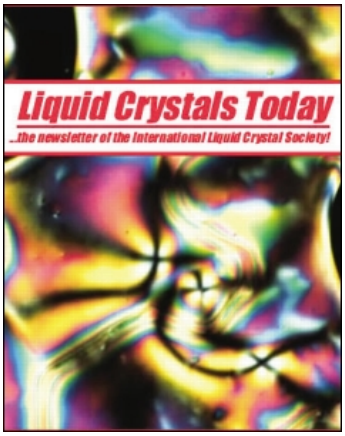

Liquid Crystals Today
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713681230

The 13th Topical Meeting on the Optics of Liquid Crystals

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Online publication date: 20 November 2010

To cite this Article Abdulhalim, I.(2010) 'The 13th Topical Meeting on the Optics of Liquid Crystals', Liquid Crystals Today, 19: 2, 67 — 70
To link to this Article: DOI: 10.1080/1358314X.2010.527663
URL: http://dx.doi.org/10.1080/1358314X.2010.527663

Liquid Crystals Today,
Vol. 19, No. 2, November 2010, 67–70

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CONFERENCE REPORT

The 13th Topical Meeting on the Optics of Liquid Crystals

The 13th Topical Meeting on the Optics of Liquid Crystals (OLC2009) was held in Erice, Italy from 28 September to 2 October 2009 at the Centre for Scientific Culture 'Ettore Majorana' (Figure 1). The meeting was part of the annual program of the International School of Liquid Crystals, directed by Claudio Zannoni, and hosted by the centre (http://www-th.bo.infn.it/islc/). Erice is a small town in Sicily in the South of Italy, 1 hour drive from Palermo airport, with a great tradition of hosting high-quality scientific meetings (http://www.ccsem.infn.it/). Erice city is located on top of Mount Erice, at approximately 750 m above sea level, overlooking the city of Trapani, the low western coast towards Marsala, the dramatic Punta del Saraceno and Capo san Vito to the north-east, and the Aegadian Islands on Sicily's north-western coast, providing breathtaking views as can be verified from the photo shots taken by many OLC09 participants from the patio of the coffee break hall (Figure 2).

This traditional meeting is held biennially to allow theoretical and experimental scientists active in the field of optics of LCs to meet and discuss their recent work. Originally the meeting was established on the more specific topic 'Nonlinear Optics of Liquid Crystals', but soon after the first meeting the name was changed to include the more general topic of 'Optics of Liquid Crystals'.

Figure 1. The lecture hall during the opening ceremony where the picture on the screen is of Ettore Majorana. (Photo by Antigone Marino.)

Figure 2. Scenery view as seen from the patio of the coffee break hall, 750 m above sea level. (Photo by Antigone Marino.)

The scientific program of the meeting included a wide variety of topics: general optics, nonlinear optics, LC devices, surfaces and interfaces, LC displays, non-display applications of LCs, LC photonics, novel electro-optic and magneto-optic effects in LCs, new materials, and hybrid systems such as nanoparticles and nanostructures combined with LCs. After the opening welcome ceremony, a plenary lecture was given by I.C. Khoo on the nonlinear optics of LCs. This overview lecture highlighted the recent developments and the challenging active research in the field. Several lectures were given on the nonlinear optics of LCs including: optical trapping in LC environments by Dr L. Lucchetti in which non-conventional trapping effects were reported, interplay between singular and nonlinear optics of LCs by E. Brasselet, soliton interaction in nematics by N. Smyth, optically induced orientational effects by D. Krimer, novel three-dimensional (3D) geometry for nematicons by G. Assanto, two-beam energy exchange by V. Reshetnyak and guest–host interactions by Y.R. Shen.

Several novel applications of nonlinear optics of LCs were presented, among which we mention the lecture by E. Santamato on the use of LCs for the generation and manipulation of the angular momentum of light and the transfer of both spin

ISSN 1358-314X print/ISSN 1464-5181 online

DOI: 10.1080/1358314X.2010.527663
http://www.informaworld.com

and angular momentum from photons to nematic LCs. Enhancement of guest particles luminescence using optical solitons was reported by J.F. Hanninot, dynamic phase contrast filters integrated into imaging systems by R. Ramos-Garcia and all-optical switching of holographic gratings by C. Umeton. Nematicon is now the name for a spatial optical soliton in nematic LCs which is important for nonlinear signal processing in all-optical architectures. Several interesting works were presented on the subject including generation geometries, applications and simulations.

LC lasers were the topic of a whole afternoon session in which Professor L.M. Blinov lectured on LC microlasers highlighting some of the novel features such as thresholdless lasing and new lasing materials. Tuning properties were presented by G. Chilaya, while localised optical modes in photonic crystals to enhance the efficiency of cholesteric liquid crystal (CLC) lasers was presented by V.A. Belyakov. Phototuning of CLC lasers was presented in a plenary lecture by T.J. Bunning and an interesting novel geometry was presented by Y. Inoue in which the helix is in-plane.

The evolving field of LC photonic crystals and porous structures infiltrated by LCs was the subject of several lectures and posters. A. Bjarklev presented the recent progress in photonic crystal fibres filled with LCs and the connection to recent developments within the Danish optical research; I. Abdulhalim presented tunable filtering properties of porous Si periodic structures infiltrated with LC in which the polar planar geometry of the molecules in cylindrical nanopores was found to be the most preferable. Colloidal and smectic LC blue phases as 3D photonic crystals were presented by S. Zumer and J. Yamamoto, respectively.

