

About OMICS Group

OMICS Group International is an amalgamation of Open Access publications and worldwide international science conferences and events. Established in the year 2007 with the sole aim of making the information on Sciences and technology 'Open Access', OMICS Group publishes 400 online open access scholarly journals in all aspects of Science, Engineering, Management and Technology journals. OMICS Group has been instrumental in taking the knowledge on Science & technology to the doorsteps of ordinary men and women. Research Scholars, Students, Libraries, Educational Institutions, Research centers and the industry are main stakeholders that benefitted greatly from this knowledge dissemination. OMICS Group also organizes 300 International conferences annually across the globe, where knowledge transfer takes place through debates, round table discussions, poster presentations, workshops, symposia and exhibitions.

About OMICS Group Conferences

OMICS Group International is a pioneer and leading science event organizer, which publishes around 400 open access journals and conducts over 300 Medical, Clinical, Engineering, Life Sciences, Pharma scientific conferences all over the globe annually with the support of more than 1000 scientific associations and 30,000 editorial board members and 3.5 million followers to its credit.

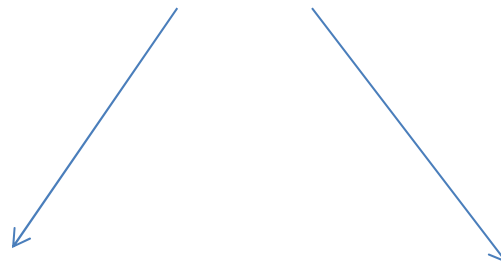
OMICS Group has organized 500 conferences, workshops and national symposiums across the major cities including San Francisco, Las Vegas, San Antonio, Omaha, Orlando, Raleigh, Santa Clara, Chicago, Philadelphia, Baltimore, United Kingdom, Valencia, Dubai, Beijing, Hyderabad, Bengaluru and Mumbai.

