A Framework for Teaching Science as Inquiry

RET II Project
Vorakarn Chanyavanich
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Project Overview

- Inquiry-based web-portal project to facilitate student understanding of astrobiology
- Aim is to communicate HOW DO WE KNOW about a subject matter
- Highlight the interdisciplinary nature of science
- Framework for motivation, organization,and communication of student-directed inquiry

Course Format

- San Marcos High School
- Ninth Grade Conceptual Physics
- Block schedule – 90 min periods, M-F
- One semester course – 90 days

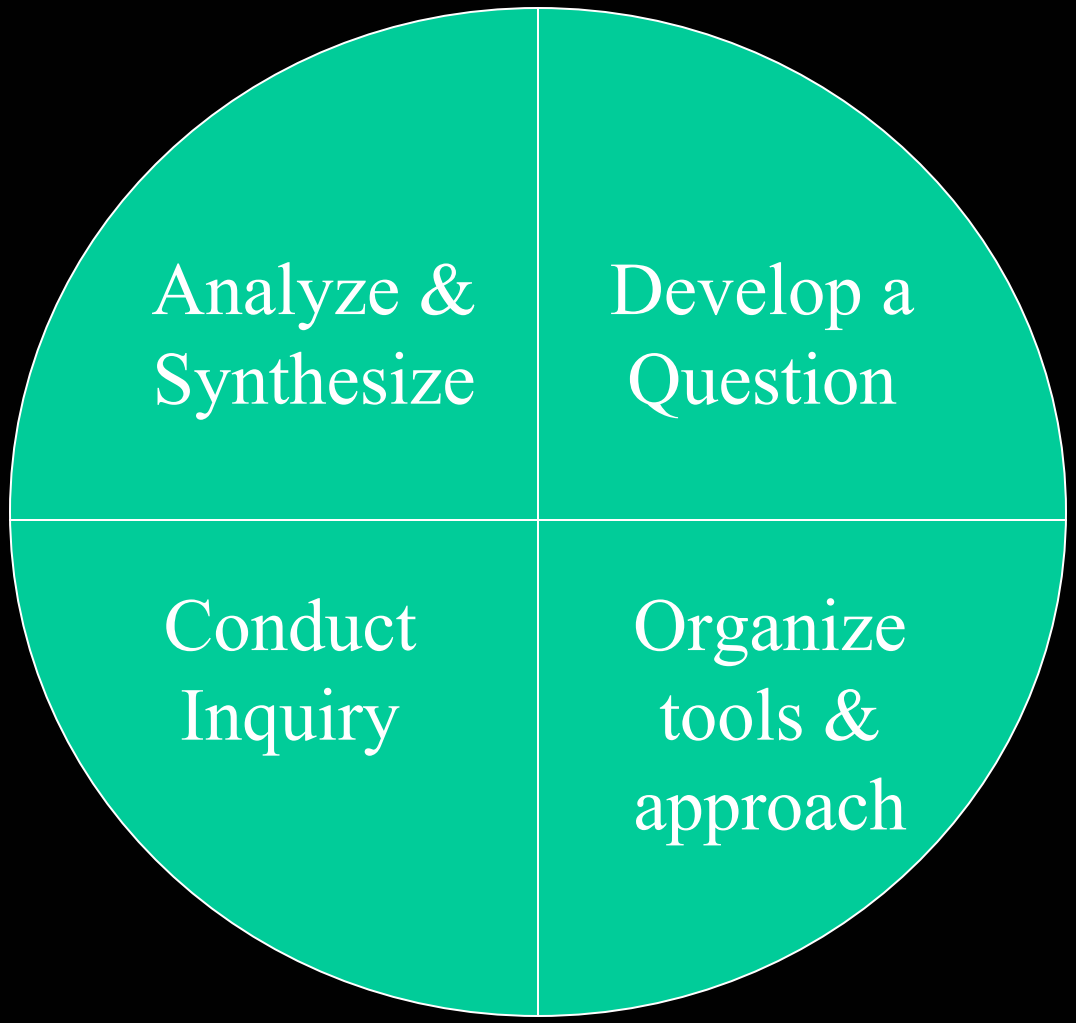
Student ability

- Basic algebra skill
- Limited lab experience
- Moderate level of interest in reading
- Low level of interest in science

Learning Objectives

- Offer students experience for self-directed inquiry
- Motivate students to explore and inquire
- Model the scientific research process
- Examine the nature of science through asking HOW DO WE KNOW
- Apply a multiple-intelligences approach to learning science through several modes of inquiry

Teaching by Modeling Research



How do we know?

