BRITISH LIQUID CRYSTAL SOCIETY

LIQUID CRYSTAL NEWS

October 2007

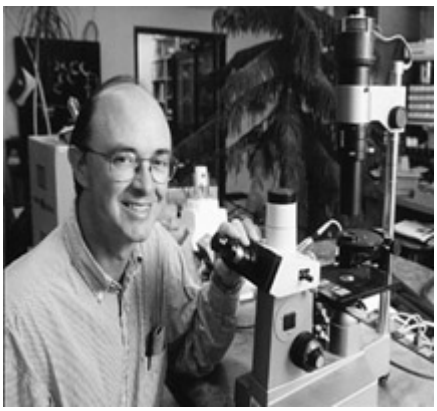
GW Gray Medal for 2007
Professor Bob Meyer

The G W Gray medal was this year awarded to Bob Meyer who heads the Volen National Center for Complex Systems at Brandeis University, USA. Bob needs no introduction to the liquid crystal community – he is known for originating some of the key ideas that have had huge impact on liquid crystals specifically and indeed soft condensed matter physics in general. Some of his most important contributions include his elegant symmetry arguments that led to the conclusion that the chiral smectic-C phase could be ferroelectric and the concept of flexoelectricity in liquid crystals.

Bob received his Bachelor of Arts degree in Physics from Harvard University in 1965, and his Ph.D. in Applied Physics from Harvard in 1970, his thesis research on liquid crystals under the direction of David Turnbull. He continued as a postdoc and Assistant Professor in Applied Physics at Harvard, and was promoted to Associate Professor in 1974. After a year as Nordita Visiting Professor at Chalmers University in Goteborg, and Joliot Curie Professor at the Ecole Superieure de Physique et de Chimie Industrielles in Paris, he joined the faculty at Brandeis University in 1978, where he is currently Professor of Physics. Meyer's research has addressed a wide range of topics involving the physics of liquid crystals and the exploration of novel soft materials based on them, focusing on chirality, electrical polarization, textures and defect structures, phase transitions, and responses to applied fields.

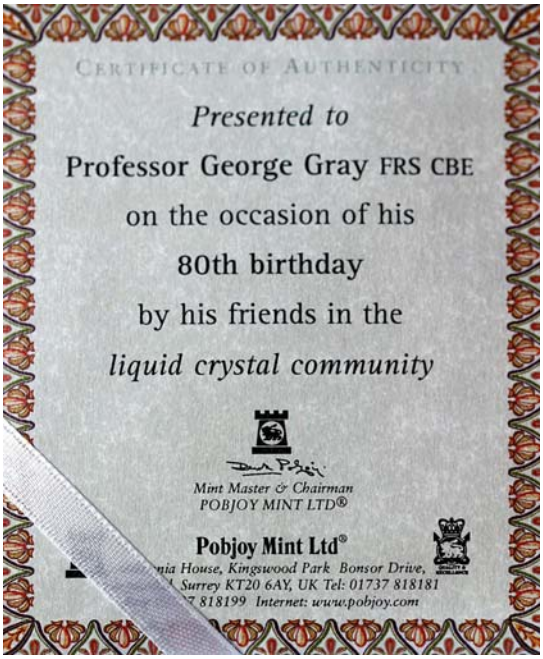
His current interests include hyper-complex fluid systems, such as nematic gels, and liquid crystals in confined geometries, as well as smart materials, especially smart optical reflectors based on cholesterics. Hyper-complex fluid systems combine two or more complex fluids in a way that imparts new properties to the combined system. An example is a cholesteric gel, which is a soft solid with the symmetry and other properties of a cholesteric; when submitted to a static shear strain, this system exhibits piezoelectricity, an electrical polarization proportional to the shear strain. This requires the combination of the solidity of the gel and the chiral symmetry and structure of the cholesteric. A smart material is one that changes its properties in a useful way in response to an external stimulus; an example is the material of photochromic sunglasses, which are clear in dim lighting, and darken in bright sunlight.

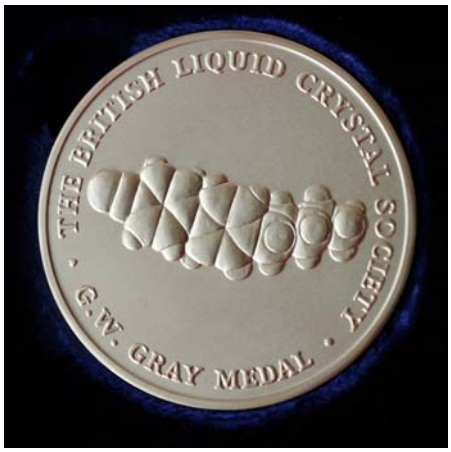
In addition to the G W Gray Medal, Bob has been awarded the Joliot Curie Medal of the City of Paris, a special recognition award by the Society for Information Display, the Vinci of Honor award in the LVMH Science for Art Prize competition, and recently been honoured by two major awards in the USA, the Benjamin Franklin Medal in 2004 and the American Physical Society's Buckley Prize in 2005 (joint with Noel Clark). It was a real honour to have him at the British Liquid Crystal Conference in Sheffield to receive the G W Gray Medal and the Society is proud to have him amongst the list of recipients.



