The 19th Optics of Liquid Crystals Conference (OLC2021) was held from 26 September to 1 October 2021 organised by Organizing Committee OLC2021, The Japanese Liquid Crystal Society (JLCS) and The International Liquid Crystal Society (ILCS). The Organizing Committee (chairied by Professor Jun Yamamoto from Kyoto University), Local Committee, and Program Committee mainly consisted of JLCS scientists belonging to a university or a company. The International Advisory Board consisting of 11 countries has been established. Unfortunately, the biennial conference was forced to be held online because of COVID-19.

The OLC is a historic international conference on liquid crystals and optics that has been held around the world since 1986, and the OLC2021 was the first OLC to be held in Asia. The OLC2021 was originally planned to be held in Bankoku Shin’yokan in Okinawa, warm Islands located in the south of Japan, and to be carefully scheduled for the online/on-site hybrid implementation by the Local Committee, while also arranging hotels, conference limousine buses, and so on. However, considering the difficult situations, the OLC2021 was decided to reschedule to a fully online conference in August. Instead, those who were planning to participate on-site were given some goods related to Okinawa (Figure 1).

Because the organisers carefully prepared for the online event using Zoom meeting application, I think the online conference went on without any major problems, although there were audio problems and changes in presentation time. Especially, the guidance and setting to the breakout room were smooth in both the oral and poster sessions. Further, one of the merits is that it is not affected by natural disasters (typhoons or earthquakes), which is often seen in Japan.

The OLC2021 had 169 participants and 137 papers (39 invited talks, 41 contributed oral presentations and 57 poster presentations) were accepted for discussion. The online presentations were made from the UK, Italy, Slovenia, France, the USA, South Korea, Brazil, China, Portugal, Germany, Poland, Finland, Belgium, Canada, Russia and Japan.

Since the OLC2021 was held from morning to evening in Japan Standard Time (JST), most of the people who could actually attend the conference on the entire schedule were from Asian countries, especially Japanese. Here, let me state a personal impression and I would like to raise a question regarding the significance of the international online conference. What I feel regretful about was that there were not so many opinions and questions from international participants at OLC2021. In particular, in the poster presentations, although the sessions were held early in the morning and in the evening considering the participants outside Asia, the audience was almost exclusively Japanese. Therefore, OLC2021 became a place for discussion in English (in some cases, in Japanese) rather than an international discussion. In the oral presentations, most of the listeners and questioners were Japanese as well.

The first day of a 6-day OLC2021 began on Sunday (26 September) in JST, and a public lecture and four tutorials were held. The public lecture was also organised online, and the committee planned a programme for elementary and junior high-school students through experiences. The tutorials were given by Professor Ingo Dierking (University of Manchester) on ITO-free carbon-based electrode materials for LCDs, Professor Claudio Zannoni (University of Bologna) on computational coarse-grained and atomistic simulations of liquid crystals and the strengths and problems, Professor Žumer (University of Ljubljana) on optical imaging of the topology of nematic defects and Professor Pawel Pieranski (Université Paris-Saclay) on collisions of nematic monopoles and disclinations. On Monday (27 September) in JST, two tutorials were given by Professor Hiroshi Yokoyama (Kent State University) on the Pancharatnam-Berry phase and sophisticated photoalignment techniques and Professor Iam-Choon Khoo (Pennsylvania State University) on liquid crystalline chiral photonic crystals working on picosecond to femtosecond scales. Fundamental concepts and approaches were summarised from various aspects, such as materials and computational sciences. In each research field, historical changes, current status and issues, and future prospects were discussed. This allowed researchers to explore new directions for their research.

After the tutorials, the opening ceremony was held. Professor Yamamoto introduced Okinawa, talked about the situation of COVID-19 and typhoons in Japan, and of course, the events in OLC2021.
In the session from the latter half of the morning on the second day, invited and contributed talks concerned with research on defects and orientation for application to optical materials for next-generation smart displays, nonlinear optics and diffractive optics were open. In addition, research aimed at using materials in a wider range of fields, such as adhesiveness, ferroelectricity and improvement of phase stability by scrutinising doping or surface anchoring were also presented. The study of side chain liquid crystalline polymers containing azobenzene mesogens presented by Professor Takahiro Seki (Nagoya University) is one of the presentations that I was personally interested in. Their research on the control and utilisation of the Marangoni effect, a phenomenon in which mass migration occurs to stabilise surface tension due to the transition of the polymer to the isotropic phase caused by the isomerisation of azobenzene by UV light irradiation, was very interesting. The resultant photo-triggered surface relief is generated with lower energy and thicker mass migration compared to conventional mass migration systems.