- Experiment
  - Know how to do something, acquire a skill, conduct an investigation
- Imagery
  - Know how to represent concept as image, data, graph
- Language
  - Know how to describe concept using words

Project Scope & Sequence

1. Motivate inquiry through imagery.
2. Perform ‘literature’ search to define scope and context of inquiry.
3. Develop inquiry question.
4. Acquire tools and organize inquiry.
5. Conduct inquiry.
6. Analyze results.
7. Communicate results.

Language of Inquiry

Describe

Analyze

Examine

Explain

Demonstrate

Illustrate

Compare

Explore

Investigate

Prove

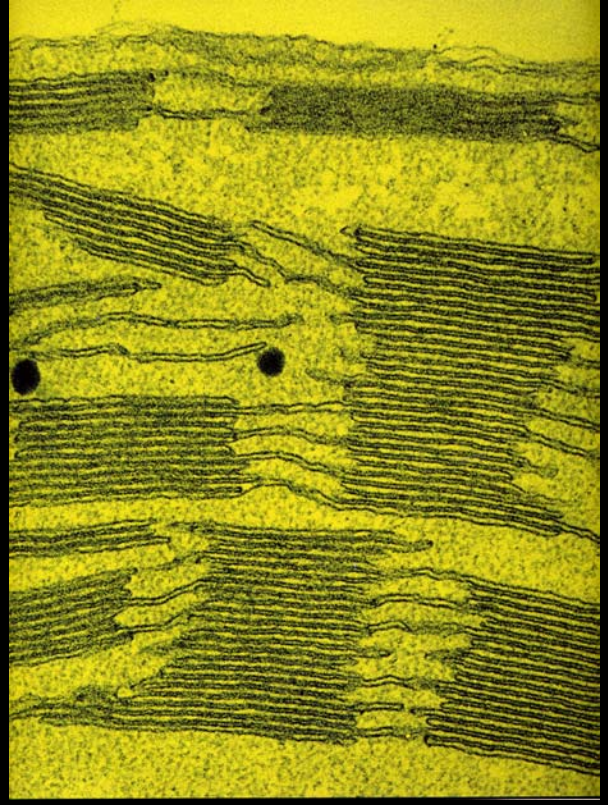