George Gray Receives the George Gray Medal

At long last George Gray has received his very own George Gray Medal, gold plated albeit, at an Evening Discourse on Liquid Crystals which was held at the Royal Society on September 22nd to celebrate George Gray's 80th birthday. The dinner was hosted by Professors John Goodby and Peter Raynes and attended by around 35 colleagues who had worked with George from his earliest days in liquid crystals. It was an extremely pleasant evening that gave the opportunity to celebrate George's unrivalled contribution to the field of liquid crystals. In addition to a large number of gifts and cards, George was presented with a photograph album compiled by John Goodby and a specially minted version of the G W Gray medal made from solid silver and gold plated.





The Evening Discourse celebrated George's 80th Birthday, and the contributions he has made to Liquid Crystal Research in the UK and Worldwide. The event brought together many of the early pioneers in UK Liquid Crystal Science, particularly those that were around at the time of the invention of the cyanobiphenyls. The evening was thus spent with reminisces, much gaiety, and catching up on the news of friends and colleagues that time had separated.

Jenny Constant, George Gray and Mike Clark

The evening culminated with the award of the GW Gray Medal to George, which was made by Cyril Hilsum. Cyril reflected on the past; how George had come to work with RSRE, George's daring practices in the chemical laboratory, the development of the large scale production of cyanobiphenyls through the perseverance of Ben Sturgeon, the development of materials, mixtures and devices at RSRE, etc. In fact how the UK collaboration, with all of its component parts, large and small, had come together to great effect in the development of modern displays.

George Gray receives the GW Gray Medal from Cyril Hilsum with Brenda Leadbetter

After a response by George Gray, Alan Leadbetter

reminisced about how he and George had met each other through John Kirton. John pointing out that Alan should be aware that George could be a prickly….. Met, they did, unsurprisingly in a pub, and after a few beers a mutual friendship was struck-up and a new research proposal was born on the structures of liquid crystal phases. Following Alan, the evening was rounded off by John Lydon who read a poem to the diners about the birth of cyanobiphenyls.

As the evening wound down, and colleagues and friends slowly dispersed into the London night, I was left wondering if they would self-organise again for George's 90th.

John Goodby

Ian Shanks, Cyril Hilsum, Alan Leadbetter, George Gray, John Goodby, Peter Raynes, and Damien McDonnell

Elegy Written in a Yorkshire Laboratory[1]

(with apologies to <u>both</u> Grays)

The curfew tolls the knell of parting day
The weary George plods homewards o'er the lea
Night falls upon the lab of G W Gray
And leaves the world to darkness and to me.

Far from the madding crowd's ignoble strife
The sober chemists ply their honest trade
And in this cool sequestered vale of life
Tomorrow's finest compounds will be made.

Full many an ester of the purest sheen
Is brought into this world with loving care
And many a mesogen is born to blush unseen
And waste its phase change on the desert air.

And in the lab as shadows fall
The air is hushed and Ken[2] sleeps at the bench
In his dreams he hears George call
"We'll solve that problem Ken, for once and all."

"By the door where Blondie[3] struts, I heard the muse
She whispered "*Two rings with just one tie -*
One bond to bind them irrevocably[4]
In the Land of Green Ginger[5] *(where the shadows lie)*".

We'll cut the link and join the rings
The azoxy group can go to hell[6]
Then we'll see what fortune brings
And will someone stop that bloody bell

Little does the sleeping Ken suspect
Tomorrow, after one more rosy fingered dawn[7]
In this most inauspicious place,
A scientific legend will be born.

No more will ambition mock their tedious toil
Their simple joys their destiny obscure
Lo the centre holds8, the transition's fine,
Time I think, to open up the wine.

Then do the boasts of heraldry, the pomp and power
And paths of glory lie in store
And all that bounty all that fame,
But Ken just grunts another snuffled snore.

A Toast [9]

Here's tae y'r honest sonsie face
Great chemist and synthetic ace
Companion o' honour
Whitever that means
Dina fashe yourself
We'll nae spill the beans
Heavy wi' honours and gongs galore
You've heard all sae many times before
But we'll enjoy retelling the story
Just basking here – in reflected glory.

Notes (if you really want them)

1 This is of course, a parody of Gray's Elegy *Written in a Country Churchyard*. It was a wow in its day. It is recorded that General Wolfe was so taken with it that, he read it to his officers on the evening before the decisive battle for Quebec.

2 This is a reference to Ken Harrison (then one of George's research students) who first synthesised 5CB. (I hope he will forgive me for this poetic licence and the accompanying cartoon - as far as I am aware, he was not prone to falling asleep in the laboratory).

3 For many years the door of George's office was decorated with a poster of Debbie Harry, pulchritudinous singer of the pop group Blondie.

4 This is an allusion to *The Lord of the Rings* (" *One ring to bind them all --- in the Land of Mordor where the Shadows lie*"). Tolkein was a lecturer at Leeds and probably wrote these lines a few yards away from where I am sitting.

5 Green Ginger is an old name for opium. There is street in the centre of Old Hull, romantically called *The Land of Green Ginger*.

6 Earlier mesogens with promising temperature ranges, involved two aromatic rings joined by an azo or azoxy group. The drawback to these molecules was their instability. The linking group was the source of the trouble. It was George's idea to remove it altogether and use the biphenyl nucleus.

