



Liquid Crystals

University of Wisconsin-Madison
Internships in Public Science Education
Beixin Julie He and Jeffrey S. Maxwell
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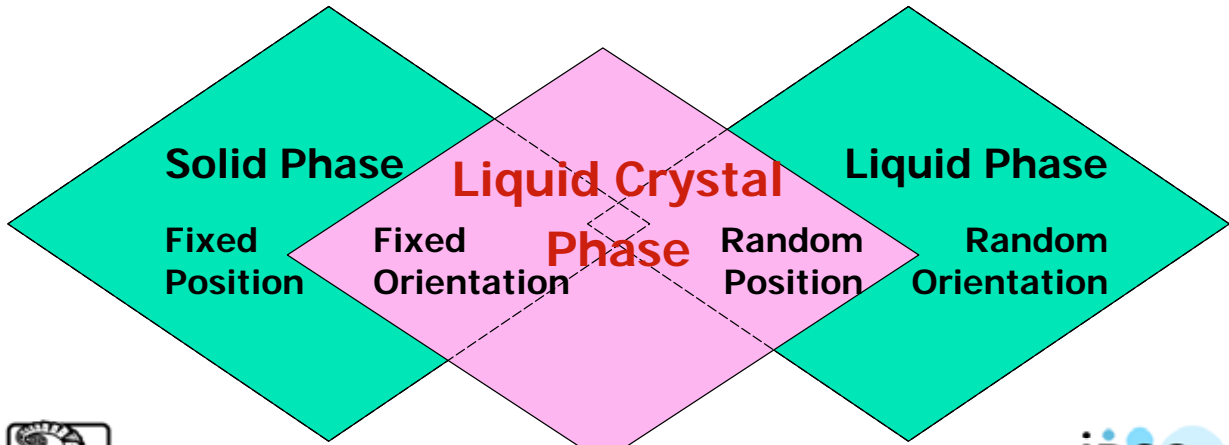
Applications of Liquid Crystals

- LC displays
- Thermometers for circuit boards, battery condition testers, etc.
- Mood rings
- Paints
- Shampoos and body wash