Contrast

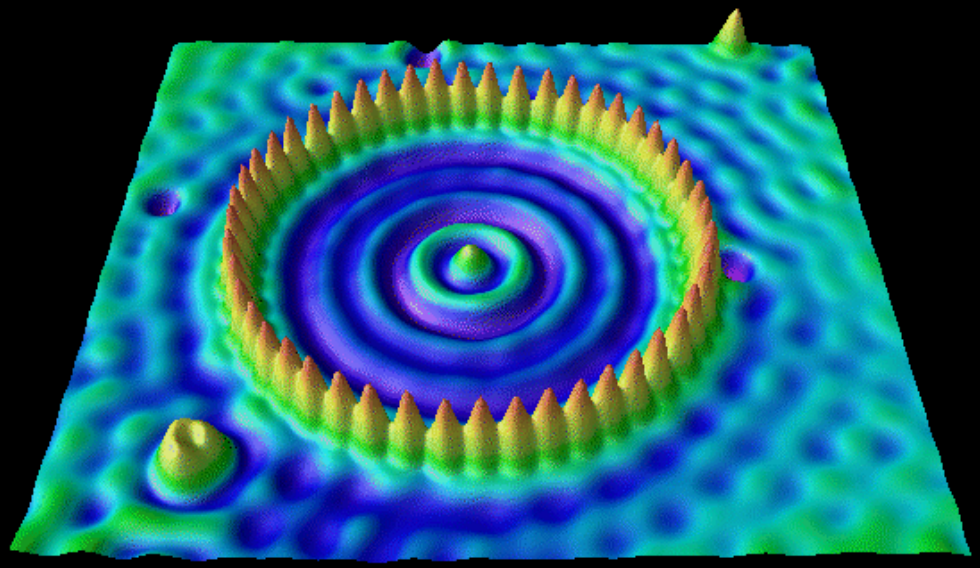
Sketch

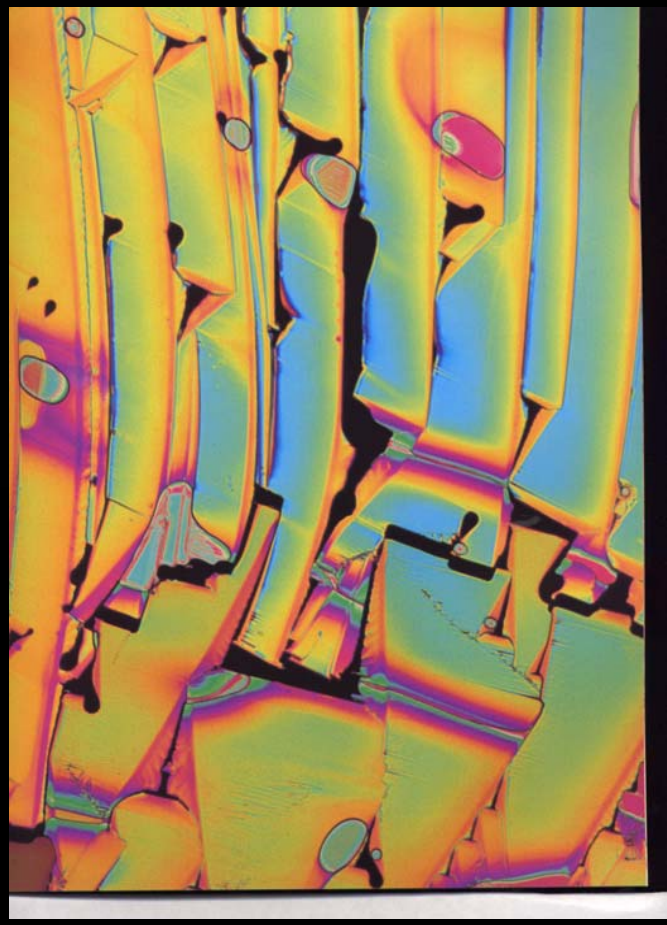
Predict

Express

Model







Topic: Polarization

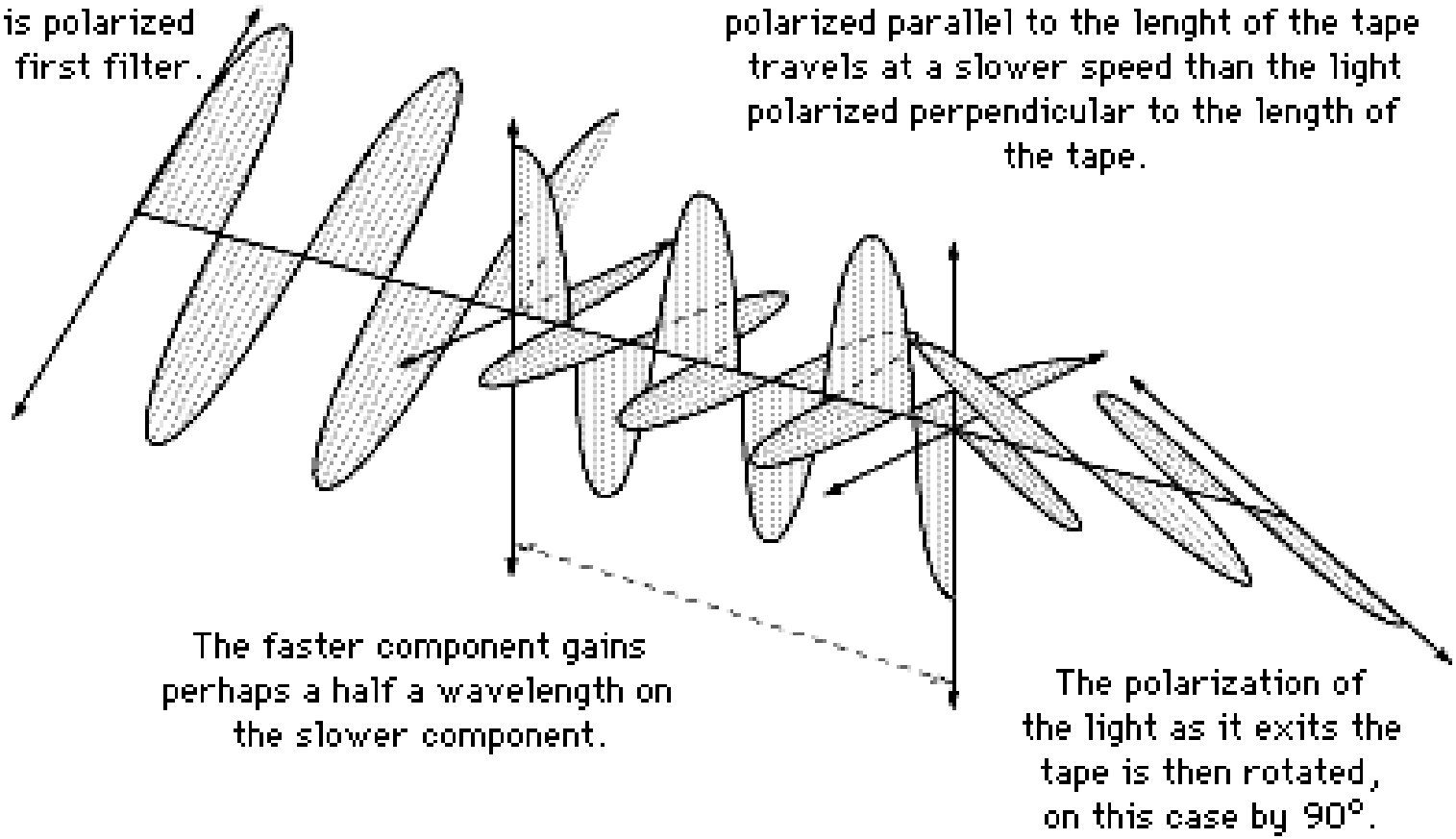
Scientific Concepts:

light, physical optics, polarization, birefringence, chirality

CA Science Standard – Physics (4f)

