



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
1985 Volume VII: Skeletal Materials- Biomineralization

Introduction

Appropriate for today's love affair with health, fitness and protecting the environment, the seminar afforded each participant the opportunity to delve into a topic that would impact these areas. Studies in biomineralization focus on one class of the tissues and structures: those that are mineralized. The result of eons of evolution of life forms, familiar examples of investigation are the skeleton of humans, the shells of oysters or crabs, and the crystals deposited within plants. Since the identity of some species is directly related to the recognition of a characteristic shape, the anatomy of an animal or plant is determined, and often preserved, only because it possesses a special mineralized form. The Fellows in the seminar became natural scientists, connecting form with function, and increasing their powers of observation and understanding of the roles of endo- and exo-skeletons.

Part of the dynamic metabolism of creatures great and small, the growth, development and demise of mineralized tissues (bones, teeth, shells) were discussed. We also enjoyed field trips on New Haven Harbor (courtesy of Schooner, Inc.), to Yale University's Peabody Museum Hall of Dinosaurs and invertebrate collections and to the beaches in Guilford. The similarities and the differences of biology/physiology and the preservation of organisms which span most of the history of life on earth were explored.

The units developed by the Fellows span topics on both invertebrates and the vertebrates. Each contribution contains a glossary of terms and illustrations in addition to the usual background bibliographies and suggested projects and tests for students. Self-contained and well researched, the presentations integrate basic scientific information with mathematics, social studies or art (!) facilitating adaption by other teachers who also may be fascinated by the world in and around us.

For an easily obtainable, continually replenishable source of material for teaching (and the potential generation of a lifelong interest, an avocation, if not development of a career in marine biology, for the student recipients) the unit "Shells" details the identification and steps toward creating a collection of the beautiful creatures found on our local shores.

"The Oyster" capitalizes on the fact that New Haven has had an industry culturing these sophisticated comestibles for over a century.

"The Crusty Fossils" discusses the varieties of crabs and their unique phylogenetic niche. As crustaceans and arthropods, animals usually not mentioned in basic science courses, this unit introduces concepts appropriate for students from the 6th to 12th grades.

Continuing along in the hierarchy of biological evolution, the unit "Dinosaurs: Here Yesterday, Gone Today"

covers a topic sure to instill enthusiasm, wonderment and myriads of questions in the widest of audiences.

For a masterful illustration of the crossover of science and mathematics “Mathematics in You” offers an introduction to skeletal anatomy as well as an ingenious mechanism for teaching basic mathematical concepts.

“Anatomy and Physiology of the Human Knee Joint” is a unit geared to senior high school biology classes and should appeal to committed athletes fostering an understanding of the construction of a very complicated portion of the human anatomy.

One obvious advantage of teaching science is the opportunity to demonstrate the concepts. “Three Dimensional Art of Vertebrates and Invertebrates” presents for the most maladept illustrator some basics for generating “a picture worth a thousand words.”

In biomineralization one learns that calcium is an essential element. “The Calcium Cycle” outlines the chemistry, transport and deposition of this element from its geological setting and origin through the biosphere into the skeletons of high school students.

“Inland Wetlands” presents criteria for identifying wetlands using the characteristic flora and includes a slide show on a local bog (Cedar Swamp, North Branford) where water lily pads are the site of deposition of calcium oxalate crystals.

From the diversity of presentations and vitality of the discussions during *Biomineralization* I make no bones about it when I say, “This group really came out of their shells!” It was my pleasure to contribute to the growth and development, form and function of their future teaching.

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