



# Trace Evidence Analysis Using PLM

**Jeff Hollifield, MS**

Chemical Microscopist/University Instructor  
2019



# Trace Evidence Analysis Using PLM

**Jeff Hollifield, MS**

Chemical Microscopist/University Instructor  
2019

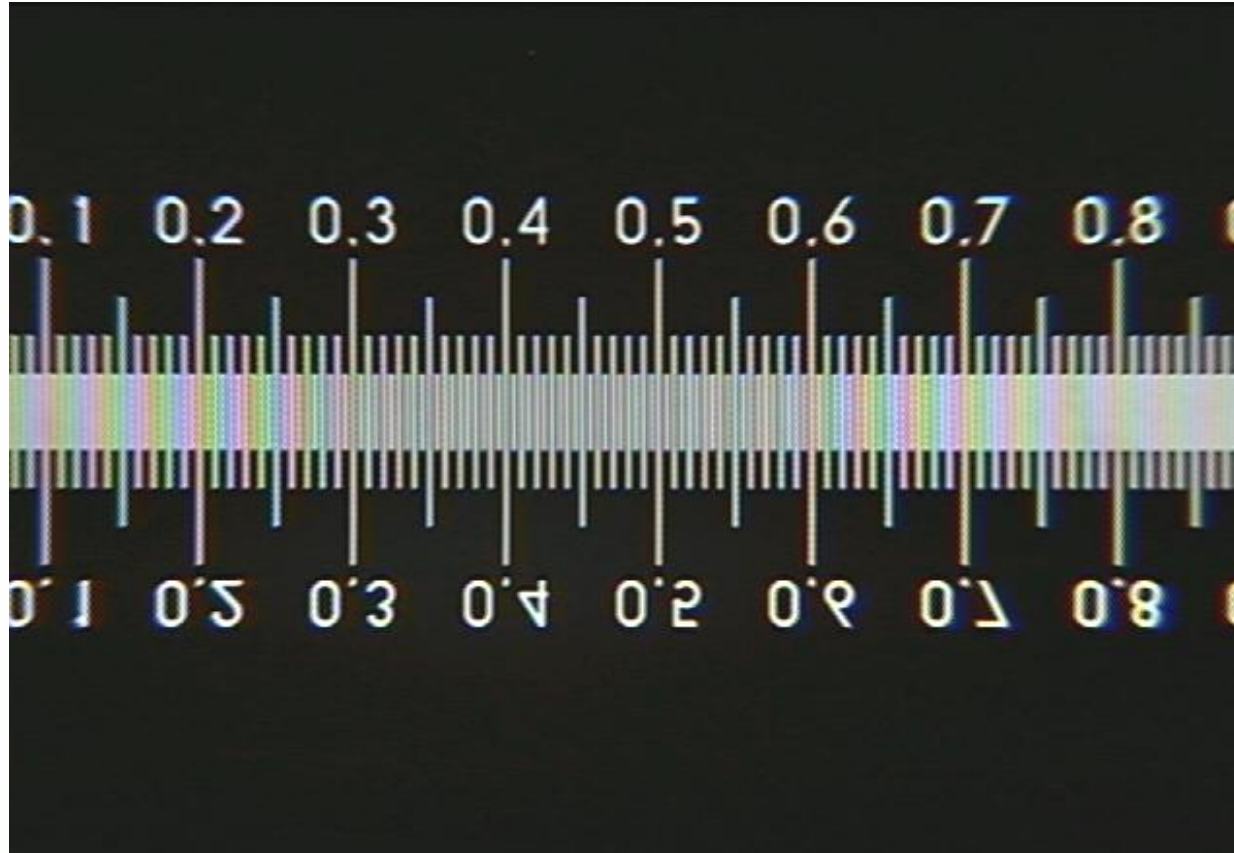
# Advantages of Using PLM for Trace Evidence

- Versatility
- Limited Size and Amount of Sample
- Non-Destructive Technique
- Relative Cost of Analysis
- Much Information Obtained Quickly