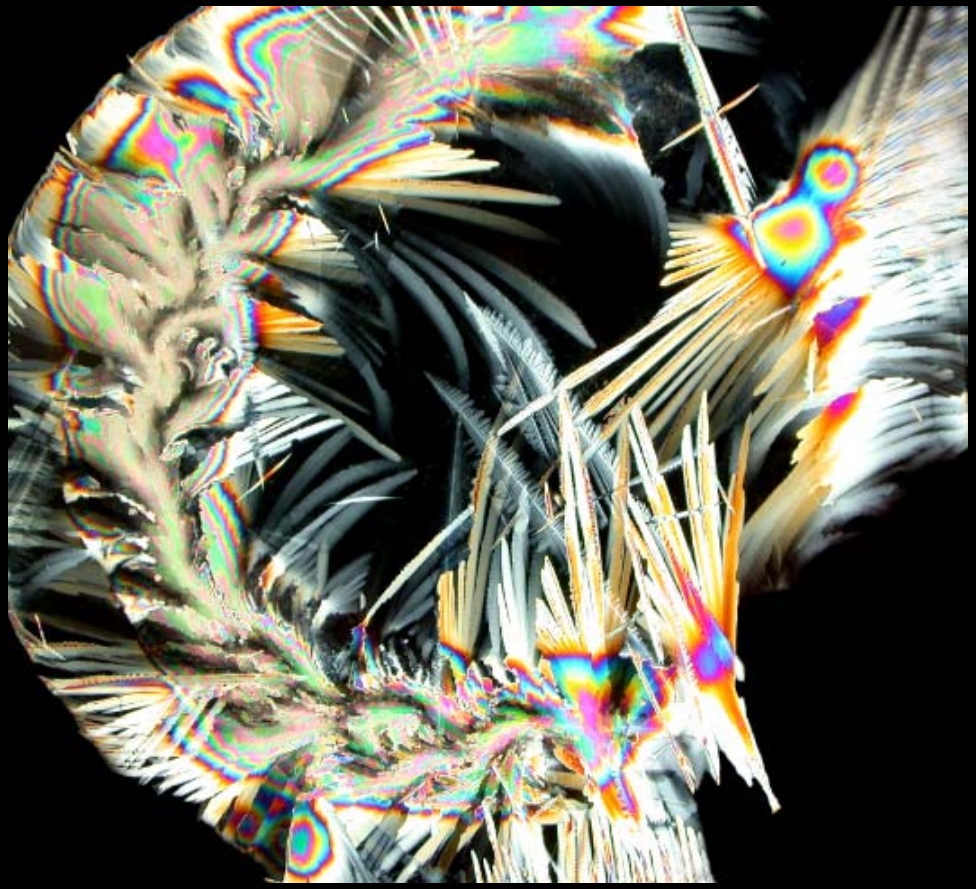
Students know how to identify the characteristic properties of waves: interference (beats), diffraction, refraction, Doppler effect, and polarization.

Student Projects - Experiment



A wave diagram of polarized light passing through a birefringent tape.

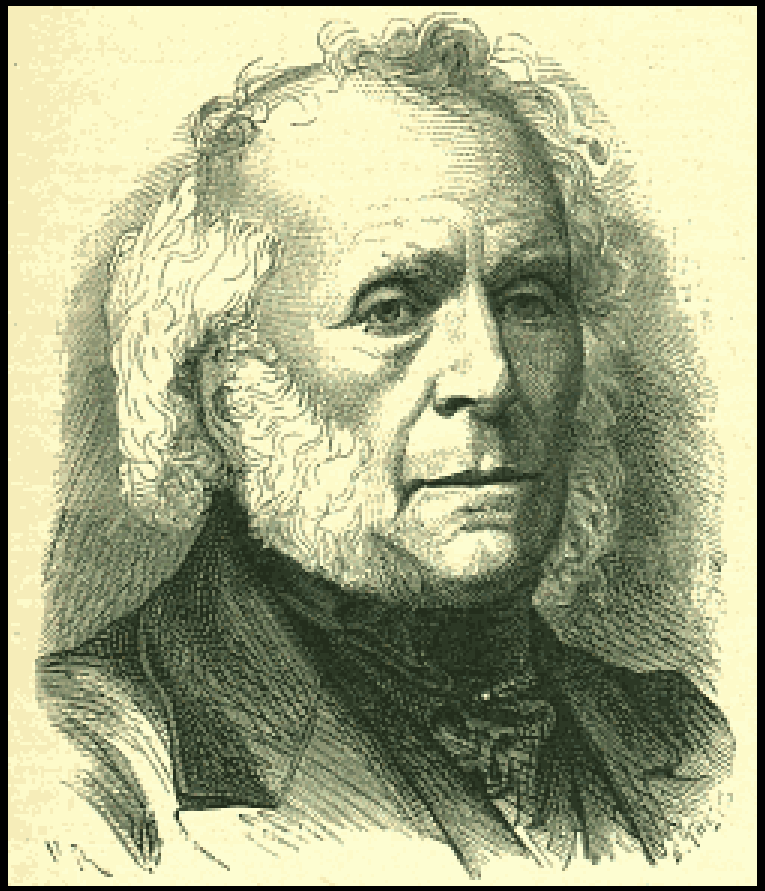
Student Projects - Imagery



Using photo-microscopy techniques, students learn to produce ice crystal art and study the birefringence of ice crystals under polarized light

