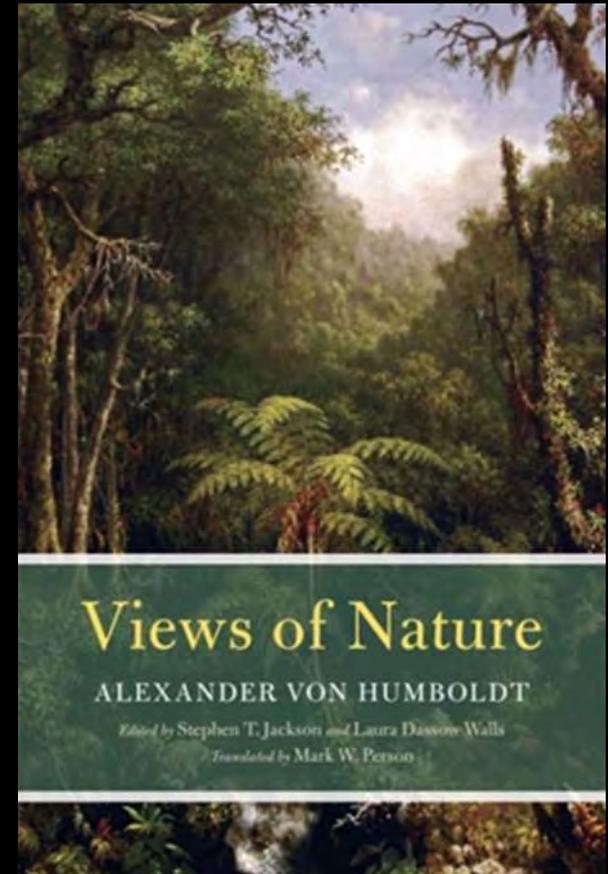
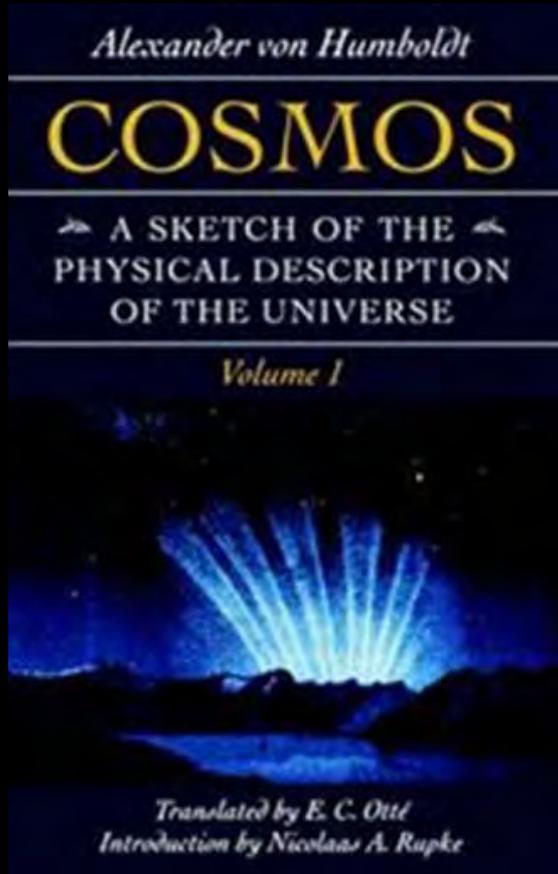


The Romance of Nature: Science, Imagination, and the Poets of Nature

Kevin M. Anderson Ph.D.

Austin Water Center for Environmental Research



Humboldtian Science

1. Explore – “Nature speaks and the scientist must go out and listen”
2. Collect – gather data for or against an idea/theory
3. Measure – widespread, accurate, collaborative
4. Connect – detect patterns that point to underlying laws
5. Cosmopolitan science – international collaboration



“the accurate measured study of widespread but interconnected real phenomena in order to find a definite law and a dynamic cause”

Earth’s magnetic field – advocated global monitoring network



Naturgemälde – Data in visual form - nature a web in which everything was connected – not just a way of thinking but a way of seeing

- plants distributed according to their altitudes, ranging from subterranean mushroom species to the lichens that grew just below the snow line.
- Every plant was placed on the mountain precisely where Humboldt had found them.



*Geographie der Pflanzen in den Tropen-Ländern;
ein Naturgemälde der Anden,*

gegründet auf Beobachtungen und Messungen, welche vom 10^{ten} Grade nördlicher bis zum 10^{ten} Grade südlicher Breite angestellt worden sind, in den Jahren 1799 bis 1805.

von ALEXANDER VON HUMBOLDT und A. G. BONPLAND.

Humboldtian Science

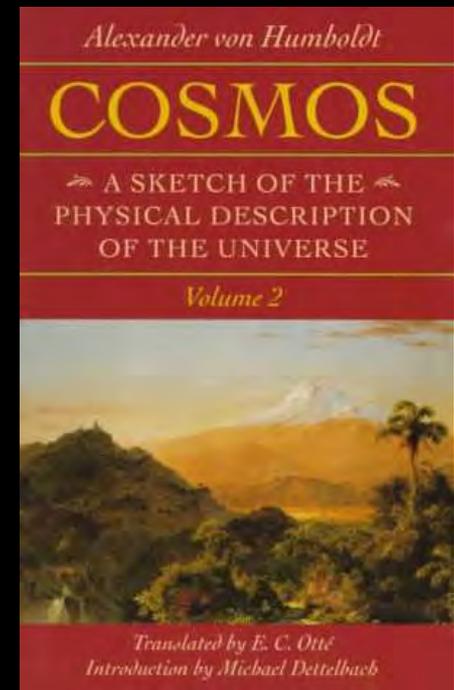
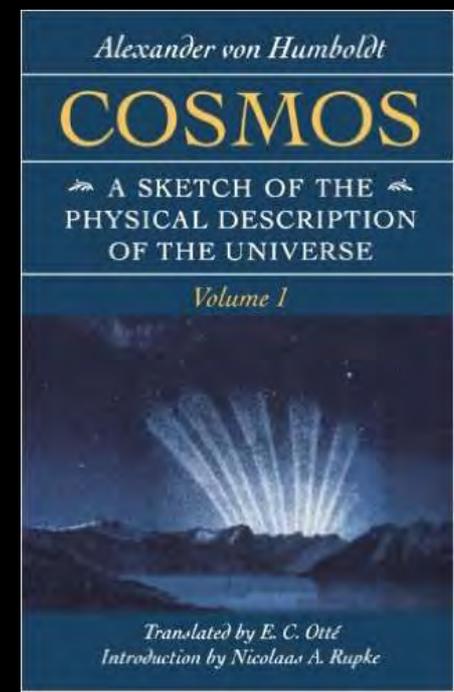
Cosmos: A Sketch of the Physical Description of the Universe

Humboldt's five-volume opus *Cosmos* (1845-1862)

From November 1827 through April 1828 he delivered a series of sixty-one lectures at the University of Berlin, speaking extemporaneously from a loose outline to a room so crowded that he soon announced a second series, which was held in a music hall before an audience of thousands, free to all comers. The reception was ecstatic.

Cosmos "is the assemblage of all things in heaven and earth, the universality of created things constituting the perceptible world."