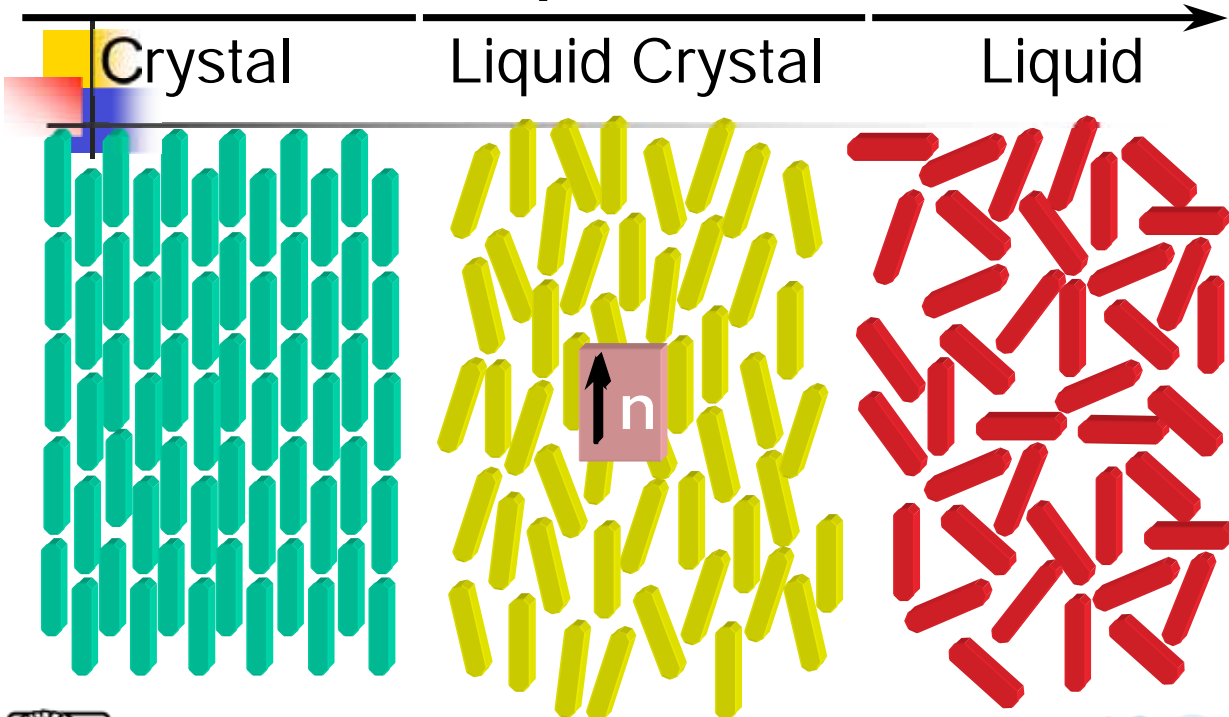


What are liquid crystals?

- Phase for some organic compounds
- Properties of both liquids & solids



Temperature





History of Liquid Crystals

- Discovered in 1888 by Friedrich Reinitzer in the heating of cholesteryl benzoate
- Name was coined by Otto Lehmann, who visualized LC's w/ heated microscope
- Applications developed in 1960s



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Liquid Crystal Structures

- Rod- or disk-shaped, polar molecules
- Lie parallel to a specific axis called the director (n)
- Constant director maintained w/in a certain distance that encloses a domain
- Fluidity via translation of domains

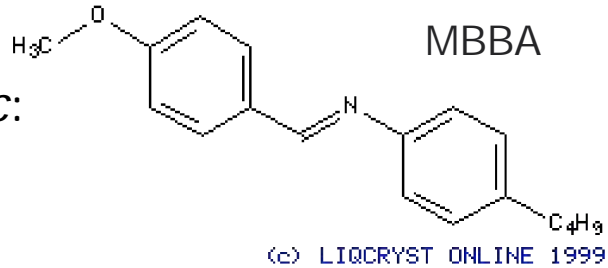


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Liquid Crystal Molecules

- Two types of chemicals exist in LC phase

- *Thermotropic*: conjugated double bonds



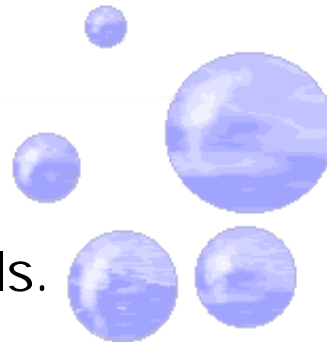
- *Lyotropic*: amphiphilic (water-loving)



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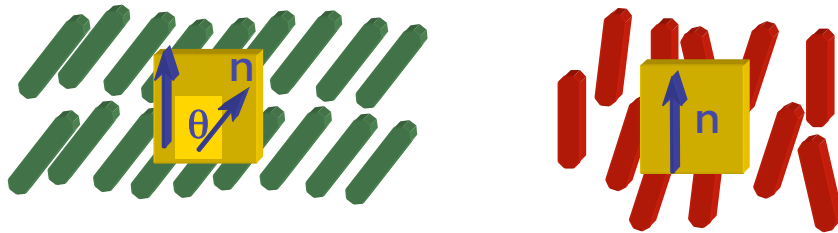
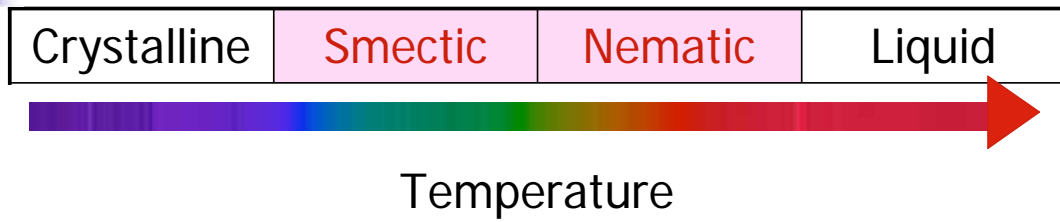
Bubbles