Morning Dragon – by Peter Wasilewski – NASA Goddard

Student Projects - Biography



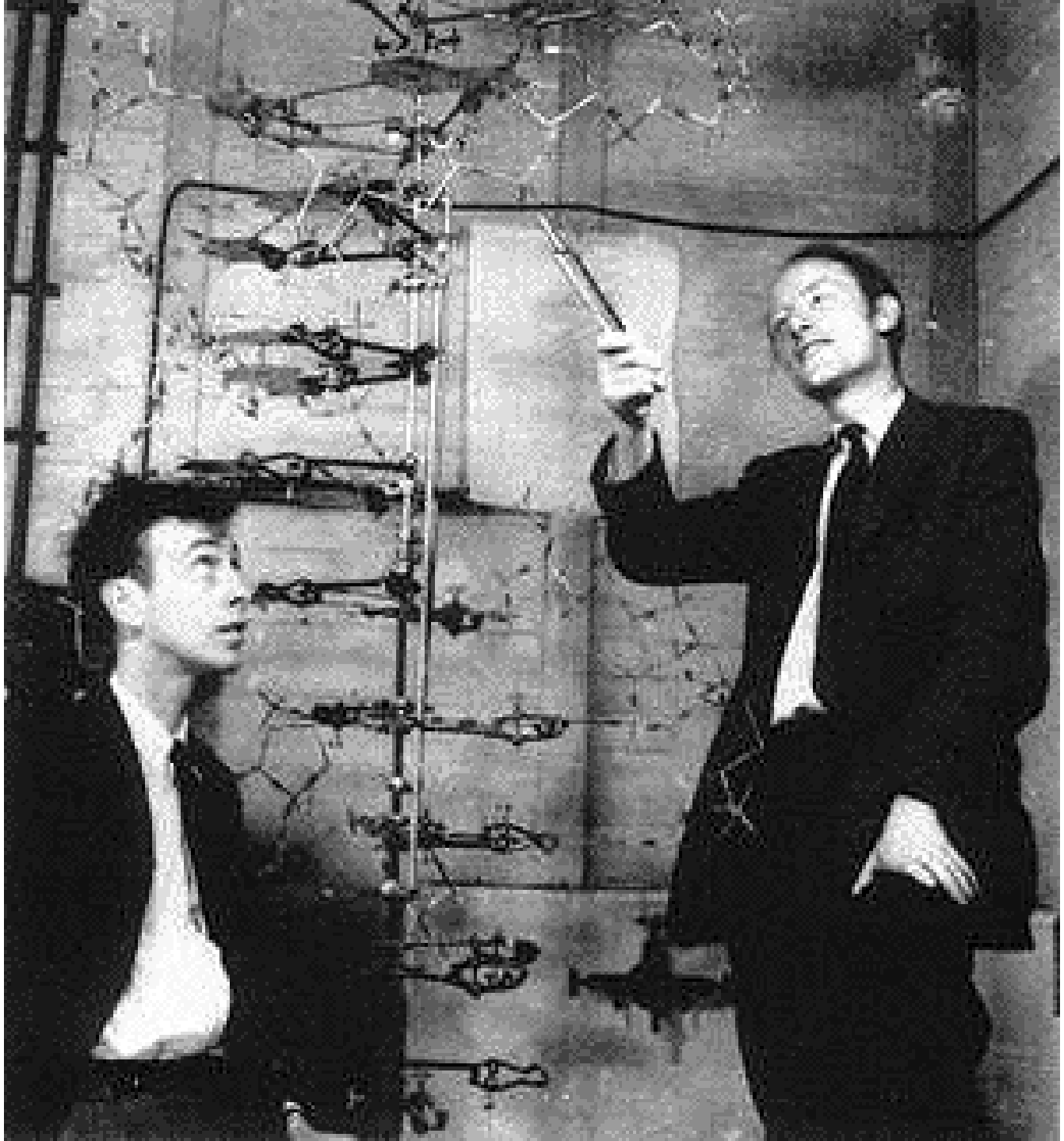
Students conduct a biographical research on the life and work of a scientist, (Sir David Brewster) examining the socio-historical context of the work of the scientist.