# Optimizing the Microscope

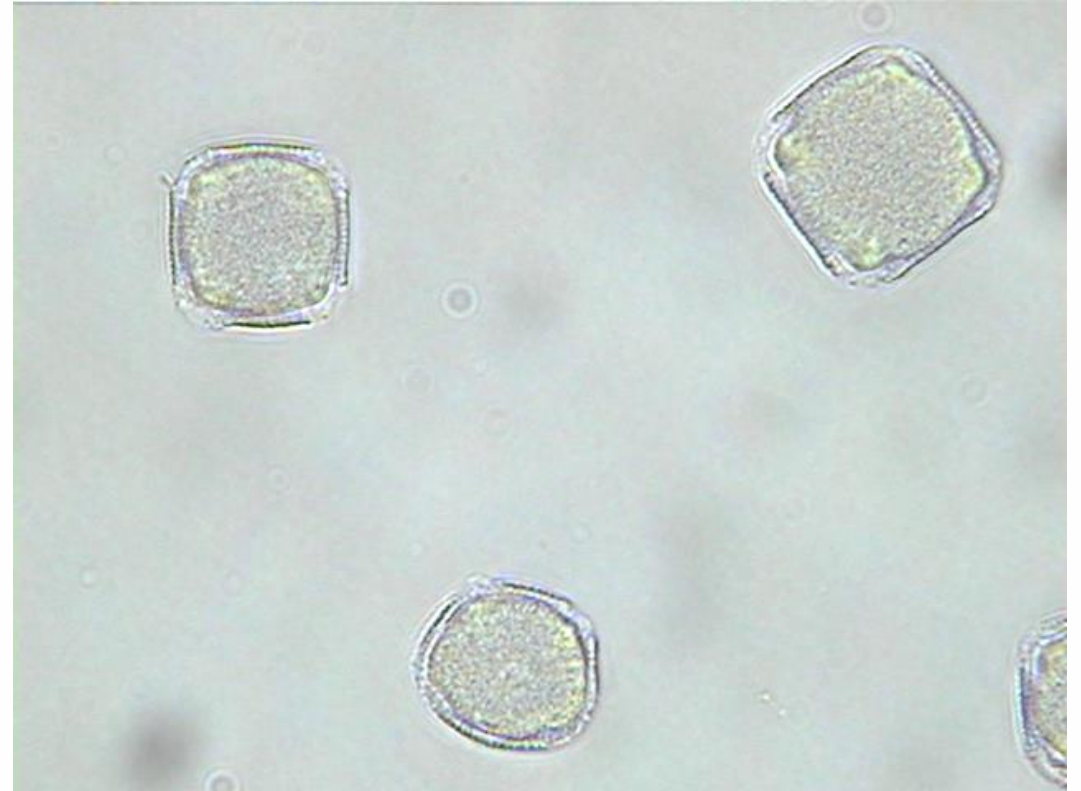
- Microscope Components
- Mechanical Alignment
- Proper Illumination
- Image Formation
- Resolution and Magnification