Liquid Crystals as a Stereochemical Artefact: Toward a New Paradigm

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India

Classification

Liquid crystals



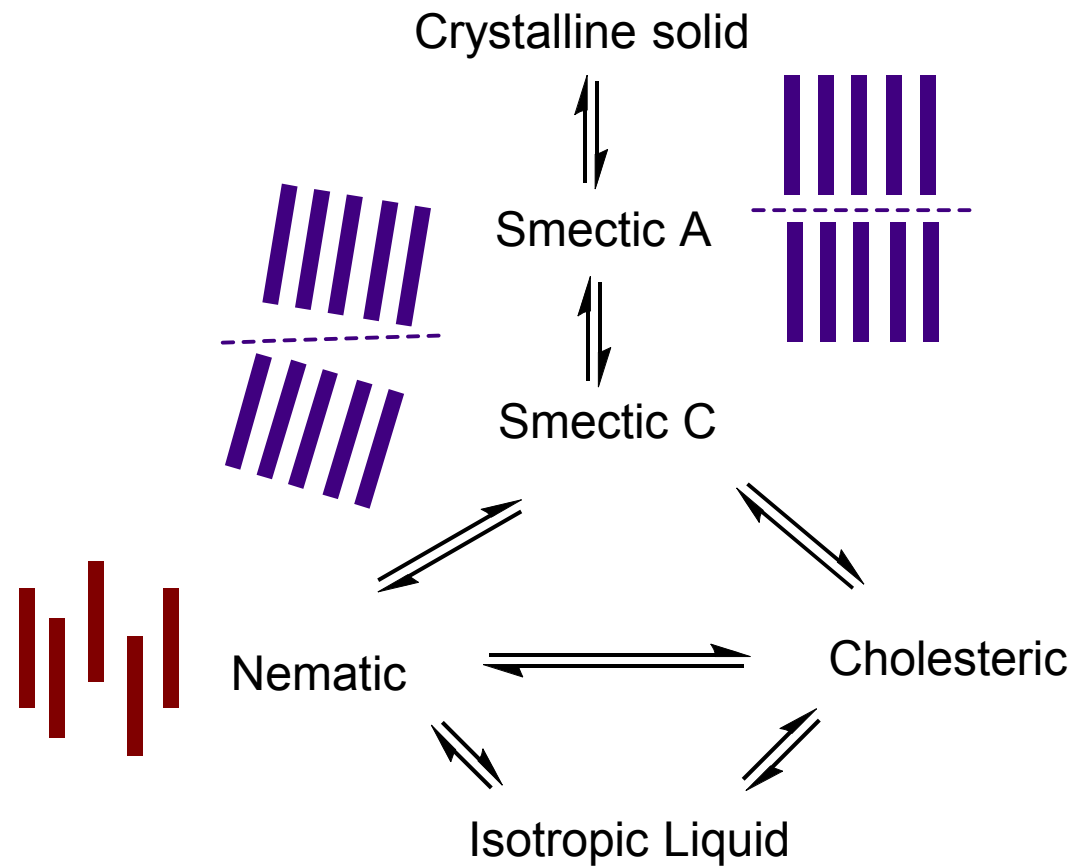
Thermotropic

Lyotropic

Current View of Liquid Crystals

- ❖ Intermediate state of matter ('mesophase')
- ❖ Possess some of the characteristics of both solids and liquids
 - ❖ Order and orientation (solids)
 - ❖ Fluidity (liquids)
- ❖ Molecular level interpretation of properties in terms of phases (nematic, smectic, etc.)

A Hierarchy of Order



Electro-optic Effects

- Liquid crystalline thin films respond to an electrical field
- This changes the consistency of the film: more or less dispersed medium
- Affects light transmission: transparent vs. cloudy

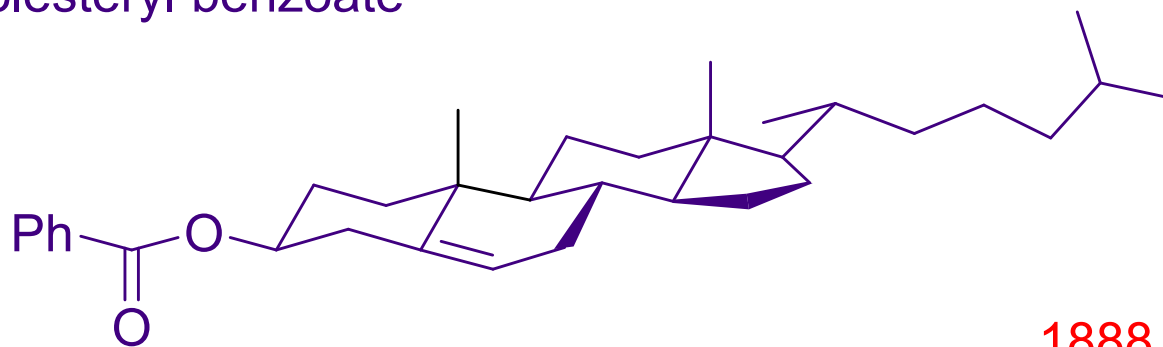
DEVICE DISPLAYS!

PROBLEMS!

- Liquid crystals (LC's) are not easy to study
 - They are neither liquids nor solids
 - They are also unstable in dilute solution
 - So, normal spectroscopic and related techniques not directly applicable
- Current view of LC's based on theoretical speculation and indirect experimental evidence!

An Early Break!

Cholesteryl benzoate



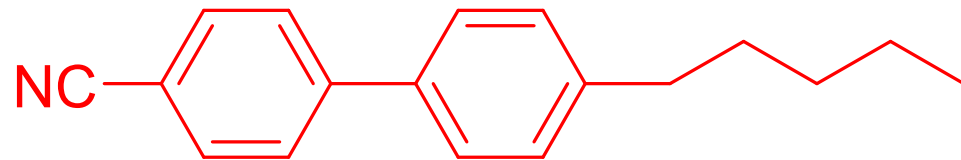
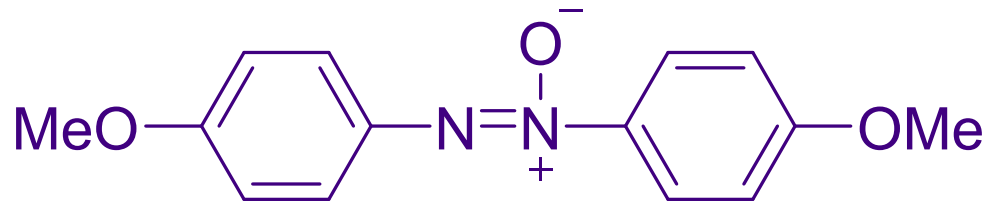
1888