Cosmos was the scientific bestseller of the age. In 1845, the first edition of the first volume sold out in two months; by 1851, Humboldt estimated that eighty thousand copies had been shipped. He himself superintended the French translation, and by 1846 it had also been translated into English, Dutch, and Italian. His publisher wrote in 1847 that the demand for the second volume was "epoch-making"

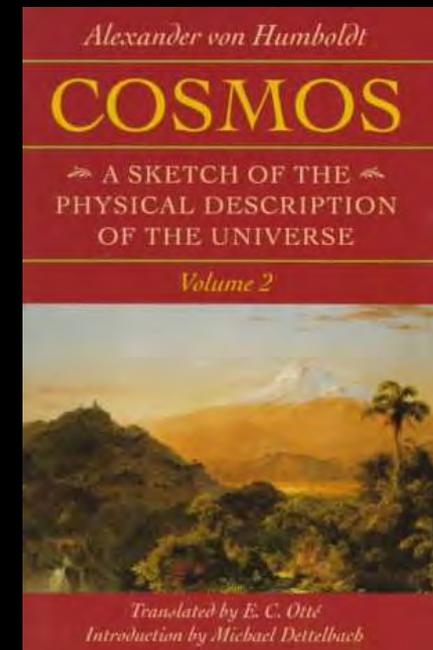
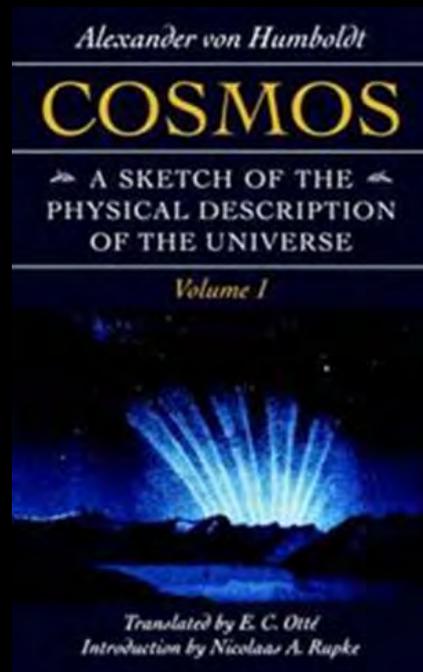
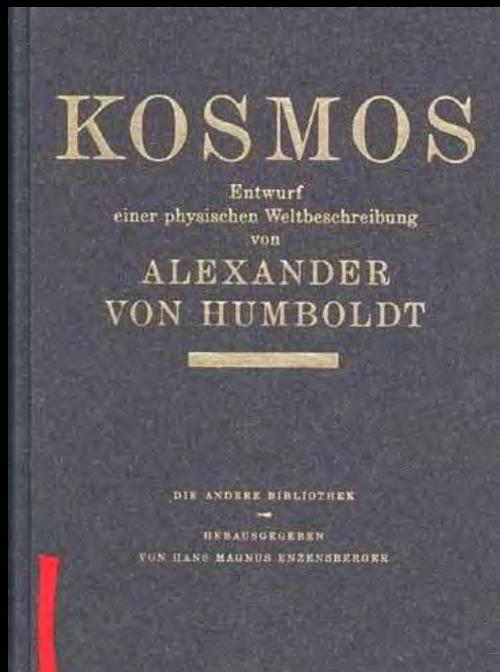


Kosmos/Cosmos - “Nature is the domain of liberty” - five volumes between 1845 and 1862

Humboldt viewed the world as what the ancient Greeks called a kosmos – “a beautifully ordered and harmonious system” – and coined the modern word “cosmos” to use as the title of his final work.

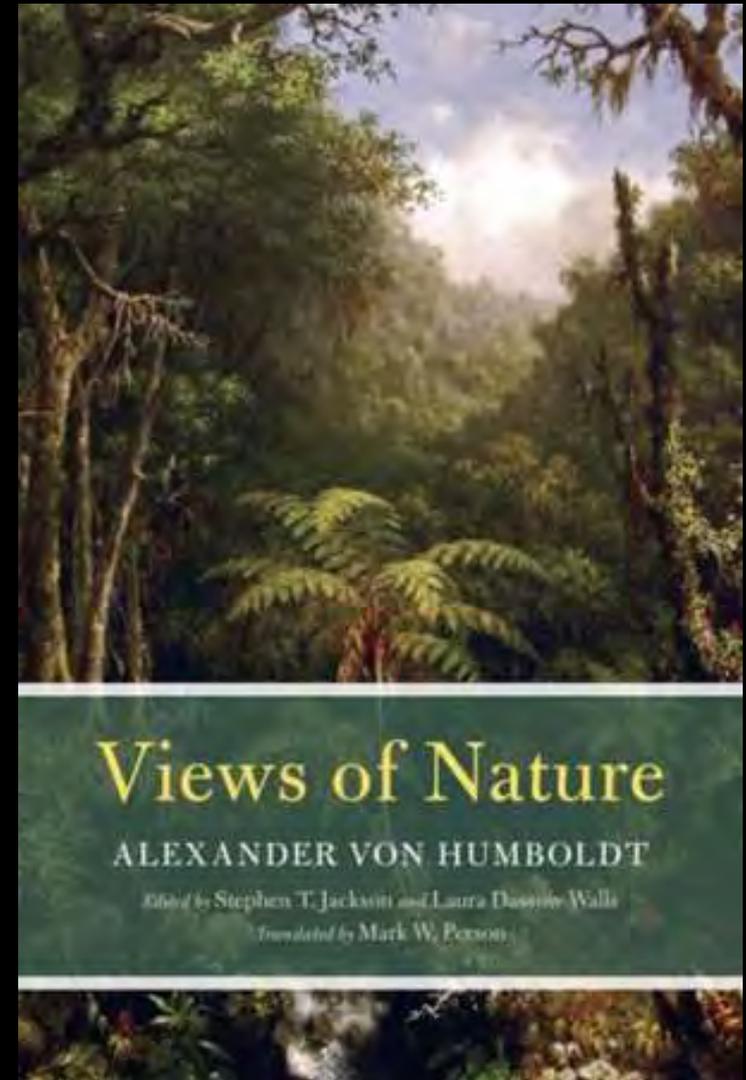
Cosmos signifies both the “order of the world, and adornment of this universal order.” Thus, there are two aspects of the Cosmos, the “order” and the “adornment.” The first refers to the observed fact that the physical universe, independently of humans, demonstrates regularities and patterns that we can define as laws. Adornment, however, is up to human interpretation. To Humboldt, Cosmos is both ordered and beautiful.

John Burroughs - Humboldt’s “poetic soul, shines out in all his works and gives them a value above and beyond their scientific worth . . . His ‘Cosmos’ is an attempt at an artistic creation, a harmonious representation of the universe that should satisfy the aesthetic sense as well as the understanding.”



Humboldtian Science – *Views of Nature* 1808 (1849)

- Ansichten der Natur – “active viewing” Naturgemälde
- Seven ways of viewing nature – steppes, deserts, plant ecology, rivers, forests, volcanoes, human impacts in the Andes
- Each essay filled with extensive annotations
- Hypertext



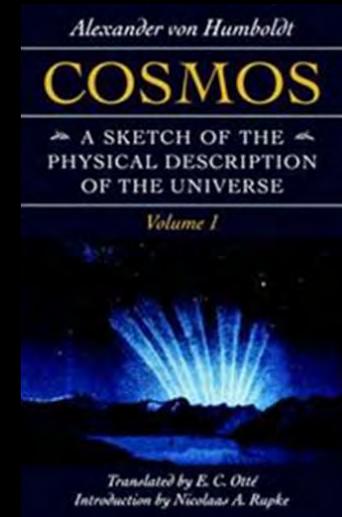
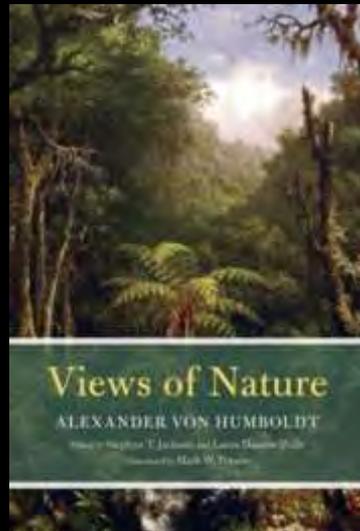
Chapter 7 - The Life Force, or The Rhodian Genius: A Tale

What is the deep structure, the governing forces that shape our reality?