# Micrometry

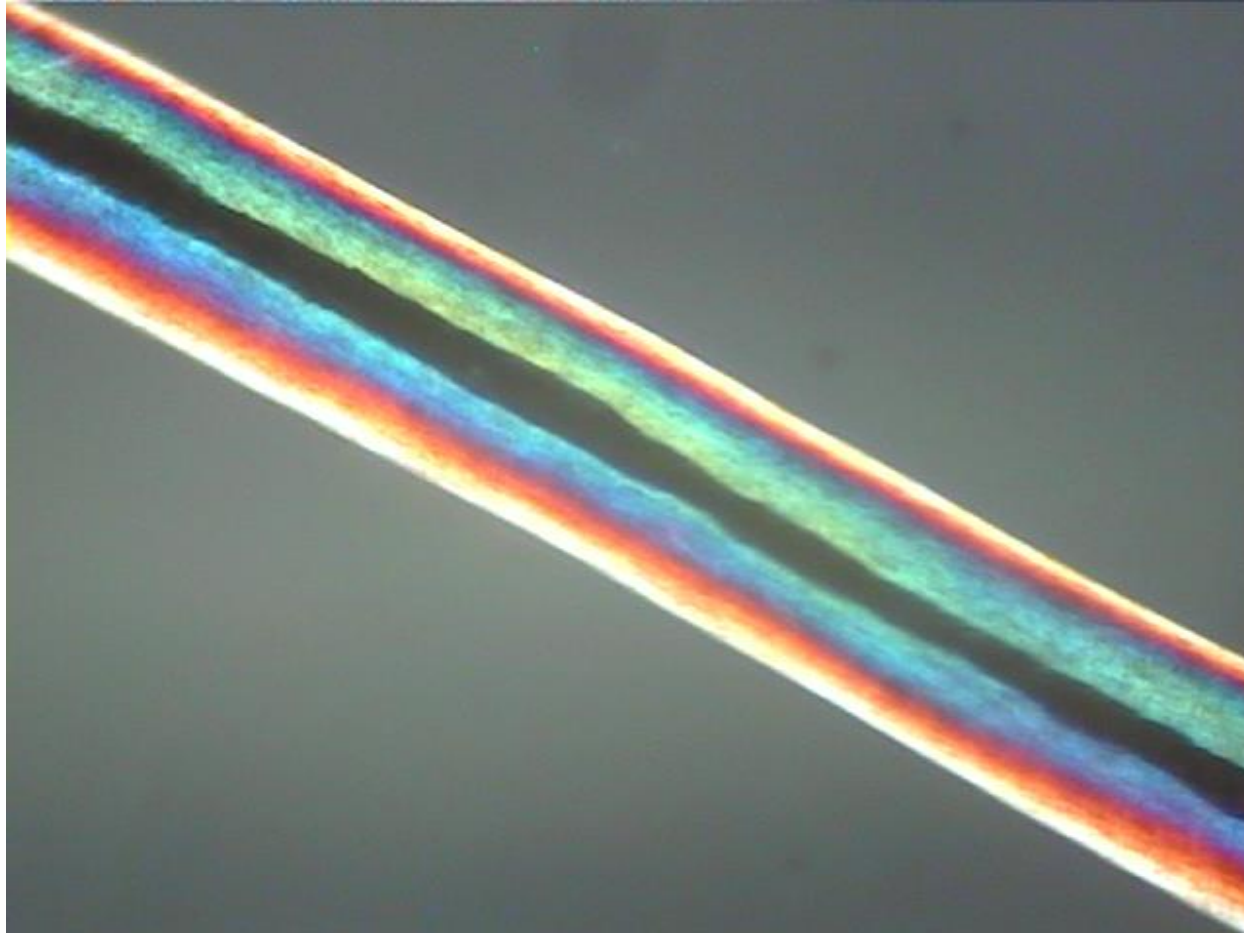




# Starch Grains and Pollen



# Analysis of Hair



# Optical Measurements

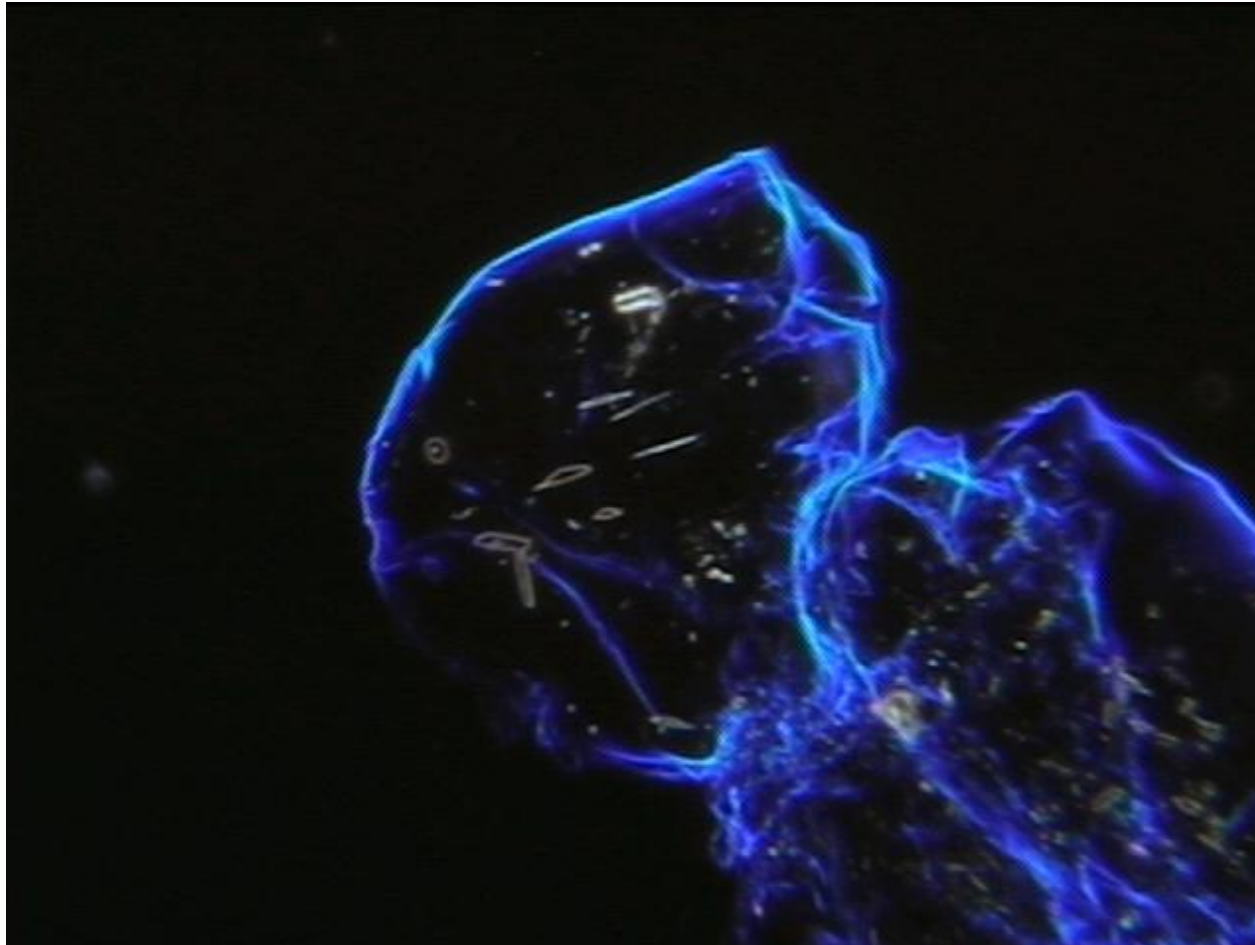
- Geometrical Optics
- Snell's Law
  - Mathematical relationship between angle of propagation and refractive index
- Refractive Index
  - Ratio of speed of light in a vacuum to speed of light in the sample
  - Measured by immersion method