Two mp's: 145 & 178 °C

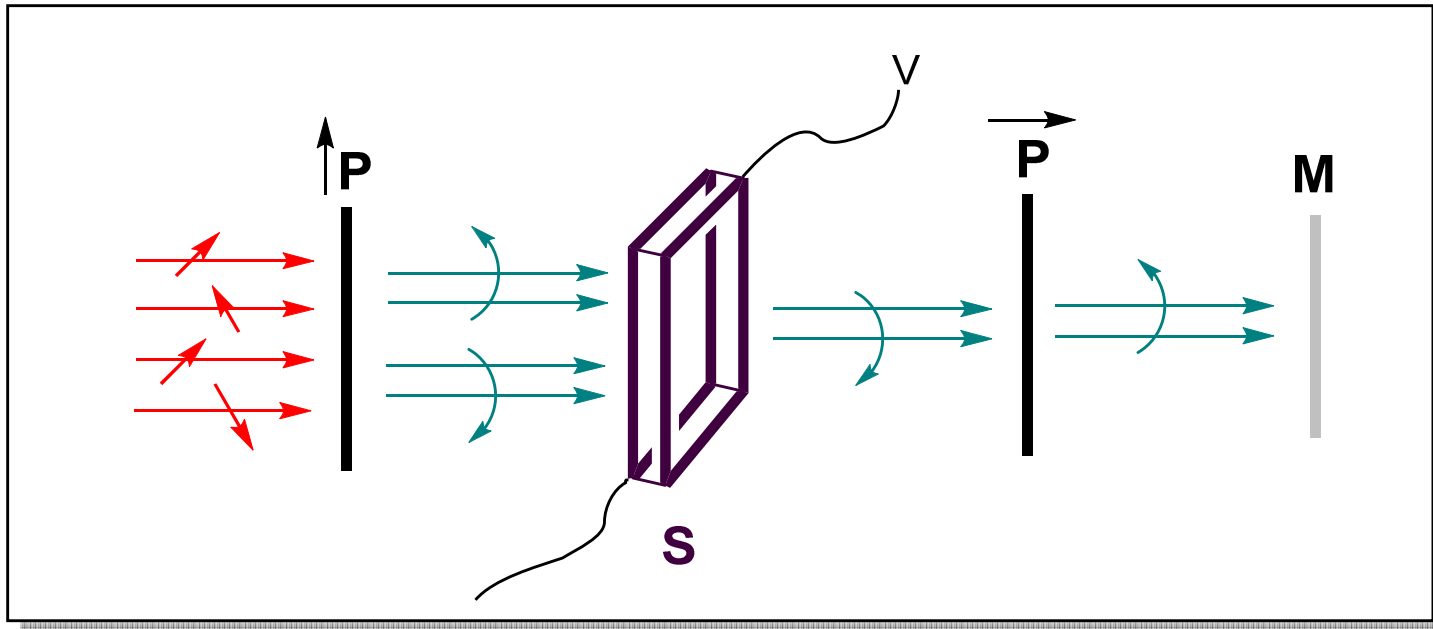
Fortuitously the first LC!

Let There Be (Polarized) Light!

Cholesteryl benzoate stimulated interest in the effects of polarized light on LC's, whether cholesteric or not!



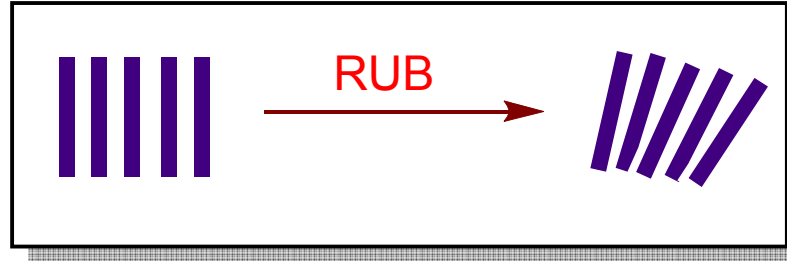
Crossed-polarizers & LCD's



TRANSPARENT \xrightarrow{V} CLOUDY

Twisted Nematics

- Prepared by mechanical action (rubbing)



- Once generated thus, resulting chirality stable over time
- Stable to electrical and magnetic effects which are also reversible

The Rub!

