YALE NATIONAL INITIATIVE
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Curriculum Units by Fellows of the National Initiative
2025 Volume I: Art, Design, and Biology

Introduction

by Timothy Barringer, Paul Mellon Professor in the History of Art

Our interdisciplinary seminar *Art, Design and Biology,* asked teachers who specialize in sciences (especially biology), social sciences, language arts and fine art, to think together about how to use skills of close looking in teaching. How can looking at art help us understand the living world? And how can scientific thinking enhance our understanding of art? By looking back into the histories both of art and science, we discovered together many points of comparison, moments of synergy, and then also fundamental differences between artistic and scientific approaches to nature over the last two centuries.

Together, through a series of discussions and site visits, we considered significant issues in the history of science and in contemporary cultural discourse, such as botany and the politics of classification, ecological theory and theories of evolution. A key issue was the importance of the study of human anatomy and animal biology for the development of European painting; but we also thought about the ways that the development of scientific modes of analysis related to racialized thinking past and present.

Some of the most compelling discussions took place in front of works of art. In the Study Room of the Yale Center for British Art, the group looked together at George Stubbs's pioneering publication *The Anatomy of the Horse*.1766. The persuasively lifelike quality of Stubbs's huge engravings and paintings rested on his perseverance as an experimental scientist. Slowly removing the skin and layers of muscle and tissue from the carcass of a dead horse (to the horror of his neighbors), Stubbs acquired an unmatched understanding of the animal's anatomy. That he also did so with a deceased tiger, from the King's menagerie, and—more shockingly—with the bodies of human beings supplied by grave robbers, added a macabre element to the project. Stubbs's works are available for free download from the Yale Center for British Art's website. His involvement with the expanding British empire, painting such hitherto unknown creatures as the kangaroo, and his famous portrait of a Zebra belonging to Queen Charlotte (known by satirical journalists as "the Queen's striped ass"), added a dimension to the story of empiricism, empire and globalization.

The Beinecke Library shared with us the great folio of *Birds of America*, published in 1827-1838 by John James Audubon. We had prepared for our visit by reading Jennifer Roberts's pathbreaking account of the production of the extraordinary plates, a testimony both to a nineteenth-century fascination with nature and the forms of violence endemic to the period's settler-colonial expansion. Several of the Curriculum Units make creative use of Audubon's remarkable prints. We also discussed his attitudes to slavery and the many un-named assistants, many of them people of color, whose contribution to the *Birds of America* has not been fully acknowledged.

One of the most productive site visits was to Yale's Peabody Museum of Natural History, famed for its displays

of dinosaur fossils and its now historic dioramas offering an early form of virtual reality diplay, placing stuffed or recreated animals in representations of their natural surroundings. Particularly interesting was a discussion of the largest paintings owned by any Yale collection: the mid-twentieth century murals by Rudolf Zallinger including the massive *Age of Reptiles*. Here art and science met in a Cold War context.

A final exploration of art and science found the group at Sleeping Giant State Park, famed for its distinctive geological formations and for the wealth of its flora and fauna. We spent time together selecting and carefully drawing leaves, with reference both to scientific writing about the biological functionality of the leaf, and to more symbolic and poetic responses to leaves in the writing and art of the nineteenth-century critic John Ruskin.

The Curriculum Units developed by the Fellows ranged widely across conceptual and physical geographies. The group included teachers from across the entire range of ages, K through 12, and each participant brought a different expertise to the table. Conversations were wide-ranging and lively; each Curriculum Unit is carefully calibrated for the students of a particular school; but each also has more general conceptual materials that could easily be adapted for use elsewhere.

Local landscapes and ecologies formed the focus for a group of Curriculum Units, all of which aim to encourage students to look more closely at the living world around them. Priscilla Black turned to the cactus as a plant with both spiritual and practical significance for the Diné Nation. In a course unit titled *Art and Biology of a Navajo Artist's View of Nature and Cactus* that encourages students to draw and look at the natural world, she invokes the accomplished paintings of Navajo artist Shonto Begay, for whom the cactus is an important presence in the dry, Southwestern landscape. Katie Franzel's first grade science curriculum unit *Exploring Earth's Natural Resources through Art* looks at local geology and ecosystems, asking students how the planet earth's resources can be used responsibly. Encouraging students to appreciate the life inhabiting local landscapes, the Unit takes case studies from Virginia's Appalachian Mountains, the Chesapeake Bay, and the James River. But teachers elsewhere could mobilize its methods to focus on their own local ecosystems.