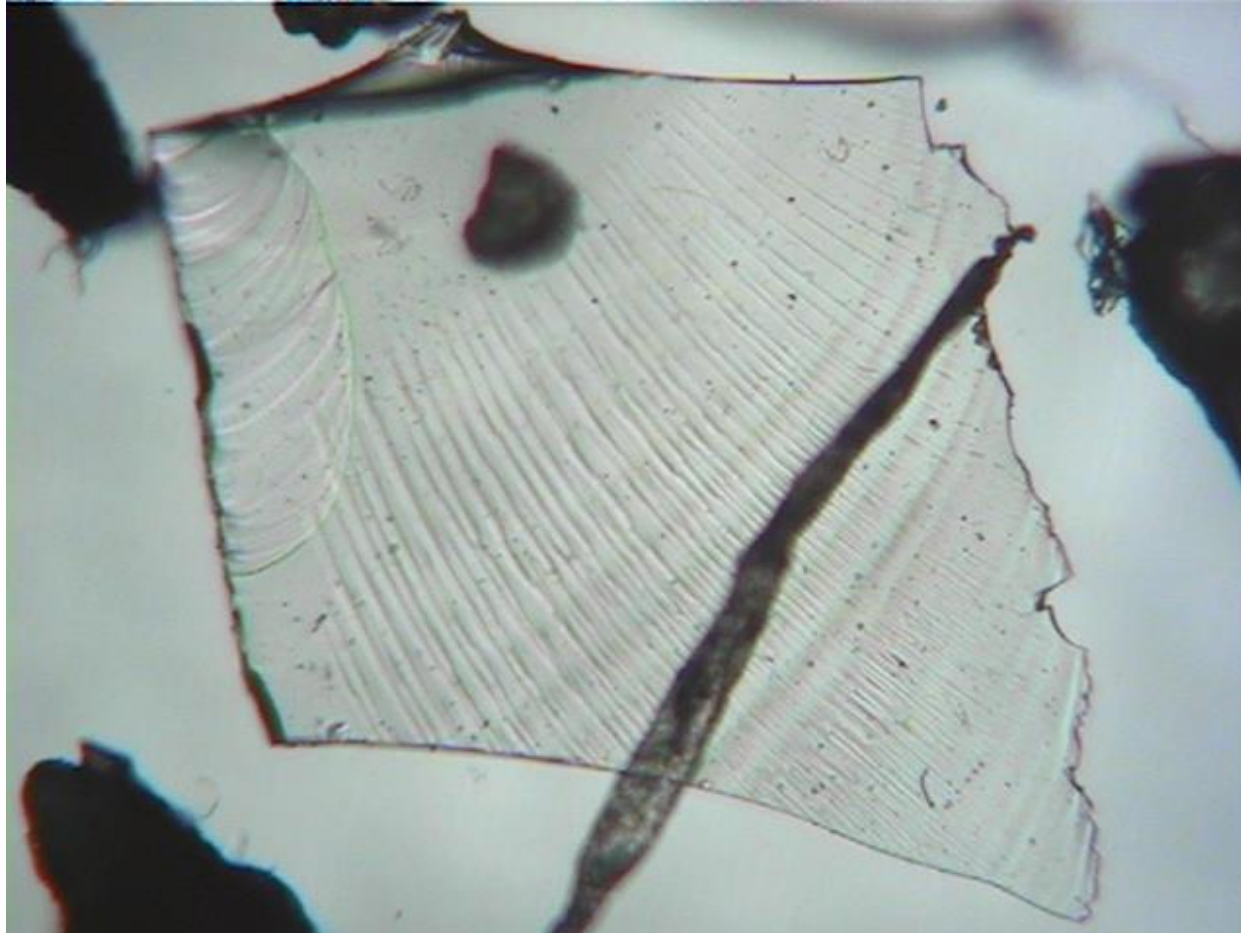
# Sample Preparation

- Choosing a Mounting Medium
- Contrast Methods
- Dispersion Staining

# Dispersion Staining



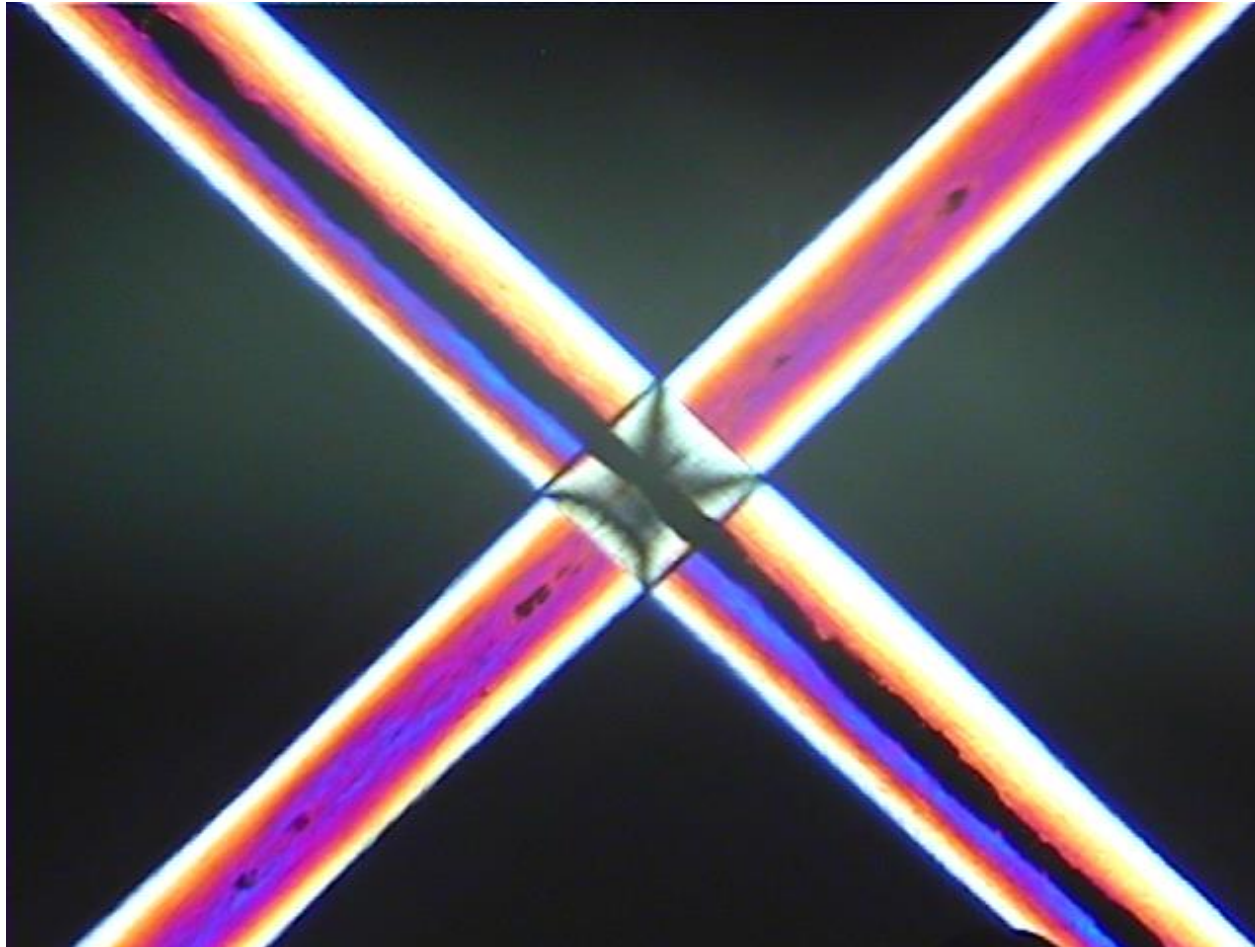
# Glass Analysis



# Crystal Morphology and Optical Characterization

- Retardation and Compensators
- Birefringence
- Sign of Elongation
- Optic Sign
- Extinction Angles
- Crystal Systems

