The Photonics Institute (TPI) at NTU and local SMEs Technolite and Nanoveu to Mr Heng.

There were also introductions from four of LUX's newest Industry Members:

- ADVINTECH, a company of micro-electronic technologists focused on expanding the experiences of photonics and thermal sensing, with a focus on super broadband and ultra wide tuneable light sources.
- Axend, a distributor for suppliers in the Electronics Process Assembly Industry. The company has expertise in die attach, wire bonding, mechanical bond testing, and materials recommendation, dispensing and curing.

Message from the Chairman/Co-director:

We had our first networking event of the year on 27th Mar at the Nanyang Executive Centre's Orchid seminar room. At the event, we welcomed 5 new industry members Advintech, Axend, Compoundtek, Eureka Robotics and Holobright to the consortium. I am heartened to see more faculties joining us as well; we have 5 new faculty members from NTU's college of engineering and science. The consortium has continued to expand its circle of influence in both the academia and industry, and we are glad to be involved in the Joint Industry Sector Planning (JISP) roundtable discussion led by EDB and ASTAR. The objectives of JISP are to develop a roadmap on Lasers & Optics for Singapore and to formulate a programme where public funds to be invested to develop these capabilities within universities or research institutes. From these discussions, a few key technology areas were identified and we would like to call upon both faculty and industry members to form work groups for a more focus discussions and tap on Industry Alignment Fund (IAF) to support such collaborative projects.

Since joining EPIC as a member, I have been attending their annual general meeting (AGM) for the past few years to stay updated with the European photonics community. This year's AGM was held in Glasgow, UK in April, and I have the honour to share with the community in one of the sessions on "Accessing International Markets" from a Singapore's perspective.

This is the prelude to the EPIC Delegation to Singapore that we are co-organizing to be held in October 21 to 24. The EPIC delegation visit also coincides with one of the major industrial event in Singapore, the Industrial Transformation Asia Pacific (ITAP) 2019. LUX will be a supporting organization and we will put up a LUX Pavilion for members to exhibit under the LUX Photonics Consortium. We hope that members can capitalise on these events to expand their business network and showcase their capabilities.

In this issue, we introduce a new photonics lab under the Center for Optical Fibre Technology, called "Laboratory for Ultrafast and Coherent Interaction or LUCI". This lab is led by Nanyang Assistant Professor Chang Wonkeun to study ultrafast light-matter interactions for high power lasers.

Last but not least, I would like to extend my heartiest congratulations to Professor Nikolay Zheludev FRS, Co-Director of TPI and Centre director of CDPT, for being elected to the United States National Academy of Engineering (NAE) earlier this year for his "leadership and technical contributions to optical metamaterials and nanophotonics".

Prof Tjin Swee Chuan
Chairman, LUX Photonics Consortium
Co-Director, The Photonics Institute

TPI The Photonics Institute Singapore

LUX Photonics Consortium Singapore

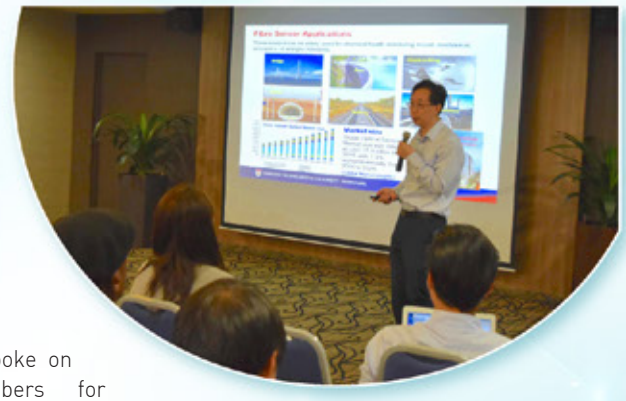
- Eureka Robotics, a spin-off company from NTU, which provides industrial robotic systems for the automating of tasks in unstructured environments. Applications include assembly, drilling, inspection and handling.
- CompoundTek, which provides enhanced foundry services for silicon photonics through a dedicated 8" commercial fab. Its core applications include: transceivers, quantum computers, neural networks, lab on chip, high Band Width cabling, and Light Detection and Ranging (LiDAR).

In addition, three LUX Faculty members delivered well-received tech talks.

Asst Prof Manojit Pramanik's topic was "Listening to light: photoacoustic imaging and its applications". He shared developments including the development of a low-cost Photoacoustic Computed Tomography desktop system that allows for in vivo small animal brain imaging, and photoacoustic microscopy that enables the likes of microneedle drug delivery monitoring.

Prof Yang Yaowen's talk was on the "Design and Development of FBG Based Geotechnical Instruments and Integration with Wireless FBG Transmitter". He discussed the benefits of Wireless Fiber Bragg Grating (FBG) sensors such as automatic data collection, real-time monitoring, and reduced manpower costs.