Close looking at the natural world can enhance learning at all levels. Kasalina Nabakooza demonstrates in her Curriculum Unit *Why Mosses Matter* that some of the simplest and most ancient forms of life, like moss, are both beautiful and environmentally valuable. Her 8th Grade class will be encouraged to observe very closely, an even to grow mosses in the classroom, realizing through close visual analysis the value of this fascinating life form. Teaching high school biology lessons, Donavan Spotz encourages high schoolers to step away from their hi-tech devices and use their eyes to observe, and their hands to draw. The study of anatomy demands slow looking and concentration, as evidenced in the work of nineteenth-century artists like J.M.W. Turner. "My students," writes Donavan, will be encouraged to stop, be still, and focus on imagery to understand the vast complexity that exists in every level of an organism." Courtney White's Curriculum Unit introduces first graders to the astonishing diversity and beauty of birds, The alliterations in her title—Analyzing Avian Adaptations through Art—give a nice sense of the delight that students will take in studying birds whose bodies have evolved in relation to particular environments, dry or wet, hot or cold.

Ecology is inherently a political question. Some population groups suffer from worse environmental conditions than others, with Black communities often being subject to environmental injustice. Sharon Ponder Ballard's Curriculum Unit encourages students to confront abstract concepts like climate change, air pollution and toxic waste, which have practical impacts on everyone's communities. Students will engage with works of contemporary art and will develop inspirational responses to the world around them (using the idea of "lyrical abstraction"). In a final, and fun, activity students are encouraged to take on the role of environmental

activists, designing utopian communities with healthy environments—and imagining how they would look through the use of Legos.

Interdisciplinary methodologies inform all the Curriculum Units. Christopher Snyder's unit is premised on mixing artistic and scientific ways of looking as a metaphor for a larger imperative not to be tied down by the expectations of a particular field. Why should musicians and artists have separate training and skills? Why should science and art never meet and overlap? By looking at historical examples like Albrecht Dürer's famous *Rhinoceros* engraving, students are encouraged to engage with both art and science, leading to creative results. The represented body in art can provide opportunities for creative learning. Holly Bryk's Unit focuses on the human body as a basis for language acquisition for learners of Spanish. By describing works of art that emphasize different aspects of the body's functioning (such as *Las Dos Fridas* by Frida Kahlo), students will gain fluency in the use of idiomatic terminology.

As an art teacher with a keen eye for the patterns and beauties of nature in his own photographic work, Willie J. Keener Jr. encourages students to look *Through the Lenses* – the lenses of art and science at the same time. Developing his Curriculum Unit in conversation with a colleague, the school's Science Specialist, Willie also looked back to the example of John Ruskin, the English art critic, geologist and botanist who looked at closely at natural forms. The Unit encourages students to draw inspiration from the natural forms surrounding them in a rural community.

In middle school art classes, Francisco Liam Nuno encourages students to respond creatively to the natural world. Beginning to close empirical observation of animal forms (a visit to the zoo is proposed) the Curriculum Unit *Alebrijes: Where Science Meets Art* moves from close looking to cultural storytelling. *Alebrijes,* based on Mexican folk traditions, are fantastical hybrid creatures of students' own devision. Students will learn to link observation and imagination through close focus on making artwork.

Abstraction is often thought of as a characteristic of twentieth century art. But it is also a key to scientific thinking. In her Curriculum Unit *Geometry and the Art of Close Looking,* Kati Steiner uses parallels between art and nature. By looking closely at paintings by Piet Mondrian and others, students will be introduced to shapes and angles, symmetry, tessellations, patterns, and sequences—in a manner that is far more intuitive and entertaining than traditional textbook approaches.

All told, the Curriculum Units represent the creativity and original thinking of a wonderful group of teachers who, despite often challenging circumstances, bring together art and science in their classrooms to powerful effect.