7 The description of the rosy-fingers of dawn is one oldest recorded poetic images. It occurs at the beginning of the second book of the Odessy.

8 "*The centre cannot hold*." is a line from Yeats' *The Second Coming*.
"*Things fall apart; the centre cannot hold*"

9 The Toast is a parody of Burns' *Address to a Haggis* which begins with the words:
"Fair fa' your honest sonsie face
Great chieftain o' the pudding-race"

Acknowledgement: Thanks are due to Professor Richard Bushby for help with the formulae in the cartoon.

John Lydon

BRITISH LIQUID CRYSTAL SOCIETY

The BLCS Annual Conference 2008

University of East Anglia

17-19th March, 2008

The 2008 BLCS annual meeting (AGM) and conference will be held on 17-19th of March at the University of East Anglia, Norwich, under the chairmanship of Dr Andy Cammidge. The main emphasis of the conference is for students and young researchers to present their latest work along with invited talks and the Sturgeon lecture. Papers are requested on any topic related to liquid crystal materials and their applications.

the Annual Meeting in Sheffield. In his acceptance speech he provided us with some informative and often amusing insights into some key moments of his career; none more so than when he recounted his interview with Cyril Hilsum for the GEC Fellowship to be held at RSRE. He told us how, feeling over-confident after several other successful interviews, he arrived at GEC to be confronted by Cyril himself. Cliff described how, in the interview, Cyril rapidly exposed his limitations, and how Cliff eventually suggested there was little point continuing as he was clearly not worth recruiting. Cliff concluded, 'to his credit, Cyril replied that he saw promise and that I was worth a bet. Winning this award today I hope is a partial recognition of how sound Cyril's judgement had been'.

Peter Raynes

Helen Gleeson to give the Percival Lecture 2007

The Percival Lecture is one of the prestigious, named lectures of the Manchester Literary and Philosophical Society. The Manchester Lit and Phil, as it is also known, was instituted in 1781 and is one of the oldest learned societies in Britain. Members of the society included such illustrious names as John Dalton, James Prescott Joule, Henry Roscoe and Ernest Rutherford, just to name a few of the eminent chemists and physicists. The Percival Lecture was founded in 1945 and rotates between the three Greater Manchester Universities on an annual basis.

Helen Gleeson was invited to deliver this year's Percival Lecture at the University of Manchester in conjunction with the Manchester Lit and Phil on Wednesday the 18th of April 2007. The title of her lecture was "Order and Vision – Physics at the Interface". The very enjoyable evening started with a wine reception at the Humanities Lime Theatre, followed by Helen's lecture, which introduced liquid crystals, the polarisation optics of helical self-organised media and their impact on biological systems, from iridescent beetles to the polarisation vision of Atlantic salmon and other vertebrates. Helen supported her lively lecture with a number of simple, yet illustrative and clever lecture demonstrations, which clearly captured the attention of the mostly lay audience.

The approximately 200 attendees of the lecture came from a very diverse background, many of them being members of the Manchester Lit and Phil. But also a large number of the honoraries of the University of Manchester were present: the President and Vice-Chancellor Alan Gilbert, who introduced Helen Gleeson as the Percival Lecturer, the Dean of the Faculty of Engineering and Physical Sciences, all Heads of School of the Faculty, and numerous academics. They all were presented with an excellent public lecture on liquid crystals and their impact far beyond common flat panel TVs. And I must say that even though I am of course familiar with the topic, I did not feel bored for a second. This really was an outstanding public lecture.

After Helen's presentation, the evening was finished in style with a buffet supper, served in the University's historical library, with a variety of tasty snack dishes available. This also provided the venue for further discussions between Helen and the diverse members of the audience, but also between members of the Manchester Literary and Philosophical Society and academic staff of the University of Manchester in general. To conclude, this was a very enjoyable event, and Helen Gleeson gave the audience what it deserved: Liquid Crystal Science in Action.

Ingo Dierking
University of Manchester

Liquid Crystal Micro- and Nano- Composites

Wednesday 9th January 2008
School of Physics and Astronomy,
University of Manchester.

http://reynolds.ph.man.ac.uk/~lcmnc/

BLCS Young Scientist Lecture 2006

A field-orientation optimised in-plane switching twisted nematic liquid crystal device

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In this paper we demonstrate the fast switching properties of a twisted nematic device switched by application of an in-plane electric field. The optimal angle of the electric field with respect to the surface liquid crystal director orientations is found and we show that this is the pure twist equivalent of the pi-cell or OCB-mode. The switching properties of an experimental device with a twist angle of 90 degrees are investigated and the orientation of the device between parallel polarisers that maximises the contrast is identified using a Jones matrix method.