Prof Yang Yaowen shared that fiber sensors are currently used for structural health monitoring in civil, mechanical, aerospace, and oil & gas industries.



Asst Prof Wei Lei speaks at the 27 March networking event. His research areas include fiber-based functional devices, multi-dimensional and wearable functional fabrics, bio-fiber interfaces, and in-fiber energy generation and storage.

Asst Prof Wei Lei spoke on "Semiconductor Fibers for Wearable Electronics", discussing the slow evolution of fibers and the quest to achieve functionality with them. He shared his work on fiber-based wearable electronics, distributed photodetecting fibers, as well as semiconductor fibers for thermal sensing & positioning and active temperature regulation.

SingEx Exhibitions, the organiser of Industrial Transformation ASIA-PACIFIC (ITAP) 2019, also presented on the conference, which is Asia-Pacific's leading trade event for Industry 4.0 and will see participation from around 18,000 attendees from 55 countries.

LUX will have a pavilion at the exhibition, which will bring together manufacturers, government agencies & businesses ranging from multinational corporations to small and medium enterprises.

The first LUX Members' Networking Event of the year 2019.

LUCI sheds new light on Ultrafast and Coherent Interactions

The Laboratory for Ultrafast and Coherent Interactions – or LUCI for short – was established at COFT last year. It seeks to investigate various effects that arise due to interactions between optical pulses and matter.

According to Asst Prof Chang Wonkeun, who is LUCI's Principal Investigator, the lab is currently looking at hollow optical waveguide technology as a novel platform for observing ultrafast light-matter interactions. LUCI uses hollow optical waveguides fabricated in-house, making full use of COFT's state-of-the-art fibre drawing facility.

A hollow optical waveguide tightly confines and guides light in its central hollow region, meaning that substantially enhanced interactions may occur over an extended length-scale, when the waveguide is filled with atoms or molecules under investigation. Additionally, as its optical properties are dictated by the waveguide's geometrical arrangement, LUCI's researchers are able to engineer these properties by tailoring the waveguide design.

Asst Prof Chang Wonkeun (left) and his team are exploring hollow optical waveguide technology as a novel platform for observing ultrafast light-matter interactions.

Asst Prof Chang is particularly enthused by the progress being made by LUCI in its investigation of nonlinear phenomena in multi-mode hollow optical fibres.

He shares: "Our computer simulation shows that, through carefully designing the waveguide structure and controlling the filling gas pressure, considerable inter-modal interactions can be induced in the gas-filled hollow waveguide."

"One of our study's most striking features is that the nonlinear coupling between the light in different modes can create its own periodic disturbance along its propagation direction, generating multiple radiation peaks over a broad spectral range that can cover the entire transmission window of the hollow waveguide. We are thrilled to observe these effects experimentally in LUCI."

But the work done at LUCI has meaningful real-world implications too. Says Asst Prof Chang: "We are actively exploring potential routes to realise compact and robust ultrafast vacuum-ultraviolet and mid-infrared light sources. These wavelength ranges are increasingly finding applications across many disciplines, including in advanced manufacturing, medicine and science."

To name but a few examples, vacuum-ultraviolet pulses can be used in medical imaging, photolithography and spectroscopy, while mid-infrared light can be used in remote sensing of chemical and bio-molecular substances, as well as for inducing higher-harmonics to generate radiations in the X-ray region.

Says Asst Prof Chang: "We are always seeking industrial collaborators to together explore the possibility of commercialising our ideas developed in LUCI."

He is grateful to LUX Photonics Consortium for providing a platform, such as via its various events and networking sessions, for LUCI's researchers to interact with many prominent companies from Singapore's photonics industry.

"These occasions are very important for academic researchers like us to stay relevant in the field, as they provide an opportunity to understand and be aware of the present challenges in the sector and the specific industrial requirements."

Awards

TPI Co-Director elected to the US National Academy of Engineering

Professor Nikolay Zheludev, FRS, Co-Director of The Photonics Institute (TPI) at Nanyang Technological University, Singapore (NTU) and founding director of NTU's Centre for Disruptive Photonic Technologies (CDPT) has been elected to the United States National Academy of Engineering (NAE) for his "leadership and technical contributions to optical metamaterials and nanophotonics".

The NAE has elected 86 new members and 18 foreign members, which brings the total U.S. membership to 2,297 and the number of foreign members to 272. Election to the NAE is among the highest professional distinctions accorded to an engineer. Academy membership honors those who have made outstanding contributions to "engineering research, practice, or education, including, where appropriate, significant contributions to the engineering literature" and to "the pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering, or developing/implementing innovative approaches to engineering education."