Imagination/Mind and Nature

Facts and Truth

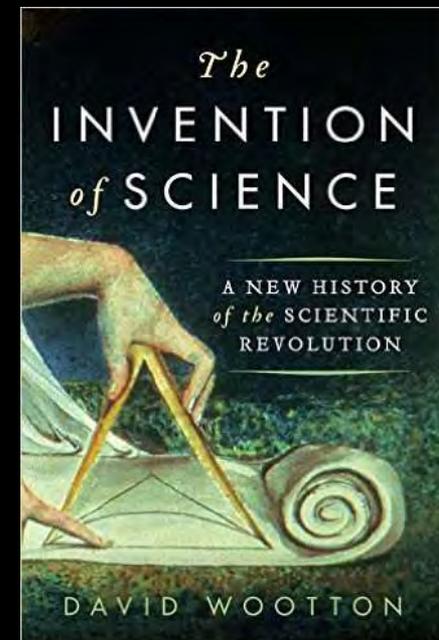
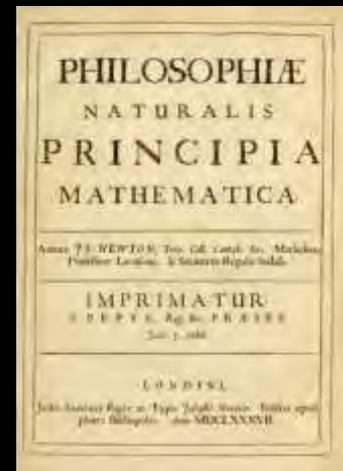
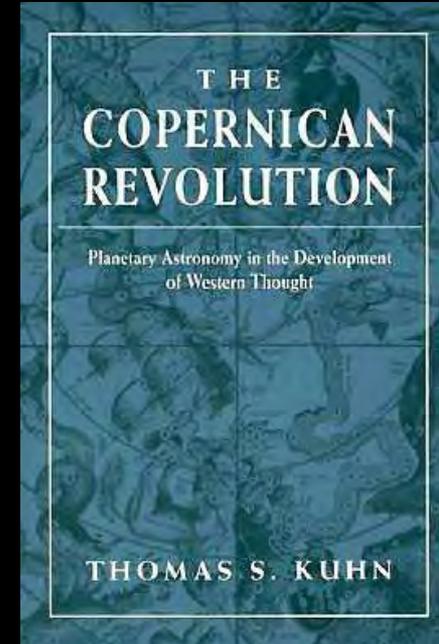
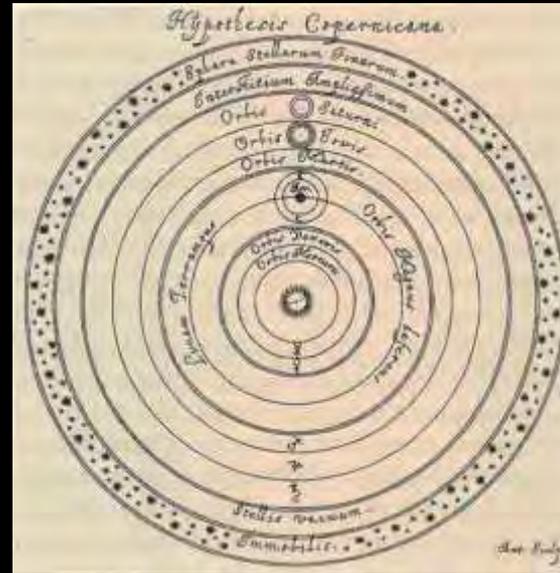
Vision



The heart of Humboldt's aesthetics: art can incorporate and surpass science in conveying the perceptual truth of the whole, but only if the artist paints the truth of particulars. By truth Humboldt means natural historical truth. The artist cannot paint just "plants," but must become botanist and know each species, its growth and habits; clouds are not puffs of pigment but studies in meteorology; mountains are visual embodiments of geological principles, water of hydrology. Landscapes become not static portraits but dynamic historical ecologies. - Walls

The Scientific Revolution 1543-1687

- 1543 of Nicolaus Copernicus's *De revolutionibus orbium coelestium* (On the Revolutions of the Heavenly Spheres)
- The publication of Isaac Newton's *Principia Mathematica* in 1687 that formulated the laws of motion and universal gravitation
- The dramatic success of the new science in explaining the natural world promotes this “natural philosophy” as an independent authority challenging the old theological philosophy and construct a new world view.
- “Experience is a great teacher” changes from “learn from the past” to “experience can actually teach you that what other people know is wrong.”
- “It is experience in this sense – experience as a path to discovery – that was scarcely recognized before the discovery of America.”
- Wootton 2015



Mind Directed Towards Nature

The Conditions of Knowledge and Science

Empiricism vs Rationalism

All knowledge from experience or All knowledge from reason?

David Hume 1711-1776

Undercut the certainty of scientific inductive knowledge by showing that since we know only what our senses tell us, we really can know nothing at all (with certainty).

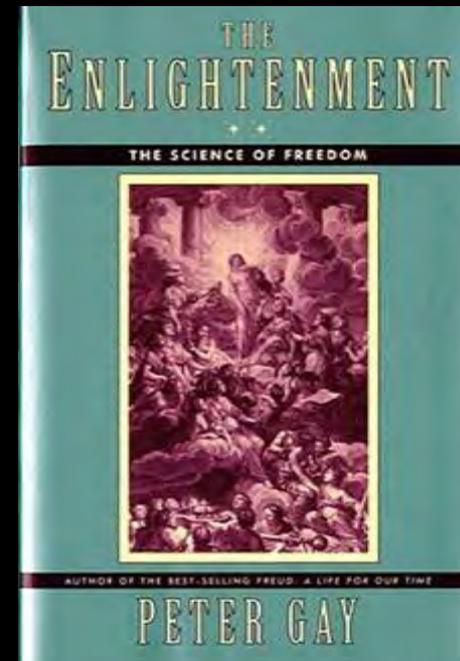
Immanuel Kant 1724-1804

- Set out to create a synthesis of rationalism and empiricism
- Hume was right in one respect – we cannot know with absolute certainty anything outside our perceptions or experience – things in themselves.
- But we can know phenomenal reality – the world as it presents itself through our experience of it.
- Experience provides the content of our knowledge and reason provides the form - the independent world and the human mind are a unity.
- To know nature better is thus to know ourselves better, for knowledge is a deeply human project.