The in-plane switching (IPS) nematic liquid crystal device is one of the two dominant technologies used in high-end liquid crystal television applications [1, 2]. In the conventional IPS geometry, shown in Figure 1(a), the director orientation (the local average orientation of the molecular long axes) is parallel to the substrates and uniform throughout the device thickness with no applied field. The device is switched by applying an electric field in the plane of the substrates at some angle to the initial director orientation, typically around 50 to 60 degrees[3], using an interdigitated electrode structure. The device is operated between crossed linear polarisers, with the initial director orientation parallel to one polariser. With no applied field, the device appears dark, and when a field is applied, the optic axis is rotated azimuthally causing the device to appear bright (typically positive dielectric anisotropy liquid crystal materials are used, though operation with negative dielectric anisotropy materials has also been demonstrated [4]). Although conventional IPS devices have high quality off-axis viewing properties and contrast ratios, their response times are significantly inferior to their major competitor, the vertically-aligned nematic (VAN) device [5]. In an attempt to improve the response times of IPS devices, twisted structures have been investigated [6, 7], though the improvement in switching time obtained has typically been small. In this paper, we identify the in-plane electric field orientation applied to a twisted nematic layer that optimises the response time. This geometry has been studied briefly by other authors in a reflective device with a twist angle of 180 degrees[8] and over a variety of twist angles using a simple analytical method similar to that presented below [9]. Here, we will investigate a 90 degree twisted device in transmissive mode and demonstrate its fast-switching properties. According to Ericksen-Leslie theory [10, 11], if the director deformation is purely in the plane of the substrates and the pixel is large compared to the device thickness, the relaxation behaviour of an IPS device is characterised by the following equation:

$$K_{22}\frac{\partial^2\phi}{\partial z^2}=\gamma_1\frac{\partial\phi}{\partial t},$$

where ϕ is the aximuthal twist angle of the director, z is the direction perpendicular to the substrates, and K_{22} and γ_1 are the twist elastic constant and rotational viscosity of the liquid crystal material respectively. It should be noted that in this geometry, the flow of the liquid crystal has no effect on the switching behaviour (this is not the case for liquid crystal devices in which the director is rotated out of the plane of the substrates during switching). In the case of a conventional IPS device $\phi(0, t) = \phi(d, t) = 0$ as shown in Figure 1(a), and the series solution is:

$$\phi(z,t)=\sum_{i=0}^{\infty}A_i\sin\left(\sqrt{\frac{\gamma_1}{K_{22}}}\alpha_i z\right)B_i e^{-\alpha_i^2 t},$$

where A and B are constants and α is defined by the initial deformation of the director. The time constant of the relaxation is given by $\tau\sim\alpha_i^{-2}$ and clearly this will be limited by the lowest order term in the series (i.e. the smallest value of α_i in the series solution). This corresponds to the lowest order mode present in the director profile at the start of the relaxation. In a conventional IPS device, the lowest order mode in the distorted director profile is a sinusoid with a period of twice the device thickness (see Figure 1(a)), and so the time constant of relaxation is given by

$$\tau_{\mathrm{rel}}\left(\mathrm{IPS}\right) \sim \frac{d^2}{\pi^2}\frac{\gamma_1}{K_{22}}.$$

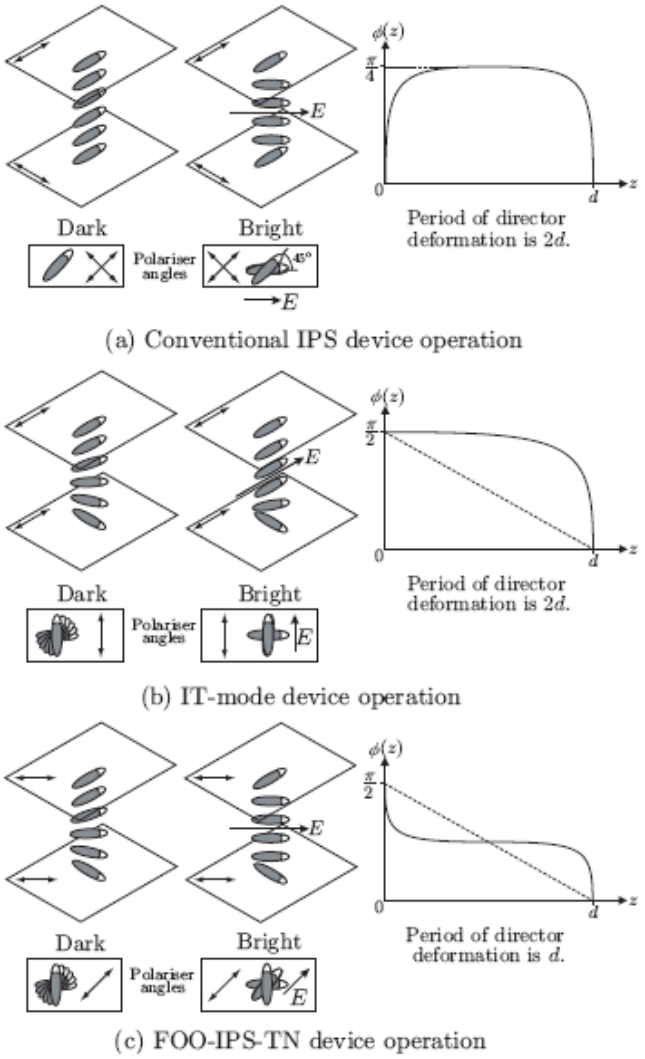


Figure 1. The operating principles of (a) the conventional IPS device, (b) the IT-mode and (c) the FOOIPS- TN device.