- Bubbles are *lyotropic* liquid crystals.
- Thickness of bubbles determines the colors of light they reflect



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Polymorphism of LC's



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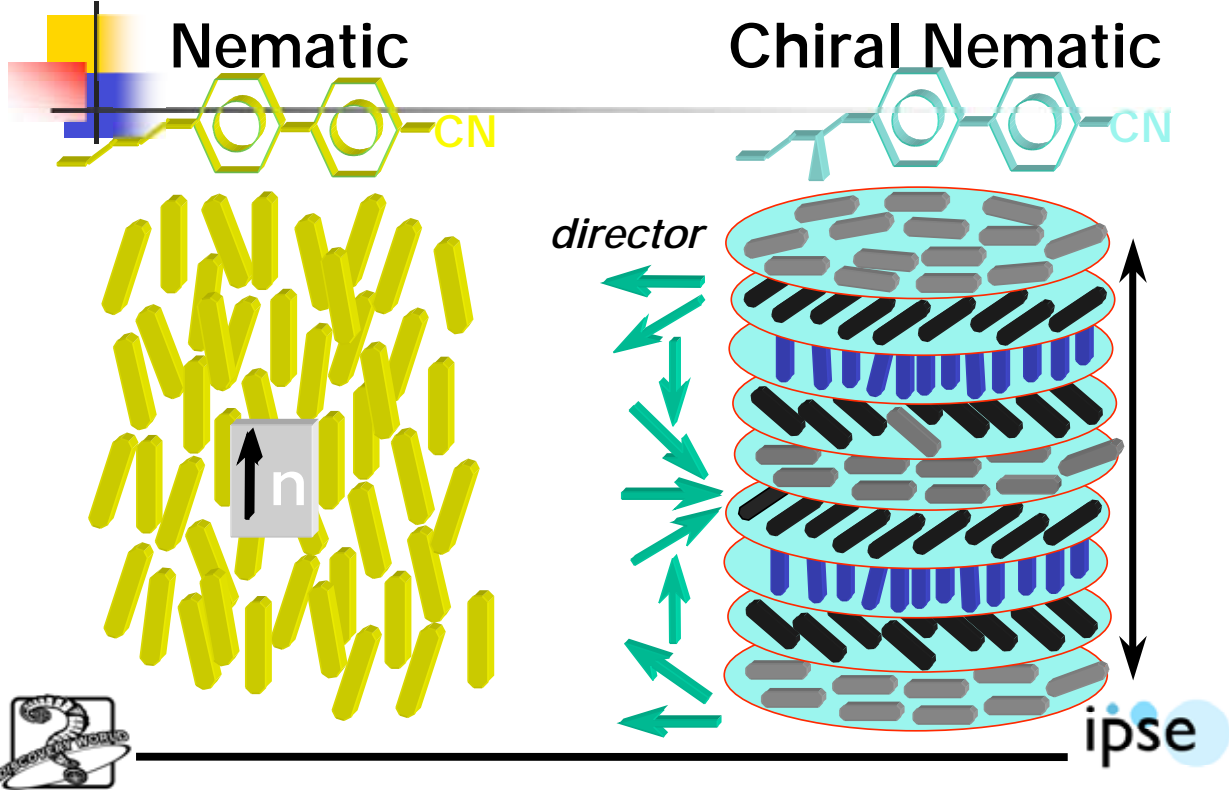
Chirality in Liquid Crystals

- Chiral molecules
 - have non-super-imposable mirror images
 - influence each other's orientation
- Chiral compounds can assume different mesophases.