The Enlightenment 1687 -1800

- Revolutions in science, philosophy, and society swept away the medieval world-view
- Ideals of freedom and equality for all, founded, ostensibly, upon principles of human reason
- Culminates historically in the political upheaval of the French Revolution 1789-99, in which the traditional hierarchical political and social orders were overthrown



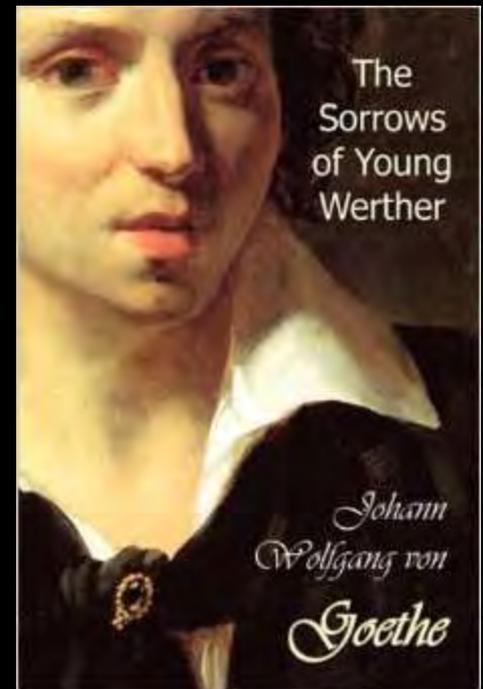
Romanticism 1800-1859

Romanticism

Romanticism was an artistic, literary, and intellectual movement that originated in Europe toward the end of the 18th century and in most areas was at its peak in the approximate period from 1800 to 1850.

The movement emphasized intense emotion as an authentic source of aesthetic experience, placing new emphasis on such emotions as apprehension, horror and terror, and awe—especially that experienced in confronting the new aesthetic categories of the sublime and the beauty of nature.

An early German influence came from Goethe, whose 1774 novel *The Sorrows of Young Werther* had young men throughout Europe emulating its protagonist, a young artist with a very sensitive and passionate temperament.



Johann Wolfgang von Goethe 1749—1832

1794 Wilhelm moves to Jena – near Weimar and his friends Schiller and Goethe. Alexander visits and begins a life-long friendship with Goethe
Later dedicates the Essay on the Geography of Plants to Goethe

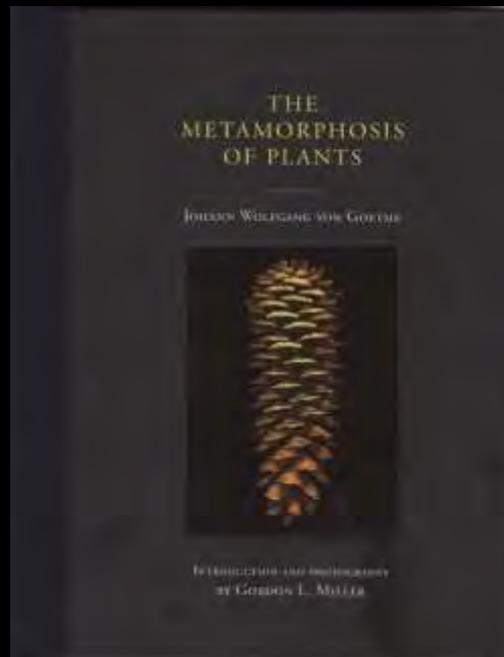
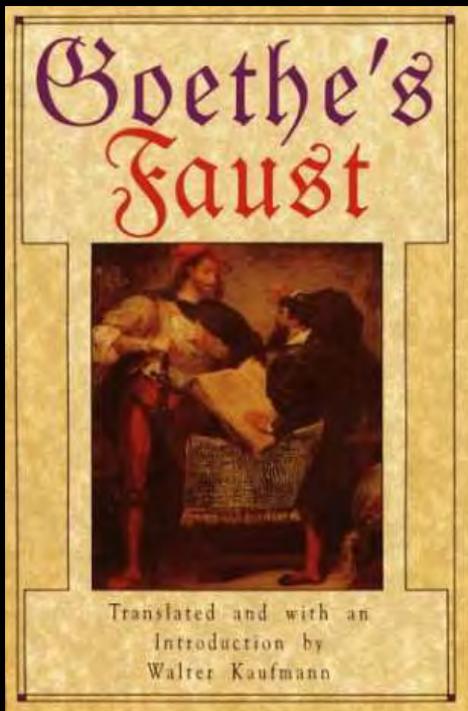
1774: Die Leiden des jungen Werthers (The Sorrows of Young Werther)

1790: Versuch die Metamorphose der Pflanzen zu erklären (The Metamorphosis of Plants)

1808: Faust Part One

1810: Zur Farbenlehre (Theory of Colors)

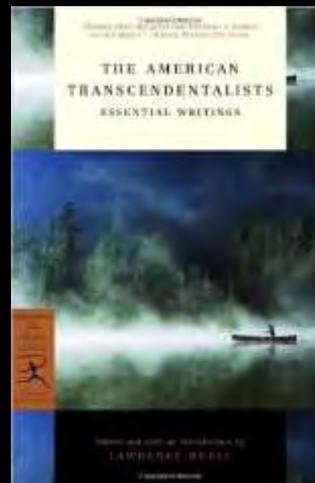
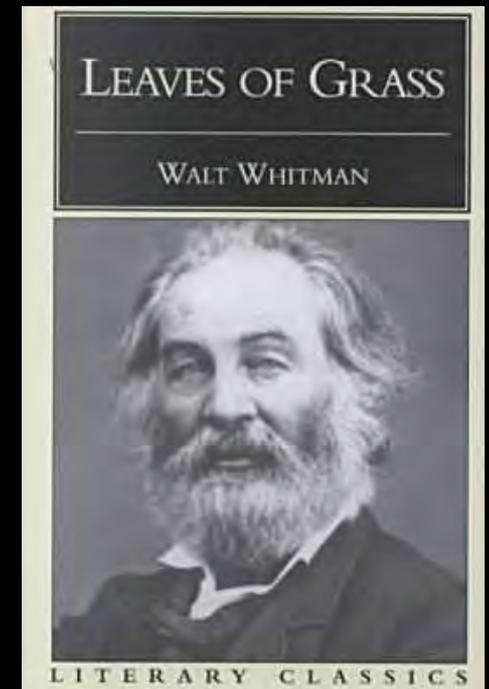
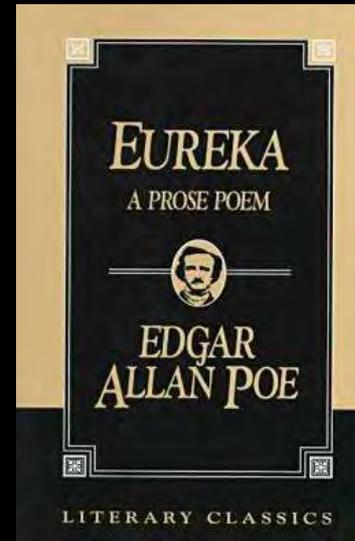
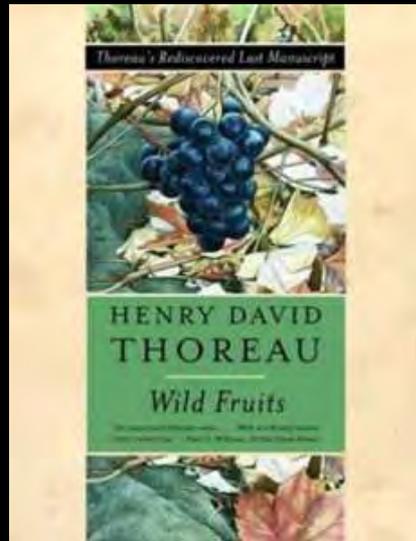
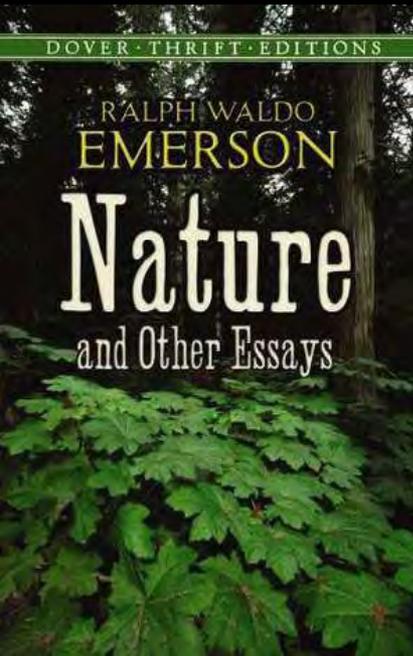
1832: Faust Part Two



Alexander von Humboldt (standing) with Schiller, Wilhelm von Humboldt and Goethe

A New Humboldtian Narrative of Life Gathering America

“The wonderful Humboldt...marches like an army, gathering all things as he goes.”