If the initial conditions are now altered to allow a twist of the director profile from $\phi(0,t) = 0$ at one substrate to $\phi(d,t) = \phi_{\mathrm{d}}$ at the other, a simple transformation of variables is required:

$$\omega\left(z,t\right) = \phi\left(z,t\right) - \frac{\phi_d}{d}z.$$

Since $\partial\omega/\partial t \equiv \partial\phi/\partial t$ and $\partial^2\omega/\partial z^2 \equiv \partial^2\phi/\partial z^2$, the series solution becomes:

$$\phi\left(z,t\right) = \frac{\phi_d}{d}z + \sum_{i=0}^{\infty} A_i \sin\left(\sqrt{\frac{\gamma_1}{K_{22}}}\alpha_i z\right) B_i e^{-\alpha_i^2 t}.$$

If the electric field is applied parallel to one of the surface alignment directions (shown in Figure 1(b) and known as the *IT-mode* [6, 7]), the lowest order mode of the distorted director profile is, once again, twice the thickness of the device. Thus the relaxation time of this device should be similar to that of the conventional IPS device (i.e. $\tau_{\mathrm{rel}}(\mathrm{IT}) \sim \tau_{\mathrm{rel}}(\mathrm{IPS})$).

The orientation of applied in-plane field that produces the smallest periodicity of director profile is parallel to the mid-plane twist angle. Such a *field orientation optimised in-plane switching twisted nematic* (FOO-IPS-TN) device with a twist angle of $\phi_{\mathrm{d}} = 90$ degrees is shown in Figure 1(c) (it should be noted that this field orientation optimisation could also be applied to twist angles other than 90 degrees and devices with smaller twist angles may be of particular interest for operation in reflection). The relaxation time of the FOO-IPS-TN device is then given by

$$\tau_{\mathrm{rel}}\left(\mathrm{FOO}\right) \sim \frac{d^2}{4\pi^2}\frac{\gamma_1}{K_{22}},$$

four times faster than the relaxation times of the conventional IPS and IT-mode devices.

In the FOO-IPS-TN geometry, the distorted director profile is the pure twist equivalent of the pi-cell or OCB-mode, which is widely regarded as the fastest switching nematic liquid crystal device [12, 13]. The major disadvantage of the pi-cell is that nucleation is required to form the bend state before the device can be operated, and this process is typically unreliable (see for example ref. [14]). Although the relaxation time of the FOO-IPS-TN is anticipated to be longer than that of the pi-cell (the relaxation time of the latter is accelerated by flow effects [15] and by the fact that the splay and bend elastic constants are larger than the twist elastic constant K_{22}), a nucleation process is not required.

Given the field orientation that optimises the relaxation time, the polariser orientation that maximises the contrast ratio can be found. If a nematic device with a twist of 90 degrees is placed between parallel polarisers and the Gooch-Tarry first minimum condition is met [16] ($\Delta nd/\lambda = \sqrt{0.75}$, where Δn is the birefringence of the liquid crystal material, d is the device thickness and λ is the wavelength of the incident light), the light transmission at wavelength λ is zero. This is true for any orientation of the parallel polarisers with respect to the liquid crystal layer. The director distribution at an applied field of 0.51 V/μm has been found using a numerical energy minimisation routine, and the light transmission through the device is then calculated using a Jones matrix method [17]. Figure 2 shows how the light transmission in the bright field-on state depends on the orientation of the parallel polarisers. The optimum polariser orientation is parallel to the applied field since the majority of the director profile in the high voltage state is approximately

parallel to the polarisers, and therefore has no effect on the polarisation state of the incident light. It should be noted that if the polarisers are crossed instead of parallel, the bright and dark states are reversed.

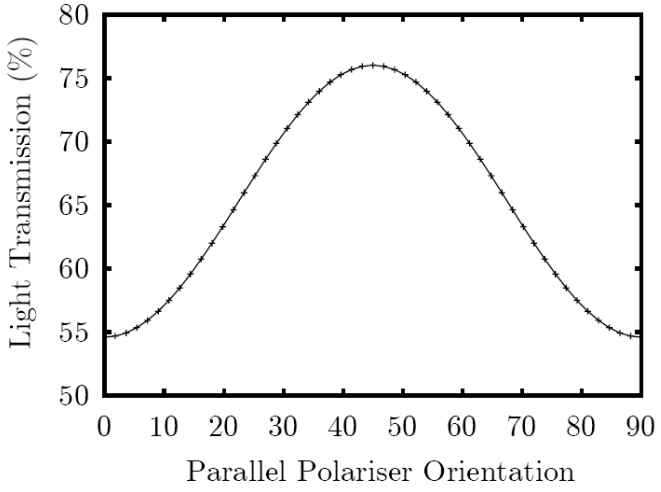


FIG. 2: Simulated dependence of the light transmission in the voltage-on state (E = 0.51 V/μm) on the orientation of the parallel polarisers for a 90degree twist FOO-IPS-TN device at the Gooch-Tarry first minimum condition. The optimum polariser orientation is parallel to the applied field.

A 90 degree twist FOO-IPS-TN device has been constructed to show the operating principal. The device consists of two glass substrates, one of which is coated with indium-tin oxide (ITO). A 0.5mm strip of the ITO is etched away using photolithography, allowing an electric field to be applied in the plane of the device (in real display devices, much thinner electrode gaps, ~ 9μm, are used in an interdigitated layout). Polyvinyl alcohol solution is spin-coated onto the substrates, which are then baked and uni-directionally rubbed to produce the required surface alignment of the liquid crystal (i.e. the plates are rubbed at 90 degrees to each other and at 45 degrees to the electrode gap). The substrates are then fixed using UV glue mixed with 2μm spacer balls, producing a 3.4μm thickness devices (the thickness was measured interferometrically). The device was filled by capillary action with liquid crystal mixture ZLI-1132 (Merck).