# Fiber Analysis

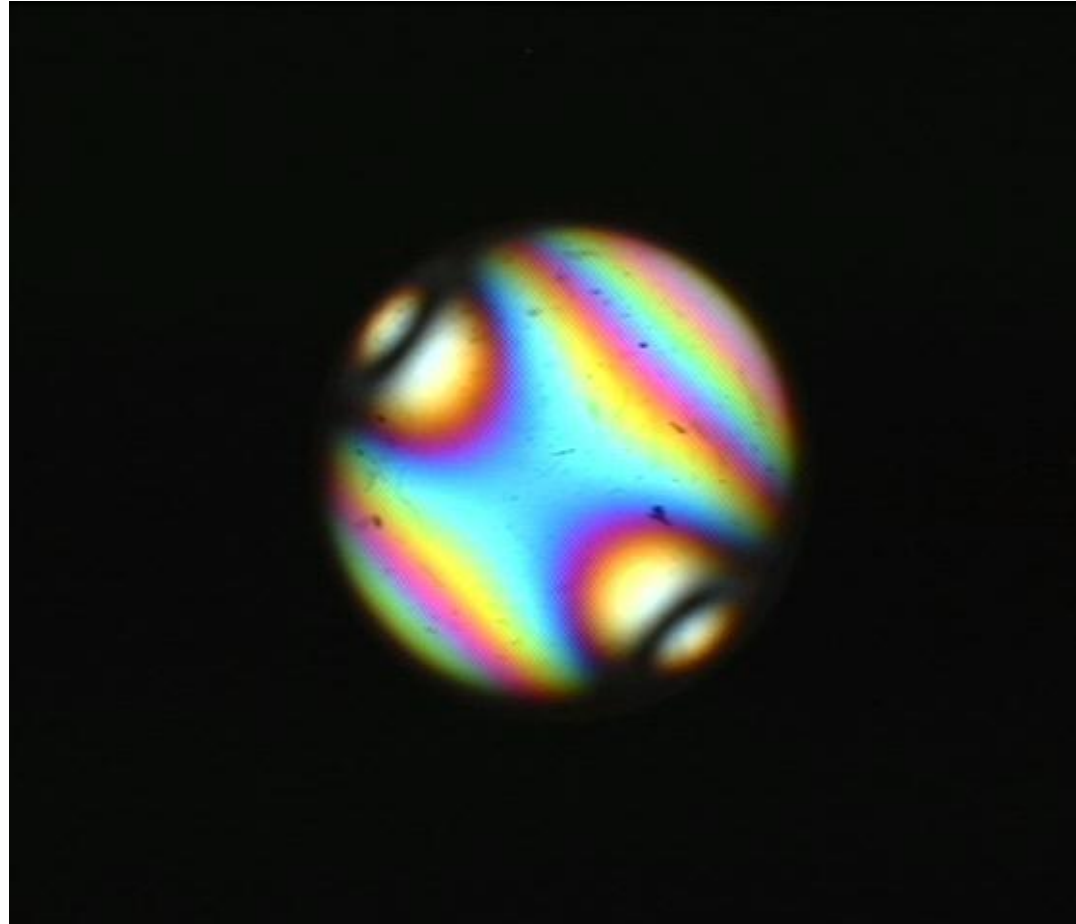


# Conoscopy

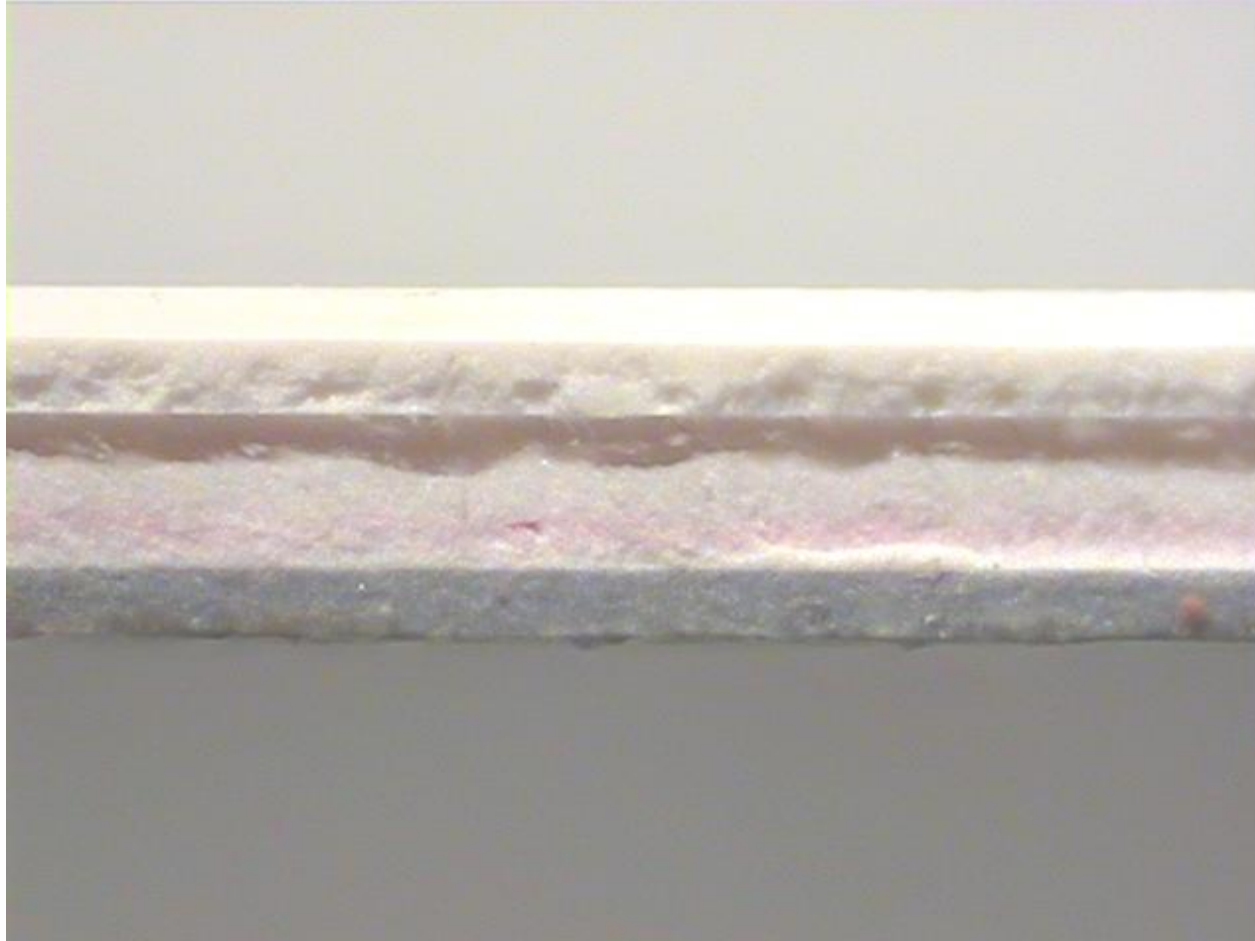
- By inserting an additional lens (Bertrand Lens) into the light path, the microscope can be used to examine the behavior of light after it passes through a specimen.
- This is particularly useful for analyzing samples that are relatively large and flat, such as polymer films or certain mineral grains.



