The decoding of the human genome is widely regarded as research at the frontier of 21st century science, just as splitting the atom was in the last century. But in the nineteenth century, the borders of knowledge clearly lay outdoors, and field biology and field geology were the most dynamic sciences, pulling knowledge forward into unknown lands, and changing the way the world was seen, even as the world itself was changing.

This course, a discourse between an art historian and a biologist, will look at the way in which nineteenth-century artists and architects responded to the insights of the natural sciences. Among the topics to be examined are the Hudson River School; images of natural wonders (Niagara, Yosemite, the Andes); the artistic response to newly discovered flora and fauna; John Ruskin and the use of geology in architecture; the role of science in art education, from Charles Willson Peale to Thomas Eakins; and the use of botanical imagery by Philadelphia architects such as Frank Furness and Frank Miles Day.

This six-week lecture course will take place in the Pennsylvania Academy of the Fine Arts, and will also make use of its building and collections. Two optional tours will be scheduled for Saturdays during the course—an architectural tour of the Pennsylvania Academy of Fine Arts and City Hall looking at their sculptural programs and use of botanical imagery, and a gallery tour of the Academy looking at the treatment of science and nature in selected works. There will be a short, optional research paper.

1. Tuesday, January 29, 2013 - “The Ordering of Nature”

At the beginning of the nineteenth century, artists and scientists shared a common view of nature, shaped by Christian theology, that the world was unchanging, except by God’s hand. The eighteenth-century Enlightenment did not upset this understanding but it inspired scientists such as Linnaeus and Cuvier to set about making a comprehensive inventory of living things, and to make it comprehensible by discovering its organizing principles. In the 19th century, however, the view of an unchanging world was itself changed, as discoveries in paleontology and from global exploration led to Darwin’s understanding of the evolution, and thereby to a fundamental shift in how we classify the living world.
2. Tuesday, February 5, 2013 - “Geological Time: The Challenge of Fossils”

Thomas Jefferson famously advised Lewis & Clark to look for mastodons on their expedition, at a time when the extinction of prehistoric animals could only be explained by reference to Noah’s Flood. A generation later there appeared Charles Lyell’s *Principles of Geology* (1830-33), which demonstrated that the earth was shaped by mighty but slow-acting forces, working incrementally over millions of years, and that the earth was far older than previously imagined. This categorical change in our understanding of the scale of the age of the Earth was a necessary prerequisite to the development of Darwin’s theory of the evolution by natural selection, which requires the vast aggregation of possibilities allowed by small random changes over sufficiently large spans of time, “the inevitably of improbable events”. In a relatively short period of time, our sense of the size of time was fundamentally altered, allowing for new ways to see the world and how it works. This class will look at the challenges posed by the discovery of fossils, mass extinction, and the geologically dynamic nature of the earth.


3. Tuesday, February 12, 2013 - “Insights from Exploration”

By the middle of the nineteenth century, artists can travel to the tropics and to the arctic, satisfying the relentless public curiosity about the exotic and remote regions of the earth. In particular, Frederic Church and Martin Johnson Heade followed naturalists such as Humboldt to South America, where they exploited new scientific knowledge as well as the new spectral pigments just coming on the market. And, while differences were discovered across these broad geographies, similarities were, too, leading to deeper understandings of unifying concepts in biology, such as Asa Gray’s seminal work investigating similarities between the floras of eastern Asia and of eastern North America.

Selected works: Martin Johnson Heade, “Tropic Landscape with Ten Hummingbirds”; Frederic Church, “Heart of the Andes”; Church, “Niagara Falls”

Text: Asa Gray (1856), *Statistics of the Flora of the United States*

The new insights of science and the turmoil of the Industrial Revolution combined to have a rich effect on architecture. John Ruskin’s writings assigned a crucial role to geology, helping to bring about the High Victorian movement, in which buildings celebrated the textures and colors of their building stones. At the same time, the Government School of Design was founded in London, where apprentices were taught how to design ornament based on nature, which was to be mass produced. Here was the origin of the Aesthetic Movement, in which the polymath Christopher Dresser, artist and botanist, contributed much. We will look at how the building we are in, Frank Furness’s Pennsylvania Academy of the Fine Arts, expresses the new understanding of nature in architectural terms.

Selected works: Furness & Hewitt, Pennsylvania Academy of the Fine Arts; Christopher Dresser, *Principles of Decorative Design*; John Ruskin, *The Seven Lamps of Architecture*

5. Tuesday, February 26, 2013 - “Science and the Museum”

The new understanding of science and scientific education brought about an entirely new building type, devoted to the production of new knowledge and the dissemination of old knowledge: the science museum. This class will look at the development of the building type, in which Philadelphia played a significant role, and look at how the character and organization of these science museums expressed current ideas about science. We will also look at the changing role of the museum building in the physical and intellectual structure of the city, as museums moved outwards from the original dense urban core to more picturesque settings on the fringes of the city, and closer its park system.

Selected works: Deane & Woodward, Oxford University Museum; James Renwick, Smithsonian Institution; John McArthur, Wagner Free Institute of Science; James Windrim, Academy of Natural Sciences; William Ruschenberger, “Summary History of the Academy of Natural Sciences” (1877).

6. Tuesday, March 5, 2013 - “Art in the Mechanical Universe”

By the start of the twentieth century, many artists had come to a mechanistic understanding of the universe, and no longer saw it in terms of Christian theology. Nonetheless, nature remained a powerful source of artistic inspiration, although in transformed ways – frequently in psychological or Symbolist terms. In this class we look at how artists at the turn of the century dealt with nature, including Winslow Homer, Ralph Blakelock, George Inness and Alfred Pinkham Ryder. We will also look at how symbolic understanding of the world shifted from a Christian theological perspective to a biological perspective.