A diagram of the experimental setup is shown in Figure 3. The device is placed with the electric field direction parallel to the parallel polarisers, producing a dark state at zero applied field. A lens is used to weakly focus the 630 nm layer beam into the electrode gap in order that any fringing fields present near the edges of the electrodes can be ignored.

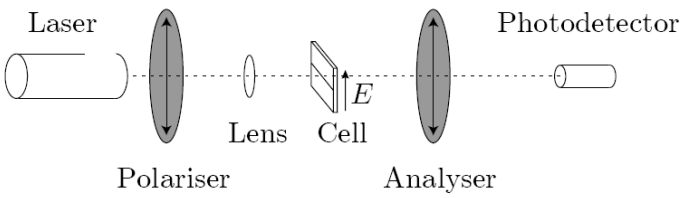
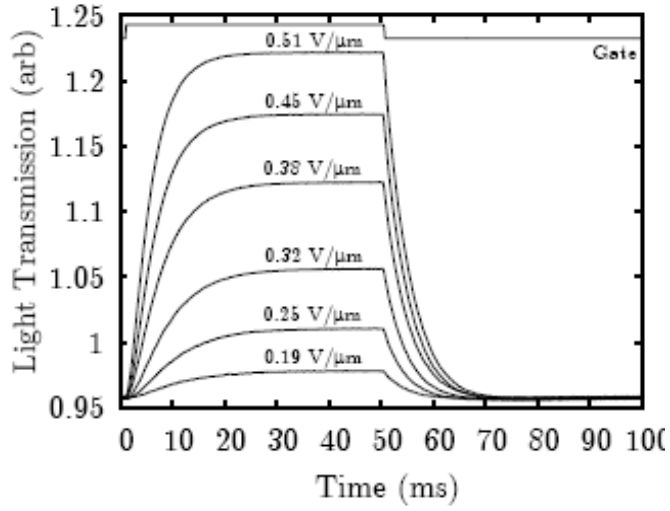
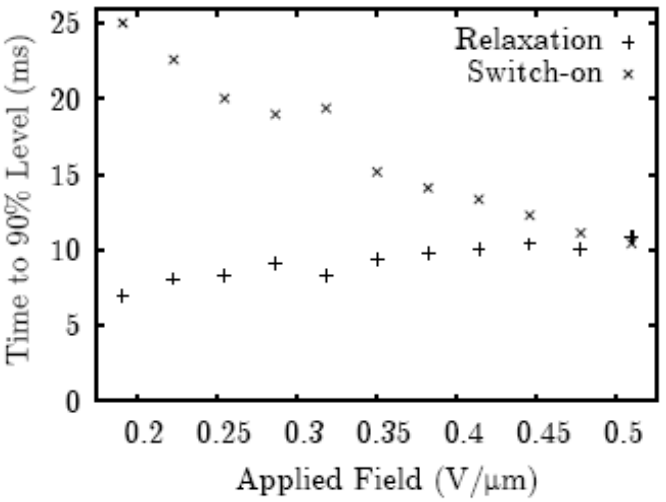


FIG. 3: The experimental setup used to investigate the FOO-IPS-TN device. The direction of the applied electric field, E, is perpendicular to the electrode gap, and the rubbing directions are ±45 degrees to this direction. A lens is used to weakly focus the beam into the electrode gap to eliminate any edge effects caused by the in-plane electrodes.



(a) Switching curves



(b) Switching times

FIG. 4: (a) Experimental switching curves for the FOO-IPS-TN device. The signal marked "Gate" indicates the timing of the 10 kHz square wave voltage pulse used to switch the device. (b) Experimental switching times for the FOO-IPS-TN device measured to the 90% switching level of the transmission curve.

Experimental switching curves for this device are shown in Figure 4(a). Initially the device is in the dark field-off state. A high voltage 10 kHz square wave is applied for 50 ms during which the device becomes bright, and subsequently the device is allowed to relax back to its initial dark state. For a given applied rms voltage, V , the electric field in an electrode gap of thickness δ is $E \approx 2V/(\pi\delta)$ (the field will be slightly larger than this in the device because the dielectric properties of the liquid crystal material distort the electric field). The switching times of the device to the 90% switching level are shown in Figure 4(b), both for relaxation and switch-on. The relaxation time is under 10 ms for the majority of addressing fields used, whilst the switch-on time shows a stronger voltage dependence, which is typical of nematic devices since the field drives the director reorientation. Relaxation times of around 11 ms and 23 ms have been reported for 3μm and 4μm thickness IT-mode devices respectively [7], but these devices used a material with a far lower rotational viscosity than ZLI-1132. Fitting of the relaxation curves of the FOO-IPS-TN device to Ericksen-Leslie theory indicates that the rotational viscosity of ZLI-1132 is approximately γ_1 = 180 mPa s, whilst that of the MLC-2051 used in ref. [7] is quoted as being 86 mPa s. Since the relaxation times of both devices are proportional to the rotational viscosity (see Equations previously), the FOO-IPS-TN device switches considerably faster than the equivalent IT-mode device.