Hybrid structures combining nanoparticles and LCs were another major topic. G. Cook described a method and system for harvesting single domain ferroelectric nanoparticles that can be incorporated into LCs. Hybrid structures containing ferroelectric and ferromagnetic nanoparticles were presented by M. Kaczmarek. Plasmonic properties of LC doped with gold nanoparticles were presented by E. Lacaze. A giant magneto-optic effect was reported by Y. Reznikov in which a huge reduction of the threshold magnetic field was observed down to the level that the earth's magnetic field was actually able to re-orientate the LC molecules. Electro-optic memory effects in LCs doped with nanotubes were reported by O.V. Yaroshchuk. H. Yoshida has shown that doping with metal nanoparticles assists in the stabilisation of CLC blue phases.

Displays and other optical LC devices and novel applications were the topic which had the largest number of papers reported, starting by a plenary lecture by S.-T. Wu on the emerging liquid crystal display (LCD) technologies highlighting some of the future demands from an LCD such as power consumption. The use of patterned LCs for quantum information applications, and vortex beam generation were presented by L. Marruci and K. Tagashira, respectively. Fast switching of LCs dispersed with microspheres was reported by T. Galstian. Optically isotropic LCs made of polymer stabilised blue phases were shown by H. Kikuchi to exhibit a large electro-optic effect useful for switching devices and displays. Optical properties of LCs mixed with photochromic dyes were reported by T. Kosa. LC devices for femto second pulse shaping and polarisation control were presented by C.-L. Pan and R.-P. Pan, respectively. The effects of dielectric relaxation and biaxiality on the electro-optic effects of LCs were discussed by S.V. Shiyanovskii. Voltage switched diffractive and emissive polymer LC devices were reported by J. Stumpe. Selective reflection of right- and left-handed polarised light from polymer stabilised CLCs was shown to occur instantaneously in one device, the so-called 'hyperreflection', by A.C. Tasolamprou. Power switching and control both for continuous wave and pulsed beams using LC devices was reported by N. Tabirian. A. Smirnov presented a new approach for microdisplays based on nanostructured materials. R. Yamaguchi presented enhanced optical characteristics in reverse mode polymer dispersed liquid crystals (PDLCs) with supertwisted nematics.

Other interesting non-optical applications of LCs were also reported. Tunable wettability of a LC/polymer composite and its applications was presented by Y.-H. Lin. Ultra large mechanical actuation in liquid crystal elastomers (LCEs) was reported by P. Keller and angular controlled bending was reported by T. White. In Keller's work a contraction of up to 400% in micrometre-sized pillars was reported. Potential modifications of LCs for applications in the GHz and THz regions were presented by J. Parka. A novel polymer matrix was reported by L. De Sio which may be useful for confinement and alignment of biological materials.

Around 80 posters were presented in three poster sessions in the afternoon (Figure 3). Topics covered reflected, in addition to the lecture topics, additional fields such as the use of LC devices in biomedical optical imaging, control of defect modes, photoinduced effects, wide dynamic range filters, infrared filter development, LC lenses, novel effects in dye doped systems, cubic optical nonlinearity in LCs doped with gold nanoparticles, molecular level simulations of twisted nematic devices, optical switching in surface stabilised liquid crystals (SSFLCs), and more.

Figure 3. An impression during the poster session. (Photo by Giancarlo Abbate.)

The poster session was an arena for discussions and exchanges of ideas.

The social program included a reception on Sunday afternoon, a trip to the ancient Greek archaeological sites Selinunte (Figures 4 and 5) and Segesta with a lunch on the Mediterranean beach and on Thursday night a dinner with Sicilian music (Figure 6). Travel from the airport to Erici on Sunday and back on Friday was well organised in groups either in small buses or by taxi. The views through the window as the vehicle went up or down the Eiric Mountain were spectacular as well as the typical Sicilian superb landscapes along the road.

To conclude, the OLC2009 conference was a successful event both for experienced researchers and for young researchers and students who came to experience another side of their scientific career.

Figure 4. Group photo of the participants of OLC 2009 conference at the ancient Greek archeological site of Selinunte. (Photo by Giancarlo Abbate.)

Figure 5. Partial group photo while waiting near the entrance to the ancient Greek archeological site of Selinunte. The closest to the front are Professor V.A. Belyakov, Professor Y.R. Shen and Professor S.-T. Wu. (Photo by I. Abdulhalim.)

Figure 6. Impression from the great conference dinner. (Photo by V. Tkachenko.)

Figure 7. A gathering of participants in a local restaurant relaxing after a long session of lectures and the conference. (Photo by V. Tkachenko.)

Figure 8. An after session break on Erici main street. From left to right: N. Tabirian, C. Umeton and I.C. Khoo. (Photo provided by N. Tabirian.)

I would like to thank the organisers for their effort in organising such a fantastic meeting both from a scientific point of view and from the social point of view where they made an excellent balance between the two (Figures 3–8). Not only the scientific lectures but also the scenic views will remain in the participant's memories for many years. The 14th topical meeting will be held in Yerevan, Arminia, September 25–October 1, 2011.

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