From 18:00 to 19:00 on the second day (27 September) and from 8:30 to 9:30 on the third day (28 September) in JST, the first half of the 28 poster sessions (Posters 1A and 1B) were held by using the Zoom Breakout rooms. Similarly, from 18:00 to 19:00 on the third day (28 September) and from 8:30 to 9:30 on the fourth day (29 September) in JST, the second half of the 29 poster sessions (Posters 2A and 2B) were held. The posters were uploaded on the web in advance and were viewable by the participants. I have not seen all the presentations, but I saw a conversation between a presenter and some researchers at a university and a company, and a polite and formal discussion took place. I presented at this session, which was my first presentation at an international conference, and I hoped that the value of my research would be conveyed to many people. Actually, there were four Japanese researchers who came to listen to the presentation, but I think we were able to have a meaningful discussion for future research or collaborations.

In the session of the third and fourth days, inspiring information was obtained on the molecular design and strategy to realise target functions, characterisation and analysis of liquid crystal state materials in various fields related to liquid crystal states, such as biomaterials, photochromics, photonics, molecular alignment, elastomers, and so on. I was impressed that Professor Oleg D. Lavrentovich (Kent State University) demonstrated an effective approach to control the spatial dynamic patterns of microparticles and living cells using programmed alignment patterns and defective photo-oriented liquid crystal elastomers. The modulation of the surface profile was activated by light, temperature and humidity, controlling cell differentiation and tissue morphogenesis.

On the fifth day (30 September) in JST, Summit room and Ocean room were progressed in parallel by using Zoom breakout rooms. A personal highlight of this session was the talk about liquid crystalline droplets by Professor Kenji Katayama (Chuo University). Interestingly, when they investigated the self-propelled motion of 5CB droplets induced by convective flow inside and outside the droplets in a surfactant solution, it was found that crystals of chemicals grow inside a droplet at the topological defects by light irradiation.

On the final day (1 October) in the morning in JST, there were some oral presentations on inorganic and organic liquid crystal materials showing structural colour and polarisation. During the session, Dr. Daigo Miyajima (RIKEN) reported on the bulk photovoltaic effect using a polar (bowl-shaped) organic molecule.

At the end of the conference, the closing ceremony and the award ceremony for the best poster presentation winners (named ‘Shimakutuba’ poster awards) were held. This year, six Shimakutuba poster awards from a wide range of research area were given to Andriani Furoida (Ritsumeikan University), Aggregation Enhanced Room-Temperature Phosphorescence with Dual Emission from Rod-Like Gold(I) Complexes, Hidetsugu Kitakado (Kyoto University), Mechoresponsive PDMS that reversibly changes fluorescence in sub-MPa stress, Kamil Orzechowski (Warsaw University of Technology), Enhanced electric field tunability and thermal stability of photonic crystal fibres filled with gold nanoparticles-doped cubic blue phases liquid crystals, Nozomi Sato
Azumi Akiyama (Chiba University), Phase transition mechanism of liquid crystal revealed by patterned-illumination time-resolved phase microscope, Azumi Akiyama (Chiba University), Realisation of a Room-Temperature Ferroelectric Columnar Liquid Crystal by Introducing Branched Alkyl Chains, Adele A Parry (University of Leeds), Novel Liquid Crystal Droplets for the Detection of Bacterial Toxins. The winners were presented with a certificate and a commemorative gift (Figure 2).

Finally, I would like to thank the organisers for organising such an international online meeting and giving me the opportunity to report on it. This conference was the first OLC to be held online due to Covid-19. It was a pity that we could not liven up the discussion face-to-face. Although it was online, I felt the importance of working together with researchers in various fields of optics, liquid crystal science and the liquid crystal industry. The next conference of OLC will be held in 2 years’ time. I hope that Covid-19 will converge in the near future and that the OLC will become a more active and international forum for exchange again.

Disclosure statement
No potential conflict of interest was reported by the author(s).

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Figure 2. The certificate and the commemorative gifts (muscovado from Tarama island and Minsah weaving handkerchief produced in Yaeyama Islands) of Shimakutuba poster prize.