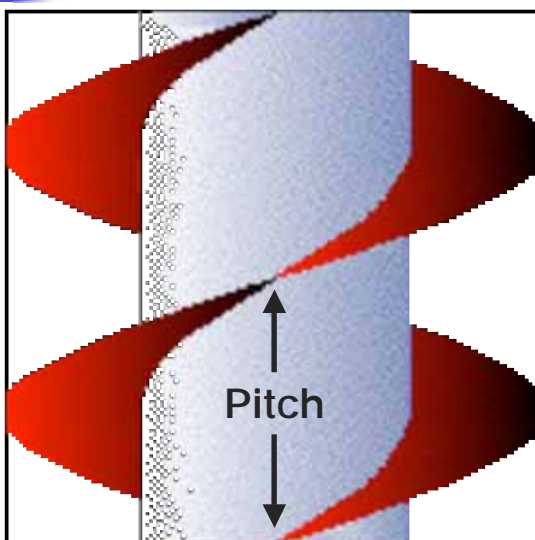


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Mesophases of Chiral Molecules



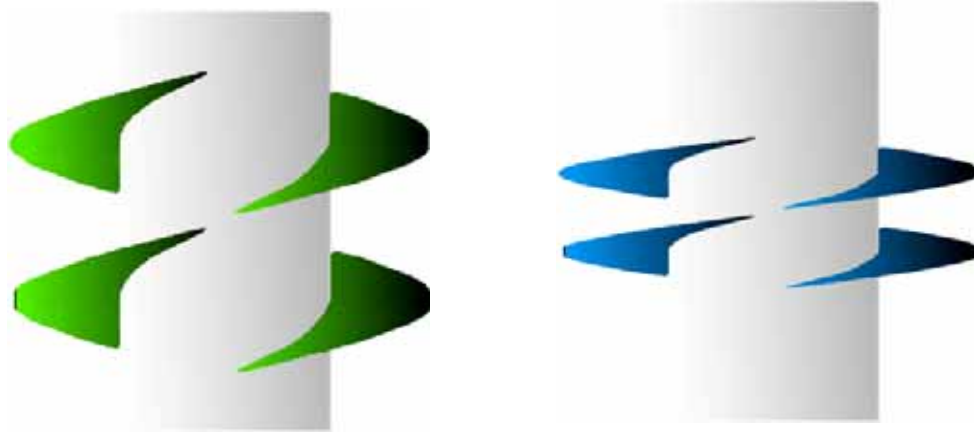
Relationship b/w Pitch and Color Change



- Pitch affects the scattering of light
- Color changes because pitch changes



Increasing temperature decreases pitch

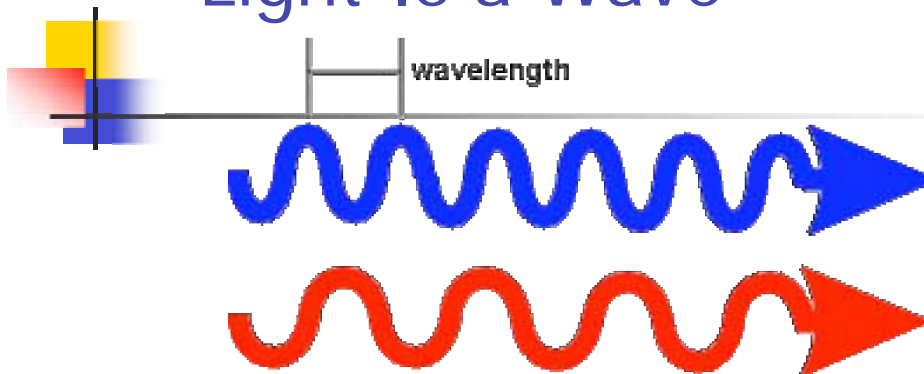


Temperature



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Light Is a Wave



Different colors of light have different wavelengths.

- White light = Mixture of all the colors of light
- Different than a mixture of paints and/or other media



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