- ❑ Can mechanical action generate chirality?
 - ❑ Even if so, would it be stable to thermal effects over time?
- ❑ What, indeed, is the origin of the Maugin effect?
- ❑ Dealing with an enormous level of molecular order far exceeding even that of solids!
- ❑ Not easy to grow single crystals of comparable size

Twisted Nematics

‘Liquid crystals for twisted nematic display devices’

G. W. Gray and S. M. Kelly

J. Mater. Chem., 1999, 9, 2037–2050

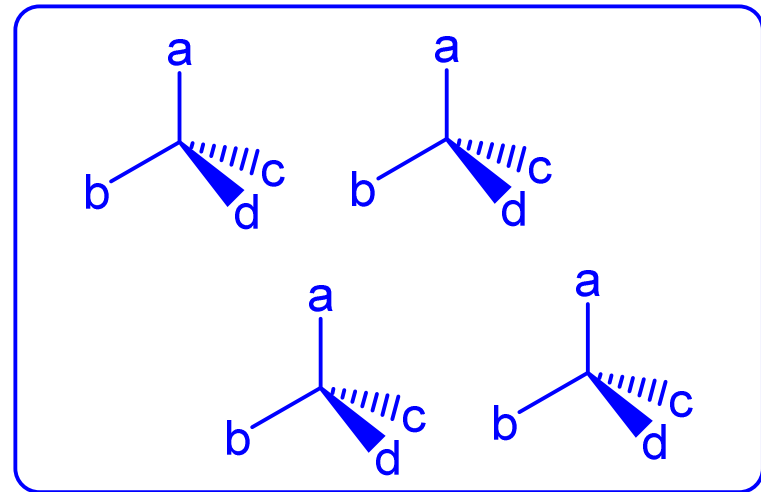
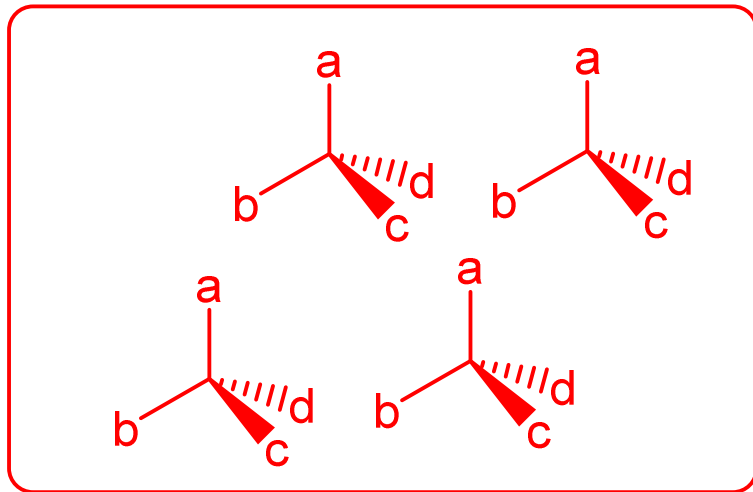
What?..Why?..How?...

The Physical Organic Chemist as Devil's
Advocate!

Stereochemistry to the Rescue!

Alternative Possibility

Are liquid crystals derived from conglomerates?



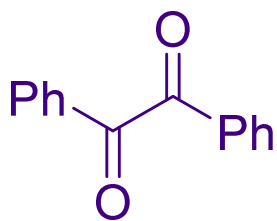
CRYSTALLINE R A C E M A T E

Conglomerates

E.L. Eliel, S.H. Wilen, L.N. Mander,
Stereochemistry of Organic Compounds,
John Wiley, New York, 1994, p 159

Spontaneous Resolution

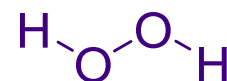
Achiral molecules can form chiral crystals!