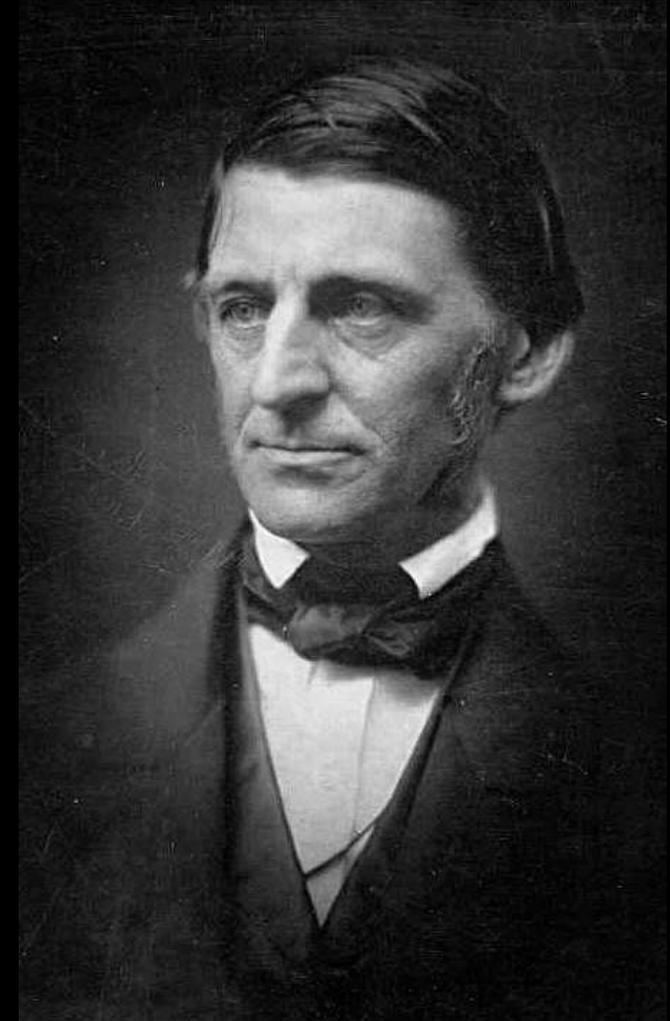
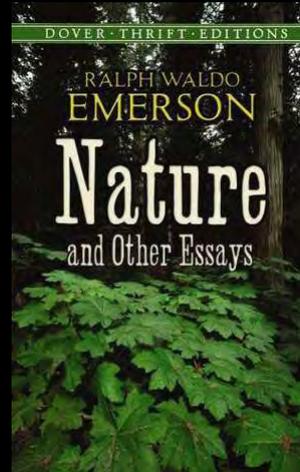


Ralph Waldo Emerson 1803-1882

The wonderful Humboldt, with his solid centre and expanded wings, marches like an army, gathering all things as he goes. How he reaches from science to science, from law to law, folding away moons and asteroids and solar systems in the clauses and parentheses of his encyclopædic paragraphs! 1860

“Nature is thoroughly mediate. It is made to serve. It receives the dominion of man as meekly as the ass on which the Savior rode.”

“All the facts in natural history taken by themselves, have no value, but are barren, like a single sex. But marry it to human history, and it is full of life. Whole floras, all Linnaeus’ and Buffon’s volumes, are dry catalogues of facts...”

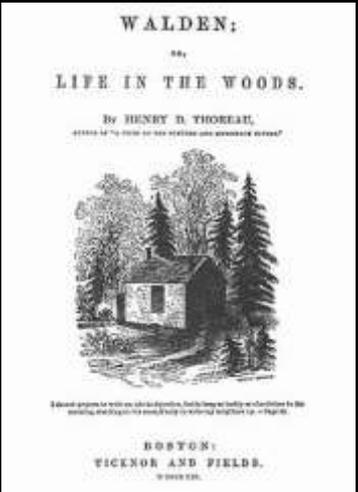


Henry David Thoreau 1817-1862

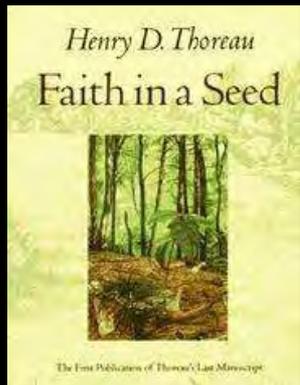
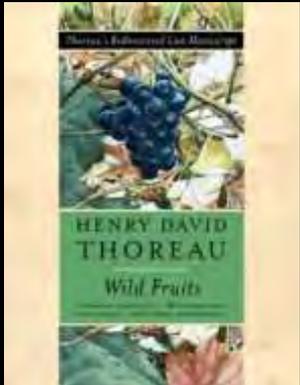
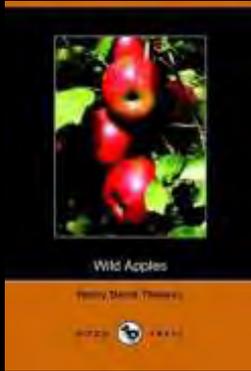
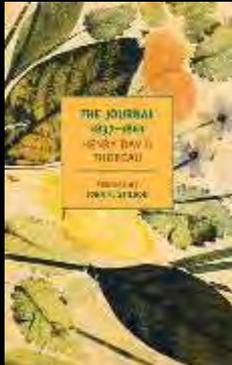
“I am an observer of nature generally, and the character of my observations, so far as they are scientific, may be inferred from the fact that I am especially attracted by such books of science as White’s Selborne and Humboldt’s ‘Aspects of Nature.’”

