A Hard Look at Soft Matter

At the International Liquid Crystal Conference held in Edinburgh, Scotland, June 30 to July 5, Ivan Smalyukh was awarded the International Liquid Crystal Society's (ILCS) 2002 Multimedia Prize for his stimulating web tutorial with interactive graphics on the uses of fluorescent confocal polarizing microscopy (FCPM) for 3D imaging of the liquid crystal director field (Figure 1).

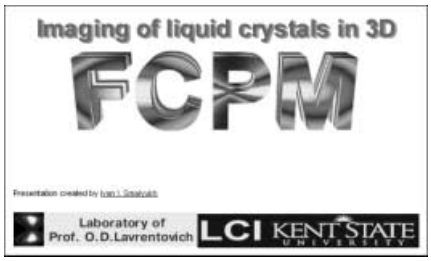

Figure 1. Splash screen: Fluorescent confocal polarizing microscopy (Liquid Crystal Institute, Kent, OH).

While confocal microscopy is an established threedimensional imaging technique used, for example, in the biological and medical sciences, its advantages to soft condensed matter systems, such as liquid crystals, are only now just beginning to become evident. In FCPM, the authors have developed a novel technique to correlate liquid crystalline orientational order with precise spatial information obtained by classical confocal microscopy.[1,2] The enthusiasm of Smalyukh for the capabilities of the new technique to image director fields in 3D shines through their web pages.

A wide variety of topics on liquid crystals and confocal microscopy are addressed, such as twisted nematics, surface instabilities, and lyotropic lamellar structures. They are presented in a way that is accessible to nonspecialists in liquid crystals or confocal microscopy. Those who are new to these fields can start with a brief description of the basic properties of liquid crystals, principles of liquid crystal displays, or from the fundamentals of confocal microscopy. The presentations smoothly bring the reader to the basics of FCPM, showing its distinctive features compared to ordinary confocal fluorescent microscopy and polarizing microscopy while stressing features of their technique to elucidate the 3D spatial variation of liquid crystal orientational order. The colorful schemes of the experimental setups, usually animated and drawn in a threedimensional perspective, allow for easy understanding of the basic principles of the technique.

While the avi movies (about 10 MB each) in the "Let's scan LC together" section take several minutes to load over a cable connection and are over in a couple of seconds, their visual impact is stunning. Most players allow you to use a handle to jump back and forth to get the impression of actually working on the sample (Figure 2). Apart from the movies, the pages load quickly and are well organized. They show many different examples of the high information content contained in the visual beauty of liquid crystal states of matter.

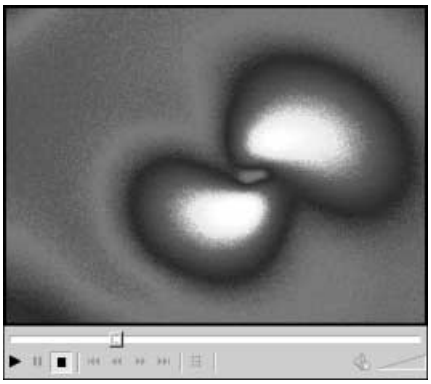

Figure 2. Use the player handle to virtually scan the sample.

Experimental FCPM textures are often compared to computer-simulated ones. The strong resemblance between "simulated" textures with observed textures allows researchers to check on the reconstruction of the director field. Interactive animations allow users a better understanding of the basic principles of FCPM and its applications. The sections devoted to resolution, the possible problems, and recommendations on how to avoid these problems are meant to help others start using FCPM and extend its powers even further to include even more precise quantitative information.

Patricia E. Cladis
Chair, ILCS Awards and
Honors Committee

[1] I. I. Smalyukh, S. V. Shiyanovskii, O. D. Lavrentovich, *Chem. Phys. Lett.* **2001**, *336*, 88 – 96.
[2] I. Dierking, *ChemPhysChem* **2001**, *2*, 663 – 664.

For further information visit:
http://www.lci.kent.edu/Lavrentovich/FCPMweb_site/FCPM.html
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