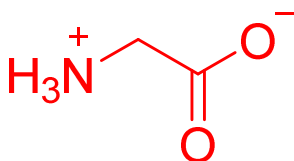
Benzil



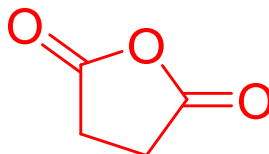
Sodium chlorate



Hydrogen peroxide



Glycine



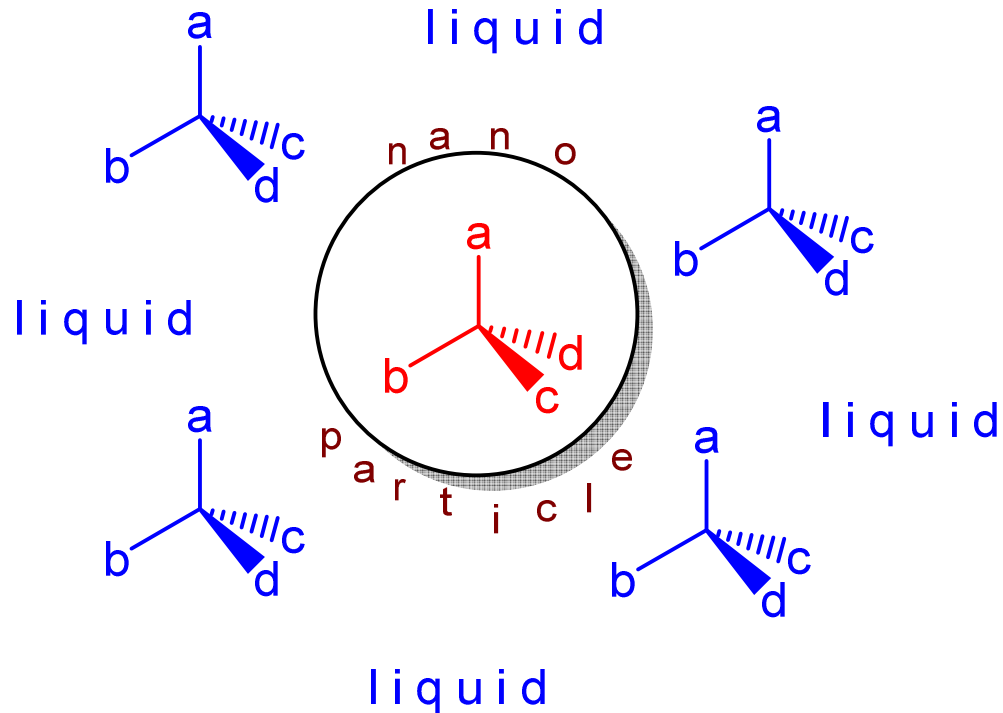
Succinic anhydride



Phenol

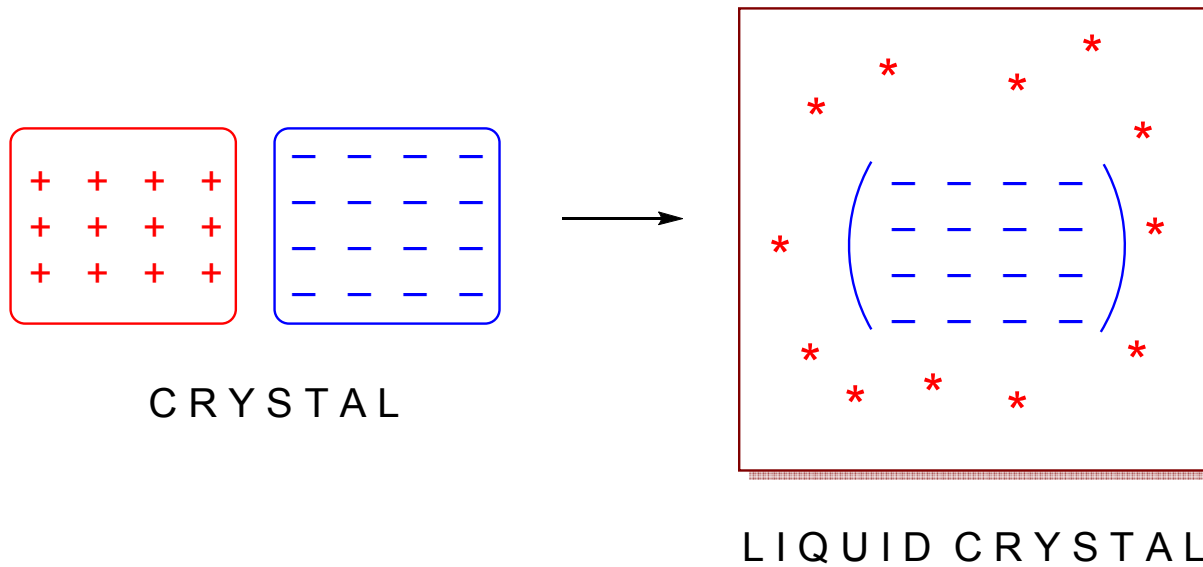
A Nanoparticle Dispersion....