In conclusion, we have demonstrated the fast switching properties of the FOO-IPS-TN device. This device is the pure twist equivalent of the pi-cell and has been shown experimentally to have a relaxation time of less than 10ms across a large range of addressing fields using standard liquid crystal materials. No nucleation process is required before the device can be operated, and alignment of the liquid crystal material in the appropriate geometry is simple. The FOO-IPS-TN device has been shown to switch significantly faster than the equivalent IT-mode and conventional IPS devices, with analytical predictions showing that the improvement should be by around a factor of four.

The authors would like to acknowledge the financial support of Merck UK, the EPSRC and the COMIT Faraday Partnership.

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Nominations for BLCS prizes

Nominations are open for the following BLCS awards and prizes for 2008:

- The GW Gray Medal
- The Cyril Hilsum Medal
- The BLCS Young Scientist
- The Ben Sturgeon award (see last page)

See the BLCS website (**www.blcs.org.uk**) for the eligibility criteria as well as the nomination procedures

BLCS Bursary Award Report

Workshop on Ferroelectric Phenomena in Liquid Crystals
Kent State University, Ohio, June 19-28, 2007

The Workshop on Ferroelectric Phenomena in Liquid Crystals was held from the 19th - 28th June 2007 in the Liquid Crystal Institute (LCI) at Kent State University, Ohio, and was organised by members of the LCI and the Department of Mathematical Sciences. Sponsored by the National Science Foundation Focused Research Group, the workshop comprised both education at workshops, lab visits and research. The goal of the educational component was to expose postgraduate students (from both the mathematical and the physical sciences) to several aspects of liquid crystals related to fluid fibres; elastomers; and defects.

This was to be done from the points of view of both physics and mathematics. The main research objective was to foster a lively exchange between the participating physicists and mathematicians on the concerned topics, in order to facilitate research progress in these areas.

The LCI is found in the Southern part of the impressive Kent State campus, close to the Department of Mathematical Computer Sciences, in which there lie strong collaborative links. It is a centre for basic and applied liquid crystal research and home to the Graduate Chemical Physics Interdisciplinary Program. Institute achievements include the discovery and characterisation of new liquid crystalline phases and the invention of new types of liquid crystal devices.

Participants of the workshop were able to visit Alpha Micron, an off shoot company of the LCI, to see such inventions in the form of digital lenses, auto dimming mirrors, electronic windows and cocktail dresses with UV reactive liquid crystalline sequins!

During the workshop I attended various tutorials on the basics of liquid crystal theory and research presentations from some of the liquid crystal world's most recognised experimentalists and theorists. Having a mixture of mathematical and physics presentations helped me gain a wider perspective of the current exciting problems which are still waiting to be solved. There was also plenty of time made available to visit the LCI's teaching cleanroom, where I made a simple LC switching cell, as well as several physics labs where the participants got a more `hands on' look at liquid crystal experiments. It was good to hear from the researchers that visitors are always welcome to examine and discuss the experiments in question.

Midway through the workshop was a day of student presentations. As the workshop was primarily focused on ferroelectric materials I decided to present some work on cylindrically layered smectic A liquid crystals, since the structure of these are similar to the cylindrically layered bent-core ferroelectrics. This piece of research focuses on the dynamics of such a system when a sinusoidal perturbation is applied. The governing equations are derived and then stability is studied. We found that the stability of the system is dependent on the wavenumber of the applied perturbations and the dependence is computed.

The chance to present some of this work to other mathematicians and leading experimentalists in the field was invaluable and the feedback received will be used to further enhance the research undertaken. In general, the student presentations were of a tremendously high quality with many coping very well with what could be quite a daunting audience!

Throughout the program we were fortunate enough to attend various social events: a welcome reception on the first evening, a day of excursions to various sites around Ohio and then a conference banquet on the penultimate evening. All were thoroughly enjoyable and aided by the friendliness and approachableness of both workshop organisers and students of the host departments.

The workshop was a huge success due to the fantastic e orts of the organising committee and the students of both the LCI and the Department of Mathematical Sciences of Kent State University. I would like to say particular thanks to the BLCS and the NSF Focused Research Group for the bursaries which aided my travel costs. My trip to Kent State University was incredibly conducive and constructive to my current and future research in liquid crystal and complex fluids theory. I thoroughly recommend visiting the LCI labs and conversing with staff and students of both the LCI and the Department of Mathematical Sciences to others in the field of liquid crystal theory.

Alan J. Walker
Department of Mathematics
University of Strathclyde

Helen Gleeson to give the Percival Lecture 2007

The Percival Lecture is one of the prestigious, named lectures of the Manchester Literary and Philosophical Society. The Manchester Lit and Phil, as it is also known, was instituted in 1781 and is one of the oldest learned societies in Britain. Members of the society included such illustrious names as John Dalton, James Prescott Joule, Henry Roscoe and Ernest Rutherford, just to name a few of the eminent chemists and physicists. The Percival Lecture was founded in 1945 and rotates between the three Greater Manchester Universities on an annual basis.