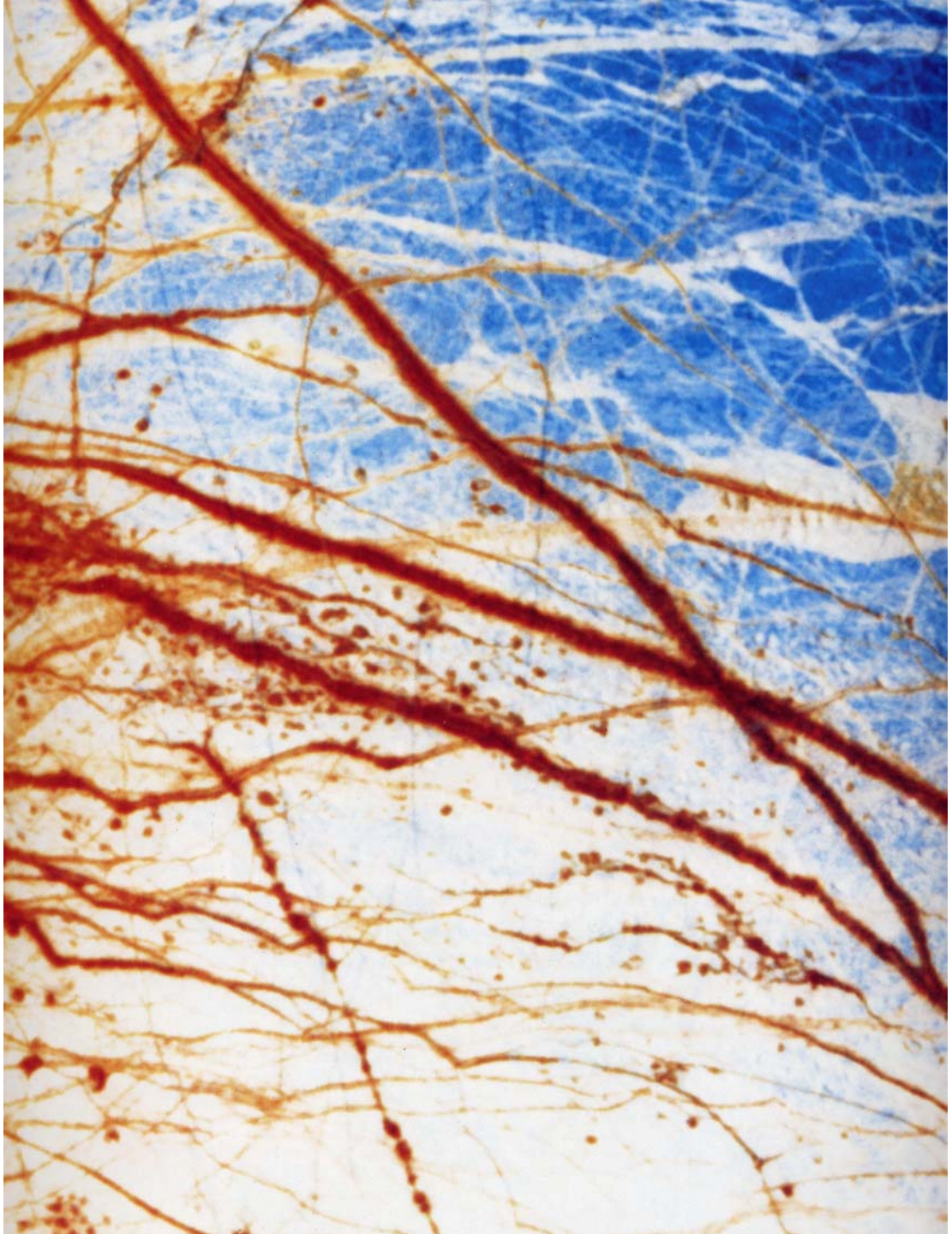
Performance Assessment

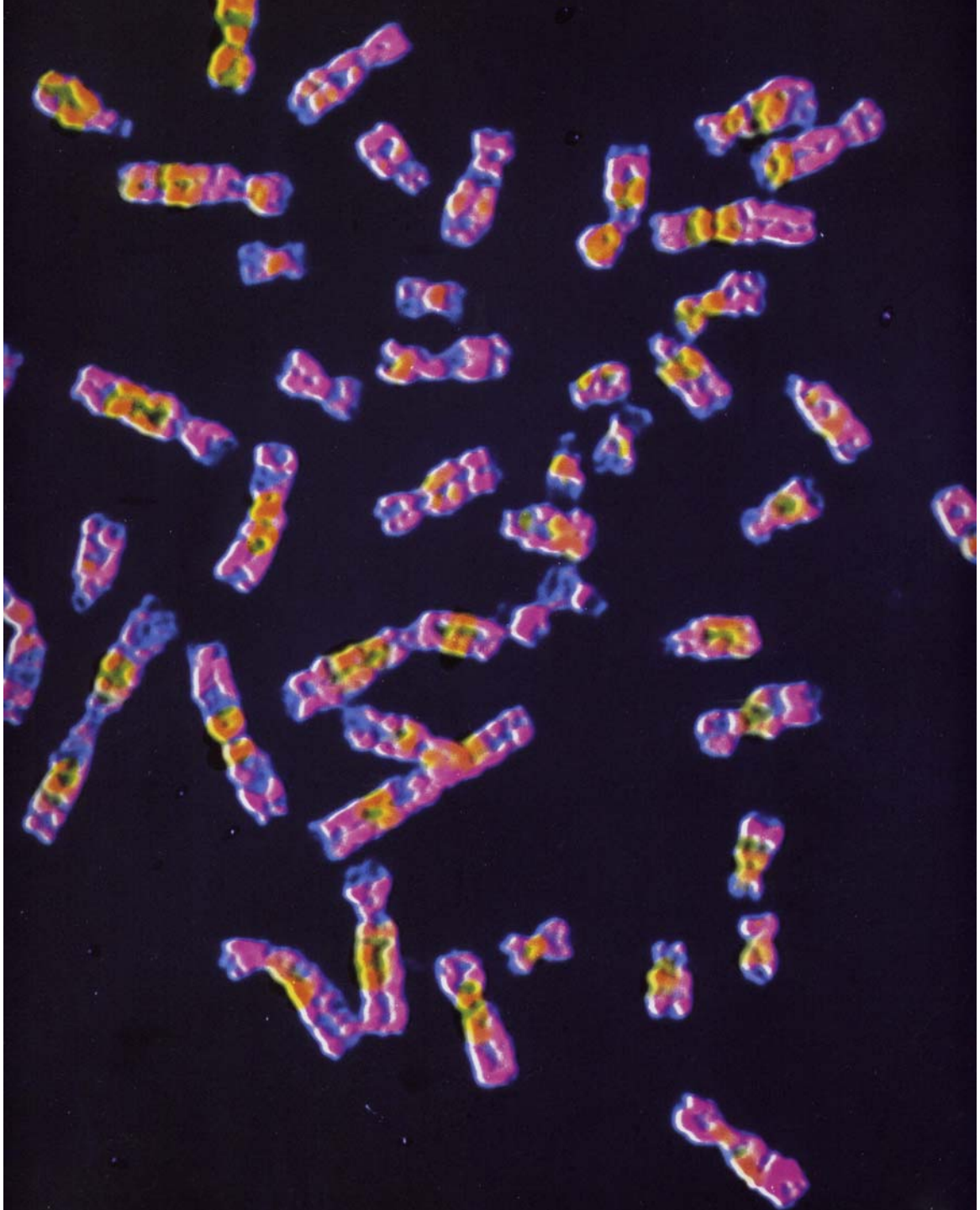
- Emphasize growth and progress.
- Monitor process as well as content.
- Require students to display and communicate their thinking and understanding.
- Stress depth more than breadth.
- Stress mastery more than speed.
- Express connections of concepts.

Identifying Areas of Growth

- Problem Solving
- Communication
- Reasoning
- Connections





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