A partially molten conglomerate



Compatibility

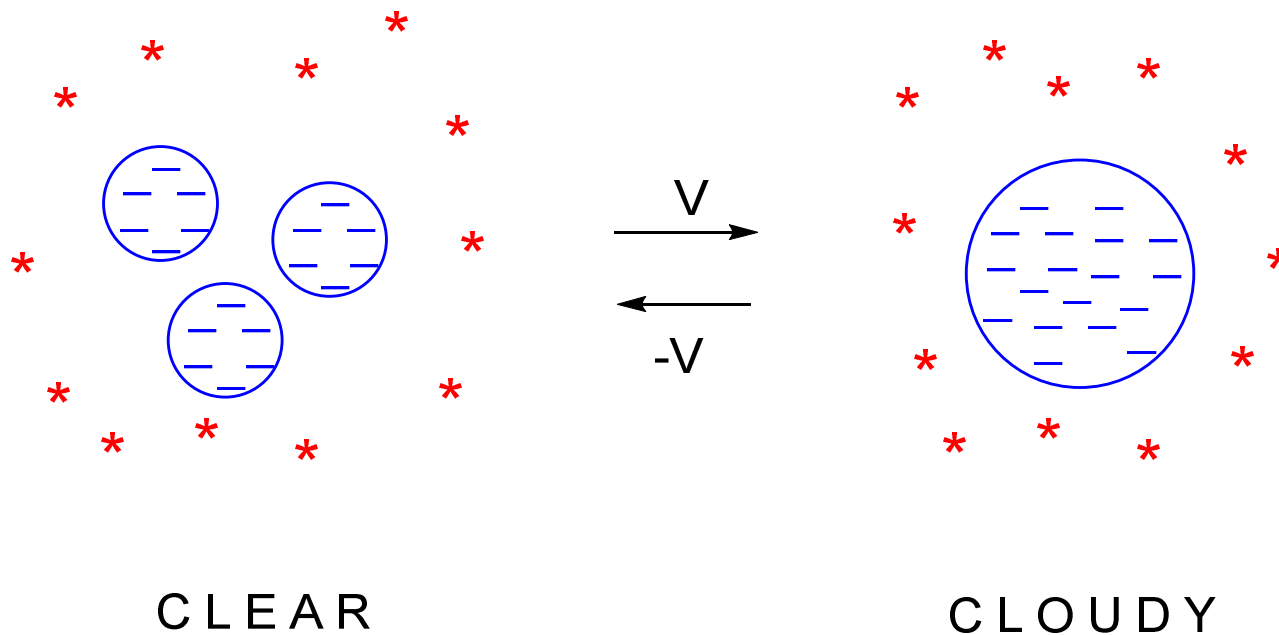
Effect on polarized light



Symmetry Breaking

Compatibility

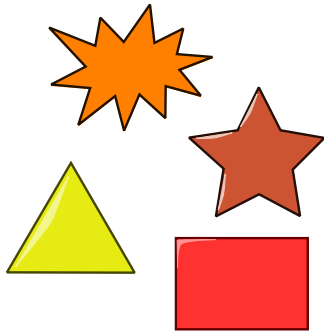
Electrical effects



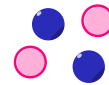
Coagulation to minimize surface charge

Twisting??...

