CRYSTALLIZATION

An interdisciplinary film for science and art
STUDY GUIDE

CHURCHILL FILMS
662 North Robertson Blvd.
Los Angeles, California 90069

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A DIMENSION FILM

CRYSTALLIZATION

A Dimension Film by Carroll Ballard

Art: K-12, college, adult
Science: JH, SH
11 minutes/color/16mm

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Summary

Vivid images of crystals in the actual process of forming and then melting. Beauty and symmetry are revealed by the microscope and polarized light, as crystals form from many common liquids. The body of the film is images without words; it is both an art experience and an unusual opportunity to glimpse some of the basic structures of nature.

Purpose

Science

To motivate and create interest, especially when introducing units such as crystals, molecules, and related subjects.

To provide a rare opportunity to view the process of crystallization as it actually occurs.

Art

To enhance the student's capacity to enjoy abstract visual experiences.

To motivate and inspire students toward creative expression of their own.

Interdisciplinary

To help students discover the connections between science and art: the film shows a natural process which can be viewed in either mode.

What You See in the Film

The black areas of the screen are actually different liquids (which appear invisible because of the special lighting used). As these liquids evaporate or freeze, you see solid crystals form. Every image is "real"—happening in real time, just as you see it. At the end, the process is reversed. The solid crystals melt and become liquid once again.

Some Ways to Use the Film

Inter-disciplinary:

Art and science can be thought of as different ways to view the same experience: Ask each student to look for something different in the film (look as a scientist, artist, musician, etc.). Look for aspects of color, line, movement, rhythm, shape, division of space, structure of crystals, even sound effects and music. After the film, ask *"What did YOU see?"*

Science:

Questions and Activities:

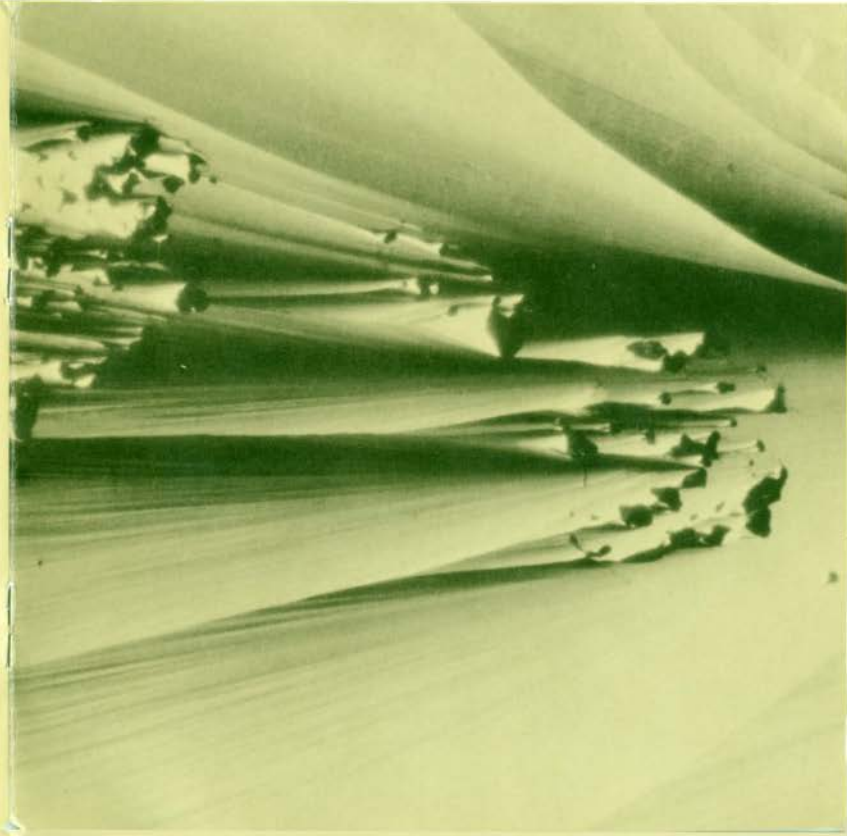
- Do you understand what the film showed? Was all of it "real"? (See "What You See in the Film")
- What can you say about the shapes of crystals based on observing the film?
- Does the shape of a crystal provide clues to the way that molecules are arranged in that substance? Explain.
- Examine crystals with a magnifier or low-powered microscope. Start with sugar, detergent, sand and salt.
- Use a thin-bladed wedge and a hammer to break some suspected crystals. Draw and describe.

Art

Things To Look For in the Film:

LINES – What different qualities of lines can you find in the film? Look for soft curves or sharp angles, width, (heavy, thick lines, thin light lines), direction, movement, spacing, tapering, organization, division, pattern, simple or complicated shapes.

Create your own designs, perhaps inspired by the images of crystals. Try to use some qualities of line and color you have observed and discussed.



The only NARRATION comes at the beginning:

"In the known Universe matter exists in only four basic states. Most of it is in a state of plasma, as in the sun. The remainder is in either the gaseous state, as in air, the liquid state, as in water, or in the solid state, as in rock.

"Through time, matter is constantly changing from one state to another. Most of the solid matter on earth today is what we call crystalline, meaning that atoms and molecules are arranged in regularly repeating geometrical patterns. Crystals exist, grow and dissolve all around us, but most of them are so tiny that they can only be observed through special instruments, such as the microscope used to photograph most of this film.

"What you are about to witness – as it is actually taking place – is the elemental process of matter, in an amorphous crystalline state, transforming and organizing into the ordered, solid crystalline state – the process of crystallization."

Speaking of Crystals...

What Are Crystals?

Most of the non-living solid materials around us are made up of crystals. That is, they are made up of parts that have quite regular shapes, and these shapes are repeated over and over, as if the substance were put together from blocks. Each substance has typical shapes of "blocks" or crystals. Crystals owe their shape to the manner in which their molecules are put together.

CRYSTALS ARE VALUABLE as diamonds and gems, but also because more and more new technologies (the whole electronics revolution, in fact) are being based on their special properties – transistors, diodes, integrated circuits (computers) lasers... interesting area for student research.

Technical: How the Film Was Made

In the film, the crystals were formed by controlled cooling of melted substances or by evaporation of saturated solutions. Substances used included vanillin, acetanilide, benzoic acid, borax, ascorbic acid, urea, menthol, caffeine, citric acid, and dextrose.

The black areas are due to the total absorption of light by the upper polarizing filter. All processes of crystallization and melting were filmed at low magnification, at the actual rate at which they occurred.