“How indispensable to a correct study of nature is a perception of her true meaning – the fact will one day flower out into a truth...Mere accumulators of facts – collectors of materials for the master-workmen, are like those plants growing in dark forests, which ‘put forth only leaves instead of blossoms.’” 1837

“Let us not underrate the value of a fact; it will one day flower in a truth”



Published 1854

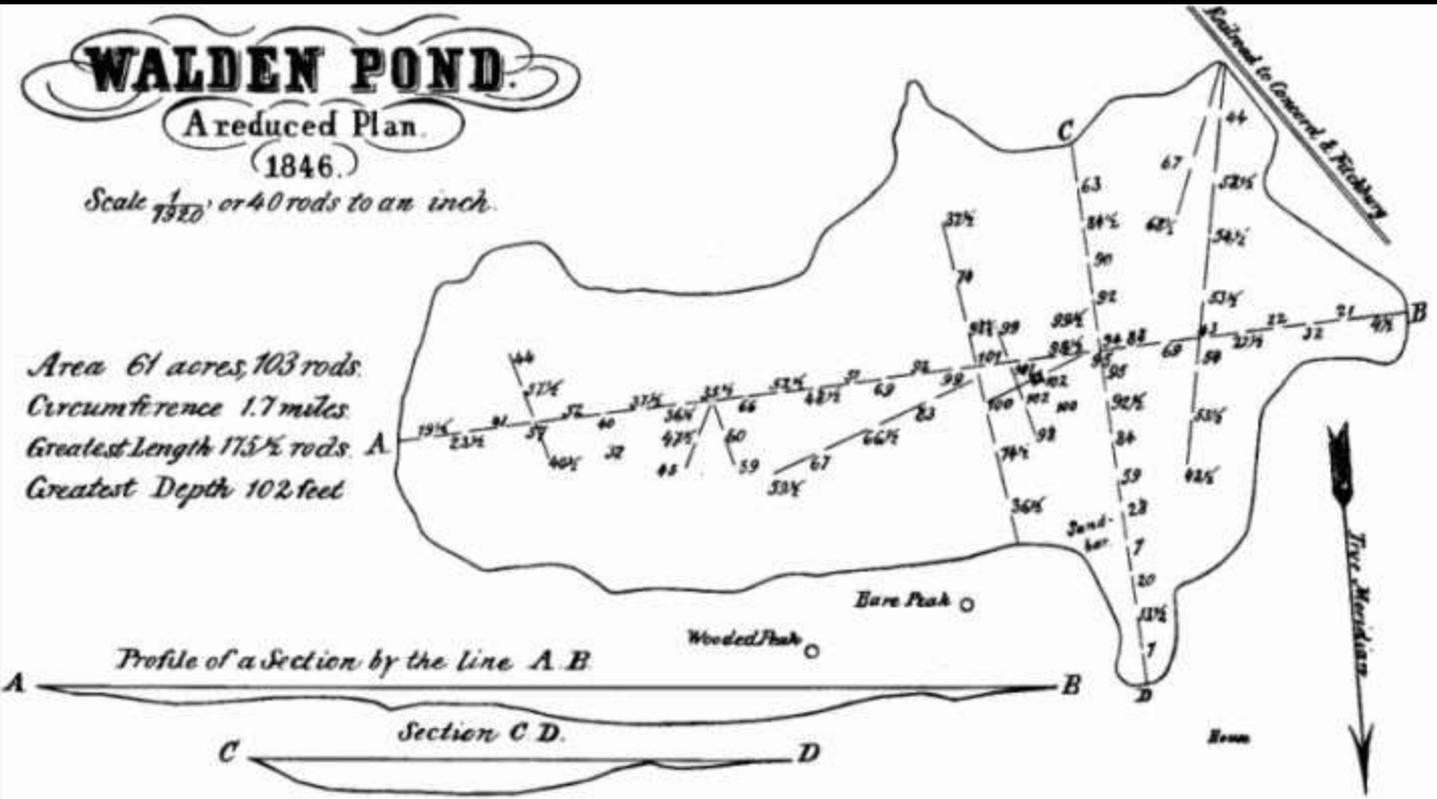


WALDEN POND.

A reduced Plan.
1846.

Scale $\frac{1}{7320}$, or 40 rods to an inch.

Area 61 acres, 103 rods.
Circumference 1.7 miles
Greatest Length 175½ rods.
Greatest Depth 102 feet



Edgar Allan Poe 1809-1849

Eureka: A Prose Poem 1849

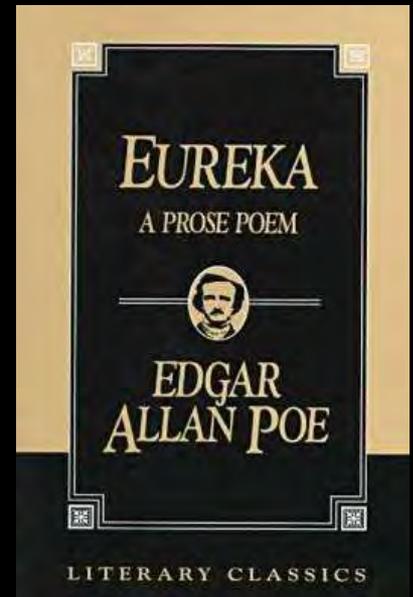
"Sonnet to Science"

Science! true daughter of Old Time thou art!
Who alterest all things with thy peering eyes.
Why preyest thou thus upon the poet's heart...?

Eureka – dedicated to Alexander von Humboldt
(Archimedes' exclamation in his bath tub when he discovered the law of buoyancy)

To those who love me and whom I love - to those who feel rather than to those who think - to the dreamers and those who put faith in dreams as in the only realities - I offer this Book of Truths, not in its character of Truth-Teller, but for the Beauty that abounds in its Truth; constituting it true. To these I present the composition as an Art Product alone - let us say as a Romance, or, if I be not urging too lofty a claim, as a Poem.

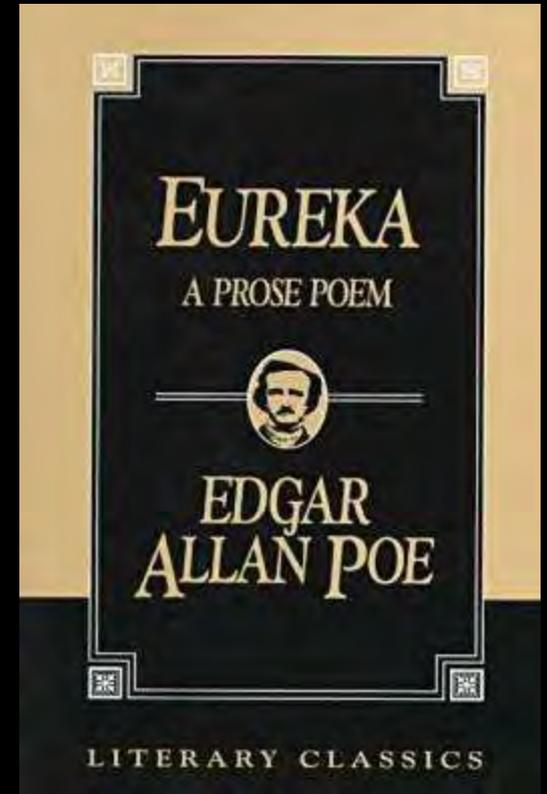
In the original unity of the first things lies the secondary cause of all things, with the germ of their inevitable annihilation.



Looking at the matter, first, in detail, we perceive that not merely the manifestation of vitality, but the importance, consequences, and elevation of character, keep pace, very closely, with the heterogeneity, or complexity, of the animal structure...

Now this is in precise accordance with what we know of the succession of animals on the Earth.

As it has proceeded in its condensation, superior and still superior races have appeared. Is it impossible that the successive geological revolutions... have themselves been produced by... successive variations in the solar influence on the Earth? Were this idea tenable, we should not be unwarranted in the fancy [of]... yet a new modification of the terrestrial surface, a modification from which may spring a race both materially and spiritually superior to Man.





Leaves
of
Grass.

BROOKLYN, NEW YORK,

1856.

Walt Whitman, a kosmos, of Manhattan the son...