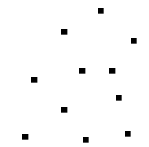
A nanoparticle dispersion : a 'twilight zone'



MACROSCOPIC
 $\sim 10^{-1}$ m



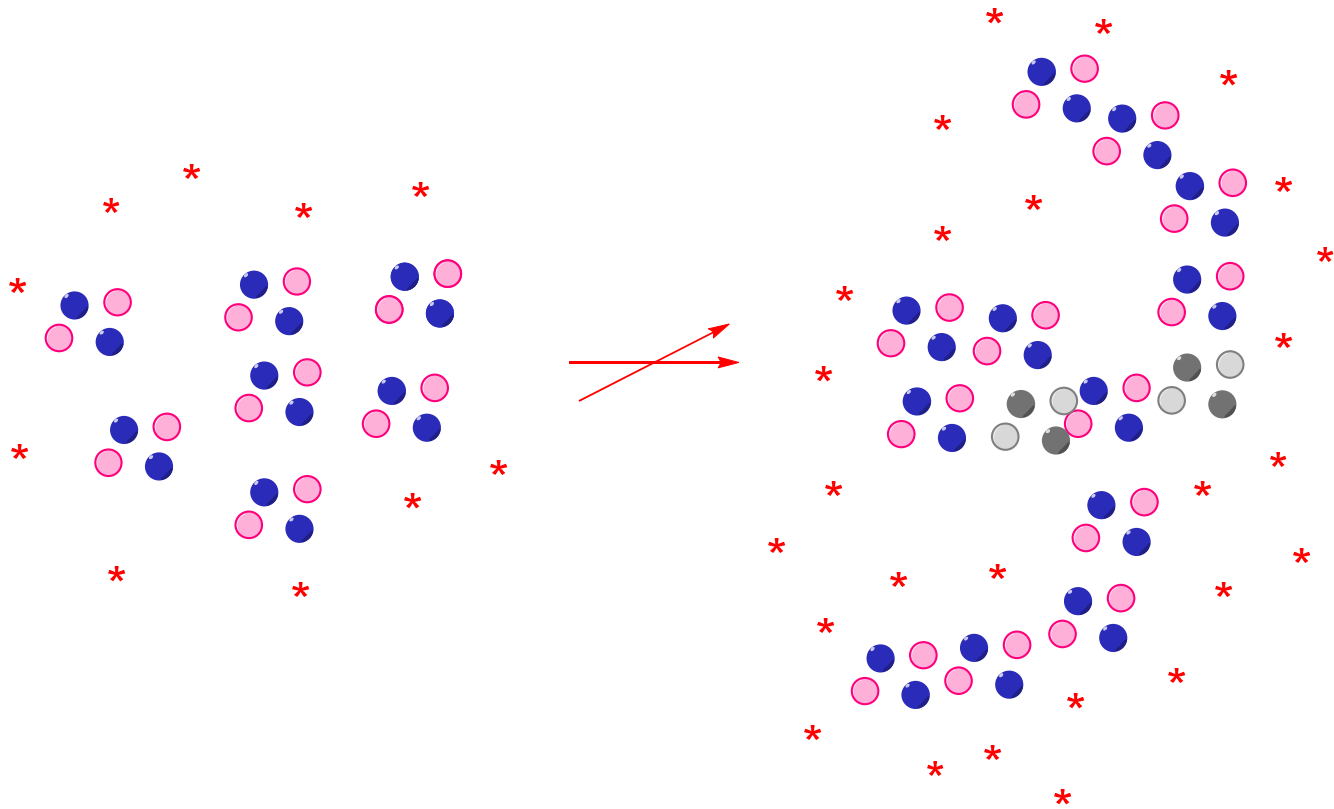
TWILIGHT ZONE
 $\sim 10^{-7}$ m



SUBMICROSCOPIC
 $\sim 10^{-10}$ m

Molecular level order in the bulk LC not compatible
with fluidity!

Supplemental Chirality



Twisting imparts helicity to the suspension

???

A LIQUID Crystal!

- What imparts fluidity to it?
- Is fluidity compatible with molecular order extending in the bulk liquid?
- Extended order would exceed that in a crystalline sample!
- A nano-dispersion can be both fluid and amenable to manual twisting

CONCLUSIONS

- ❖ Chiroptical properties of LC's demand a new approach
 - ❖ Conventional view of molecular order extending in the bulk seems unlikely
- ❖ LC's possibly represent a symmetry-broken state
- ❖ Nanoparticle dispersion model compatible with observed optical & electrical phenomena

ACKNOWLEDGMENTS

➤ OMICS & Conference Organizers

➤ Indian Institute of Science

➤ **THANK YOU!**

Let Us Meet Again

We welcome you all to our future conferences
of OMICS Group International

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