Helen Gleeson was invited to deliver this year's Percival Lecture at the University of Manchester in conjunction with the Manchester Lit and Phil on Wednesday the 18th of April 2007. The title of her lecture was "Order and Vision – Physics at the Interface". The very enjoyable evening started with a wine reception at the Humanities Lime Theatre, followed by Helen's lecture, which introduced liquid crystals, the polarisation optics of helical self-organised media and their impact on biological systems, from iridescent beetles to the polarisation vision of Atlantic salmon and other vertebrates. Helen supported her lively lecture with a number of simple, yet illustrative and clever lecture demonstrations, which clearly captured the attention of the mostly lay audience.

The approximately 200 attendees of the lecture came from a very diverse background, many of them being members of the Manchester Lit and Phil. But also a large number of the honoraries of the University of Manchester were present: the President and Vice-Chancellor Alan Gilbert, who introduced Helen Gleeson as the Percival Lecturer, the Dean of the Faculty of Engineering and Physical Sciences, all Heads of School of the Faculty, and numerous academics. They all were presented with an excellent public lecture on liquid crystals and their impact far beyond common flat panel TVs. And I must say that even though I am of course familiar with the topic, I did not feel bored for a second. This really was an outstanding public lecture.

After Helen's presentation, the evening was finished in style with a buffet supper, served in the University's historical library, with a variety of tasty snack dishes available. This also provided the venue for further discussions between Helen and the diverse members of the audience, but also between members of the Manchester Literary and Philosophical Society and academic staff of the University of Manchester in general. To conclude, this was a very enjoyable event, and Helen Gleeson gave the audience what it deserved: Liquid Crystal Science in Action.

Ingo Dierking
University of Manchester

British Liquid Crystal Society Winter Workshop 2006

The British Liquid Crystal Society Winter Workshop was held in the Department of Chemistry at the University of Hull from lunchtime Monday 18th December to lunchtime Wednesday 20th December 2006.

As I am sure everyone is aware, the Workshop is designed for new entrants to the field of liquid crystals, particularly PhD students, but post-docs, technicians and industrialists also have much to gain from the event. Areas covered by the Workshop include a general introduction to liquid crystals, the synthesis of liquid crystals, identification of liquid crystal phases by optical microscopy, differential scanning calorimetry, and X-ray analysis, liquid crystal polymers, the physics of liquid crystals, liquid crystal devices, and modelling of liquid crystals. Theory and practical work is included, and there is ample opportunity for social activities. All participants are provided with notes from each of the topics covered.

The three-day format of the Workshop is now well established, and although well-attended and financially successful for many years, costs have increased, and numbers of delegates, particularly industrial delegates who bring in more money, have decreased, to the extent that the 2004 event was lowest attended Workshop ever. However, numbers picked up slightly for the 2005 Workshop, and a further increase in the number of delegates was seen for the 2006 event.

A total of 31 delegates attended the 2006 Workshop (28 last year), comprising of 2 industrial delegates (7 last year), 26 academic delegates (16 last year), and 3 non-residential delegates (5 last year). All delegates seemed to enjoy themselves, and I am sure that they all benefited from the wide and varied academic and social programmes.

This year was the first Workshop under the 3-year EPSRC funding, which was obtained during the past year. Such financial support will cover 3 Workshops, and enables the free attendance at the Workshop for all research students registered with a UK university (other academic delegates were charged £130 and industrial delegates were charged £240). Such financial support brought a 60% increase in the number of academic delegates compared with the 2005 event, although the number of industrial delegates was well down, but this number has seen wide variation in the past.

The 2007 Workshop will operate from Lunchtime Monday 17th December to Lunchtime Wednesday 19th December 2007, and I look forward to another successful event..

Mike Hird
University of Hull

Don't forget the BLCS Winter Workshop 2007!

17-19th of December in Hull, register early!

http://www.hull.ac.uk/chemistry/research/BLCS/wwindex.htm

British Liquid Crystal Society

Registered Charity (328163)
Annual report on the accounts

The closing accounts showed a 3.9% growth in cash at Bank (£19768.02) compared to last year (£19023.11) despite warnings of expected heavy expenditure. Growth has been due to a record number of membership renewals, many of which are for at least three years, culminating in £660. Tim Wilkinson should be congratulated for his efforts. A strong profit (£1329.56) was returned from York for BLCS2006. The Royal Society-BLCS UK-INDIA Networking meeting held in York came as a welcome, unexpected spin-off, raising £540.85 for BLCS. Strathclyde returned a small profit for the one-day Bristol meeting.

As forecast last year, expenditure was heavy due to purchase of medals (GW Gray and C Hilsum), bursaries for ILCS2006 and, expenses for GW Gray Medal recipient. However, the Society did not have to contribute to the Winter Workshop this year since it has sought Research Council funding.

The capital value of the Sturgeon Fund continues to increase due to the addition of interest. Due the generosity of the Sturgeon Lecturer, we have not incurred any expenses for the last three years.

The balance sheet is in a very healthy position. I propose to write-off any gains/losses expected from 2005 BLCS Annual Conference (Exeter). Also, I propose to transfer a portion of from the current account in to our savings account in order to maximize return on investment.

Special thanks are conveyed to Dr Gary Lester for his hard work and continual persistence in returning a fantastic profit of £1500 from the Exeter BLCS Annual Meeting, which was proposed to be written off.

AS Matharu
Hon. Treasurer
18th March 2007