1819-1892

Who includes diversity and is Nature,

Who is the amplitude of the earth, and the coarseness and sexuality of the earth,
and the great charity of the earth and the equilibrium also,

Who has not look'd forth from the windows the eyes for nothing, or whose brain
held audience with messengers for nothing,

Who contains believers and disbelievers, who is the most majestic lover,

Who holds duly his or her triune proportion of realism, spiritualism, and of the
æsthetic or intellectual,

Who having consider'd the body finds all its organs and parts good,

Who, out of the theory of the earth and of his or her body understands by subtle
analogies all other theories,

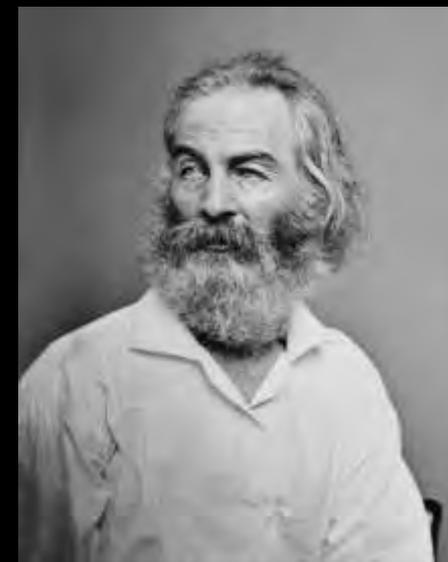
The theory of a city, a poem, and of the large politics of these States;

Who believes not only in our globe with its sun and moon, but in other globes with
their suns and moons,

Who, constructing the house of himself or herself, not for a day but for all time,
sees races, eras, dates, generations,

The past, the future, dwelling there, like space, inseparable together.

1860

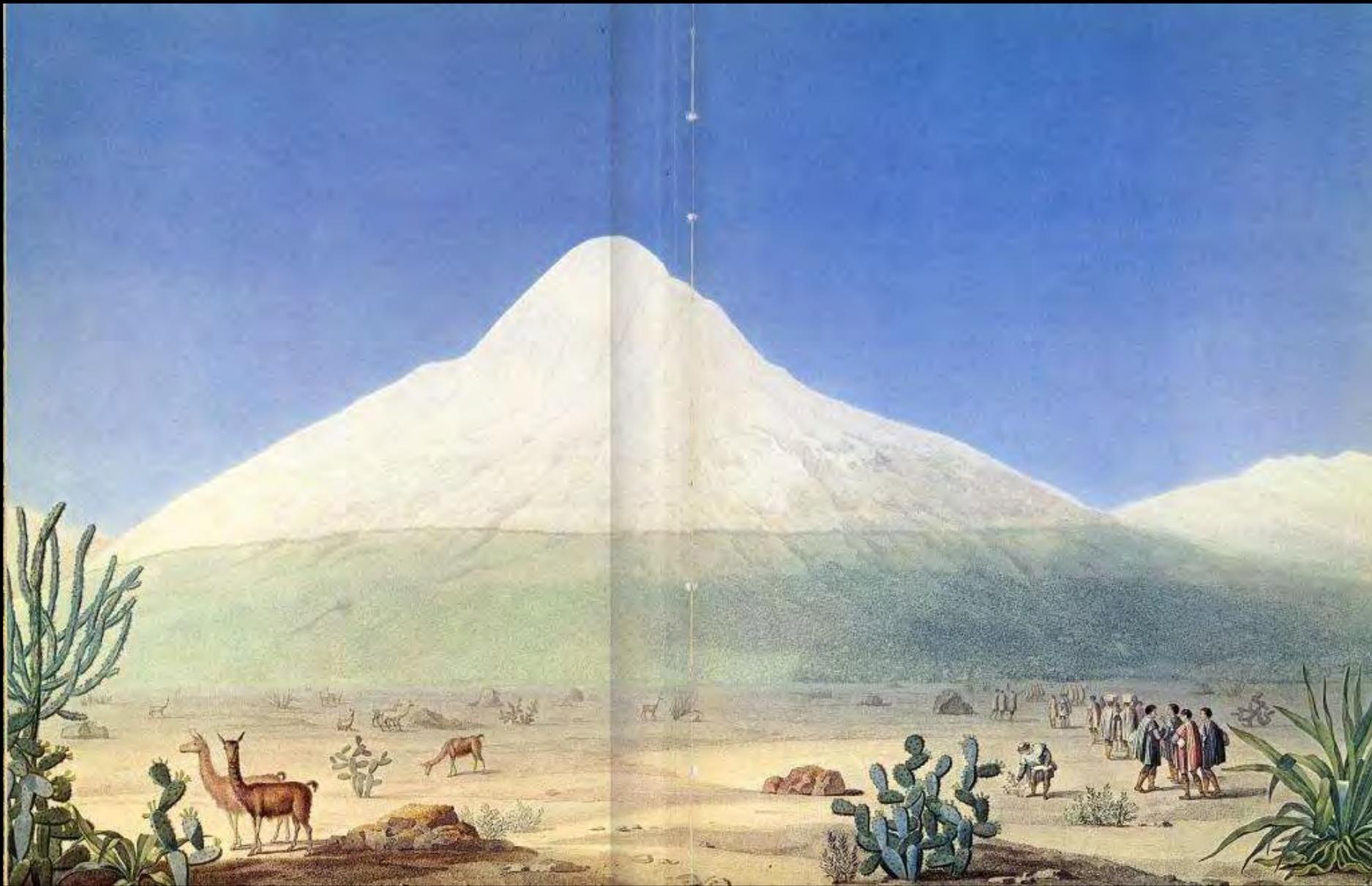


Humboldt's Chimborazo and his Vision of Nature

It would be an enterprise worthy of a great artist to study the aspect and character of all these vegetable groups, not merely to hothouses or in the descriptions of botanists, but in their native grandeur in the tropical zone. How interesting and instructive to the landscape painter would be a work which should present to the eye, first separately, and then in combination and contrast, the leading forms which have been here enumerated!



A View of the Mountains of Chimborazo and Carquairazo, in South America.



Alexander von Humboldt, Le Chimborazo vu depuis le Plateau de Tapia



Alexander von Humboldt, Cayambe 1810



Alexander von Humboldt and Aimée Bonpland at Mount Chimborazo, Ecuador 1806
Friedrich Georg Weitsch



