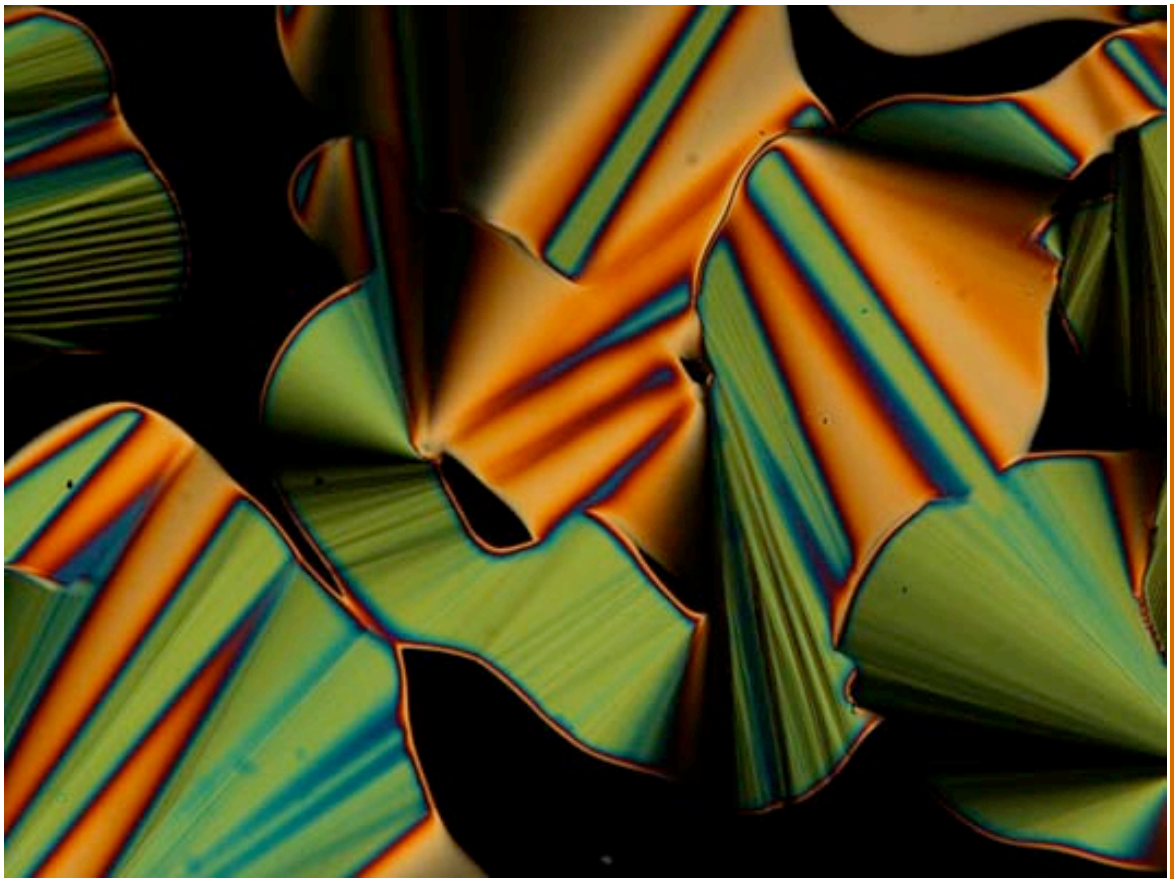
UCA Department of Physics and Astronomy

PHYS 3345: OPTICS



Focal conic texture under polarized microscopy of the hexagonal columnar liquid crystalline phase formed by the self-complementary CGCGAATTCG CG DNA oligomer.

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Assignment 08: Chapter 08
DUE: April 09, 2008

Spring 2008

Work each problem neatly and completely. Unless otherwise noted, each problem is worth **4 points**. You should solve on green engineering paper or blank unruled paper. You must include sufficient demonstration of your problem solving process. If a problem is to be solved by inspection, state this. If graphs or plots are required, you should use an appropriate tool for their construction (there are several respectable options available on the computers in LSC 114).

1. Distinguish between an $\mathcal{R}$–state and $\mathcal{L}$–state elliptical wave if both plots are ellipses with major axes at 45° to the x–axis. Write the equation for each wave and demonstrate its right- or left-handedness.
2. Hecht, Problem 8.9.
3. Hecht, Problem 8.12.
4. Hecht, Problem 8.19.
5. Hecht, Problem 8.54

The *Schaum's Outline: Optics* supplement has many solved problems to assist you. In particular, you will find the following problems useful: Chapter 5, Problems 8, 9, 13, 14, 55–61, 68, 69.

Review Questions

These are not assigned for grading, but they are the sort of conceptual questions that you should be able to address adequately if they were to show up on an exam.

1. If E_y lags E_x, what does this mean about the phase angle ε? What if E_y leads E_x?
2. Is natural light actually unpolarized?
3. Explain why clockwise rotation is called an $\mathcal{R}$–state (and counterclockwise an $\mathcal{L}$–state). Hint: examine the angular momentum vector.
4. What is the importance of anisotropy or asymmetry with respect to a polarizer? (Or, why is an isotropic material generally a poor polarizer?)
5. Explain why a vertical wire-grid polarizer allows a horizontal **E** field to pass.
6. Briefly explain the Polaroid H-sheet and how it works.
7. If two polaroids are held so that their transmission axes are 90° apart, no light is transmitted. Explain why a third polaroid, inserted between the two sheets at an angle of 45°, allows transmission.
8. Define birefringence (relate back to Question 04).
9. Explain the geometry behind Brewster's law.
10. Review *8.13.1 The Stokes Parameters*, especially the example on page 375.