This is his latest accolade, following his election into the Fellowship of The Royal Society in May 2018 and the Thomas Young Medal award in 2015.

Prof Zheludev is also the Deputy Director of the Optoelectronics Research Centre (ORC) at the University of Southampton, and head of the nanophotonics and metamaterials research group, the Editor-in-Chief of "Journal of Optics" (IOP Publishing) and an advisor to the Nature Publishing Group.

Industry News

EPIC presentation by Prof Tjin Swee Chuan

LUX Photonics Consortium was represented at the European Photonics Industry Consortium (EPIC) Annual General Meeting by its Chairman Prof Tjin Swee Chuan. The annual event was held at the Technology and Innovation Centre in Glasgow, UK.

He provided a Singapore perspective during the discussion on "Accessing International Markets" on day 2 of the April 10-12 event. Two hundred delegates – 65 per cent of whom were C-suite – from 25 countries participated in the by-invitation-only event.

To infinity and beyond - Transcelestial Technologies

Heartiest congratulations to Dr Mohammad Danesh, co-founder and Chief Technology Officer of LUX Industry Member, Transcelestial, for being named in Forbes' 30 under 30 2019 list!

Danesh (below) is leading the development of a space laser network that aims to deliver a step-change in internet connectivity globally. He says: "This will be the fastest way to bring the rest of the world up on the bandwidth and connectivity curve."

Spacetech start-up Transcelestial, which has already raised US$2.5 million in funding, uses an on-ground version of laser communication technology for point-to-point communications. This technology will have a much lower cost than fibre optics for telecoms and enterprises.

Transcelestial's latest commercially-available product is the CENTAURI, which allows for reliable 2Gbps connectivity at up to 3km distance. Tested in Singapore and overseas for over a year, it has been proven to provide telco grade reliability in extreme weather conditions, including Singapore's rainy climate.

The CENTAURI will address the growing demand for high bandwidth and low latency, especially in last mile and backhaul connectivity. More information can be found at transcelestial.com.

Phaos does Singapore proud in Nanjing

Well done to Phaos Technology for clinching third place at the Grand Finals of the Nanjing Overseas Talents Start-up Contest. The Advanced Optics Technology start-up can look forward to the Nanjing government's support as they look to expand into the Chinese market.

The LUX Industry Member had earned the right to represent Singapore by emerging as one of the top eight start-ups at the overseas preliminary round held here last December. The Singapore leg saw over 75 applicants from fields such as Artificial Intelligence, Smart Manufacturing, Internet of Things and Life Sciences.

A total of 1,795 people from 27 countries had applied to join the contest.

Phaos Technology's Mr Chen Lianwei Leon (second from left) at the Singapore leg of the Nanjing Overseas Talents Start-up Contest.

CompoundTek strikes new partnerships

LUX Industry Member CompoundTek has partnered with the Silicon Photonics Group at the University of Southampton's Optoelectronics Research Centre, UK, to offer silicon photonics design services and accelerate the adoption of silicon photonics technology.

Says CompoundTek Chief Executive Officer Raj Kumar: "CompoundTek looks forward to providing the marketplace with silicon photonics design capabilities as a value-added service in addition to our existing foundry fabrication services. This strategic partnership reflects our commitment to developing advanced solutions with commercial benefits."

The company has also collaborated with photonic simulation software provider Lumerical Inc to develop an enhanced process design kit (PDK).

Says Chief Operating Officer K.S. Ang: "This milestone partnership with Lumerical speaks to CompoundTek's commitment in supporting our existing and potential customers' endeavors to improve their productivity in silicon photonics design."

"Together with our design partners, this photonics design automation solution, together with our open silicon photonics manufacturing process platform, will accelerate the adoption of silicon photonics solutions for various applications ranging from datacom transceivers, smart sensor, bio-medical, automotive LiDAR, quantum computing and artificial intelligence."

Local Conferences and Exhibitions

Industrial Transformation Asia-Pacific (ITAP), 22 ~ 24 October 2019, Singapore Expo

LUX Photonics Consortium Pavilion
Don't missed it,
contact us today!

European Photonics Industry Consortium (EPIC) Delegation to Singapore, 21 – 24 October 2019

Programme Highlights

- 20 European Photonics Companies Delegates coming to Singapore.
- 3.5 days of Program with multiple networking sessions.
- 10-min pitching session for LUX members to grab.
- Special Invitation to attend the ITAP Opening Ceremony.
- Visit LUX members - Denselight, Meridian Innovation, Palomar Technologies, Singapore Technologies.
- Visit to The Photonics Institute (TPI), NTU.
- LUX Photonics Consortium Quarterly networking session.