# Interference Figure



# Paint Chip Analysis

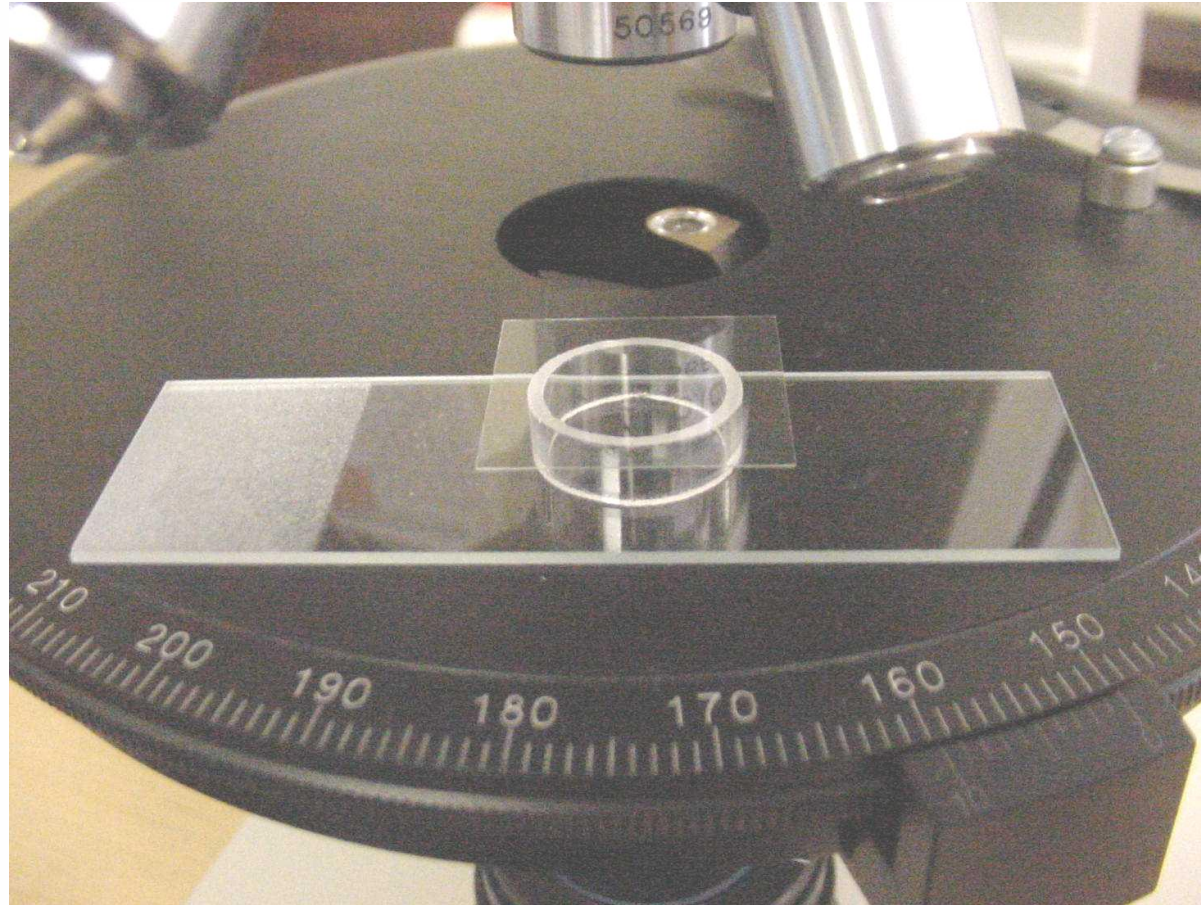


# Microchemical Testing

- Solubilities
- Spot Tests
- Microcrystal Tests
- Use of Vapor Chamber



# Vapor Chamber with Glass Ring



# Ancillary Techniques

- Thermal Tests
- Using Circularly Polarized Light
- Slightly Uncrossed Polarizers
- Parallel Polarizers
- Opaque Samples



# Reporting The Results

- Report Writing
- Court Testimony





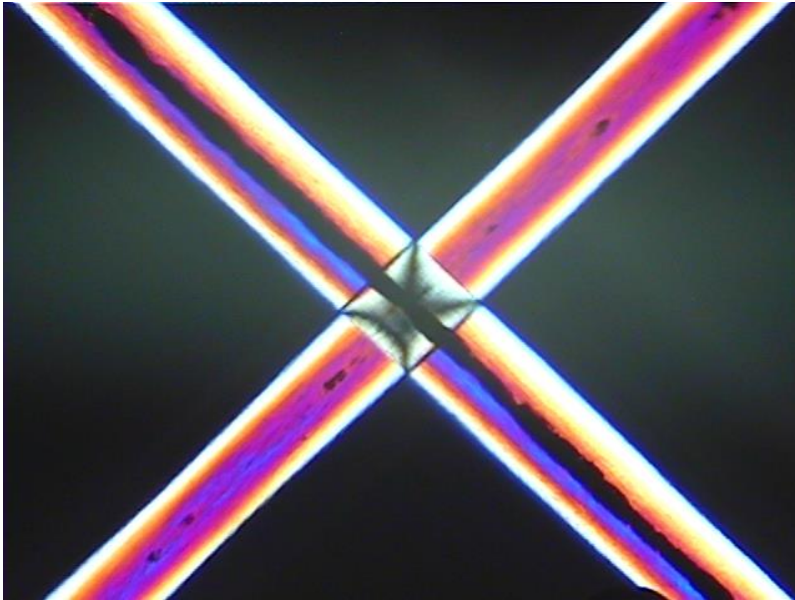
**Thank you for joining us.**

**Jeff Hollifield, MS**

**Chemical Microscopist**

**microanaly@aol.com • (630) 887-7100**

# Forensic Trace Evidence Course



Learn the principles and practical use of the stereomicroscope and polarized light microscope for the analysis of common microscopic trace evidence:

**Hairs • Fibers • Paint • Glass**

Visit [www.hookecollege.com](http://www.hookecollege.com) for upcoming dates

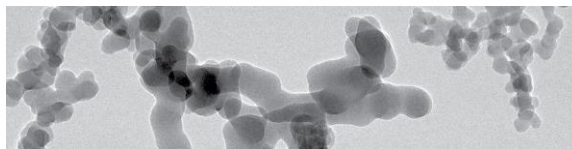
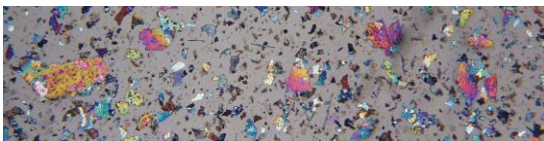
# MATERIALS ANALYSIS



## McCrone Associates

Experienced Industry Professionals

Our team solves your most complex  
particle identification problems







**EDUCATION & TRAINING**

# **Hooke College of Applied Sciences**

Scheduled Courses and Custom Training

Light Microscopy • Microspectroscopy

Electron Microscopy • Sample Preparation

**INSTRUMENT SALES**



# **McCrone Microscopes & Accessories**

Trusted Advisors to Scientists Worldwide

Linkam Thermal Stages • Laboratory Supplies

JEOL NeoScope Benchtop SEM • Digital Imaging Systems

Nikon Microscopes and Measuring Equipment



**Thank you for joining us.**

**Jeff Hollifield, MS**

Chemical Microscopist

microanaly@aol.com • (630) 887-7100