Frederic Edwin Church
Chimborazo, 1864

The Artistic Humboldt of the New World
Frederic Edwin Church
1826-1900





The Andes of Ecuador 1855

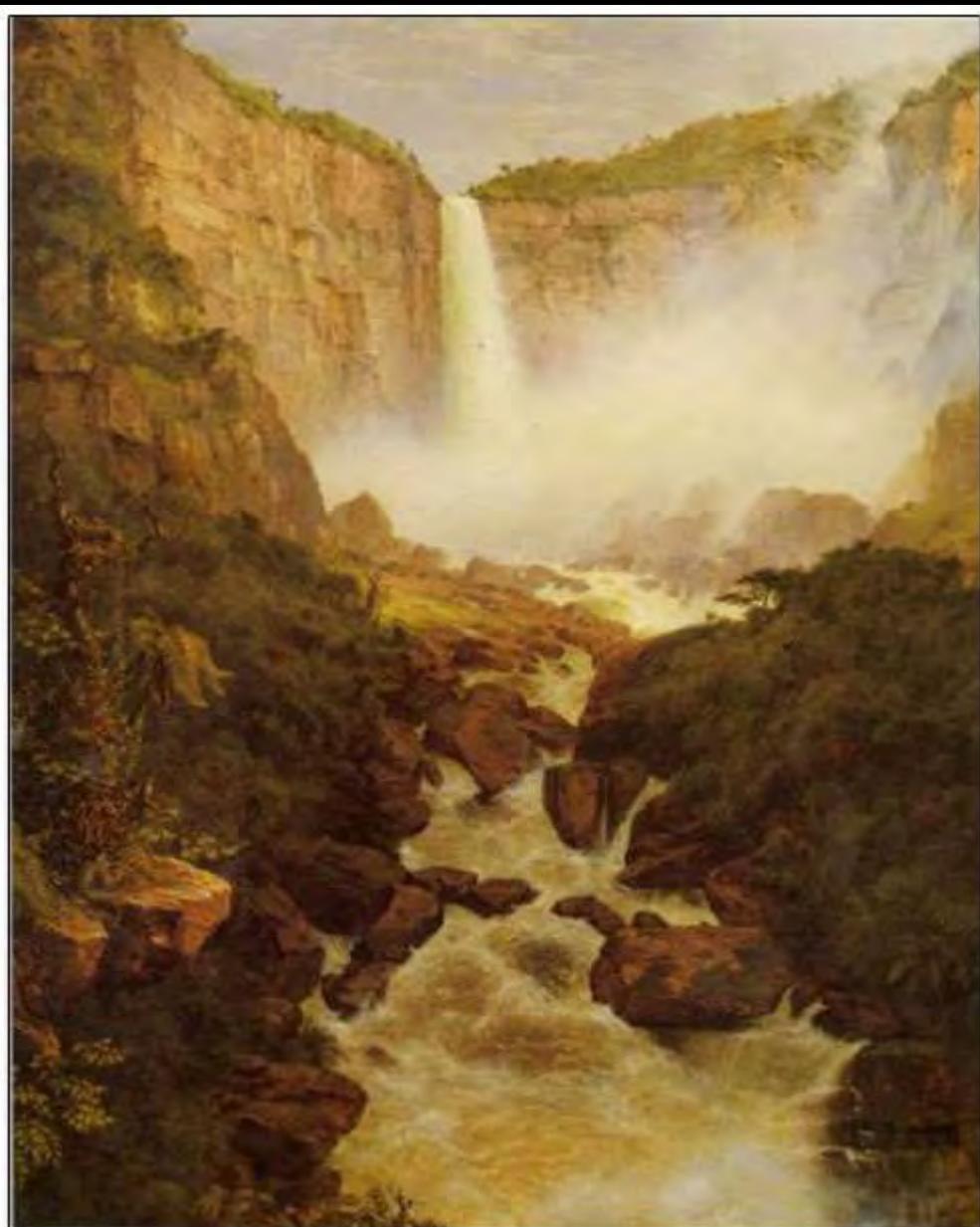
After a disagreeable journey across an elevated plain with a cold piercing wind and a sprinkling of rain we finally came to the edge of an eminence which overlooked the valley of Chota. And a view of such unparalleled magnificence presented itself that I must pronounce it one of the great wonders of Nature. I made a couple of feeble sketches this evening in recollection of the scene. My ideal of the Cordilleras is realized.



Frederic Edwin Church,
Cayambe 1858



Alexander von Humboldt
Tequendama 1810



Frederic Edwin Church
Falls of the Tequendama near Bogotá 1864



Frederic Edwin Church
Morning in the Tropics ca. 1858



Heart of the Andes, 1859

After a disagreeable journey across an elevated plain with a cold piercing wind and a sprinkling of rain we finally came to the edge of an eminence which overlooked the valley of Chota. And a view of such unparalleled magnificence presented itself that I must pronounce it one of the great wonders of Nature. I made a couple of feeble sketches this evening in recollection of the scene. My ideal of the Cordilleras is realized



Frederic Edwin Church
Chimborazo, 1864



Frederic Edwin Church
Cotopaxi, 1855



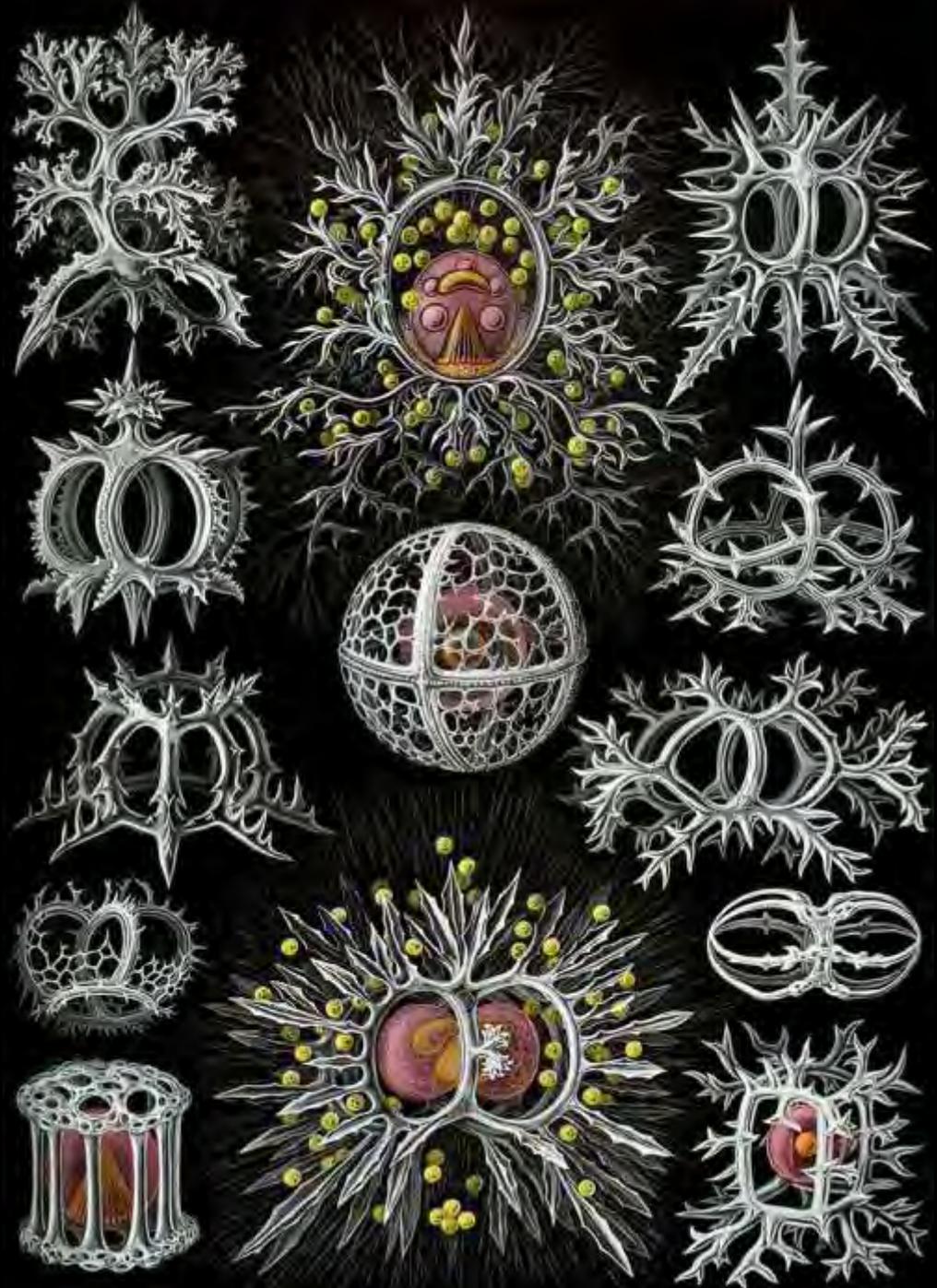
Frederic Edwin Church
Oil Study of Cotopaxi, 1862



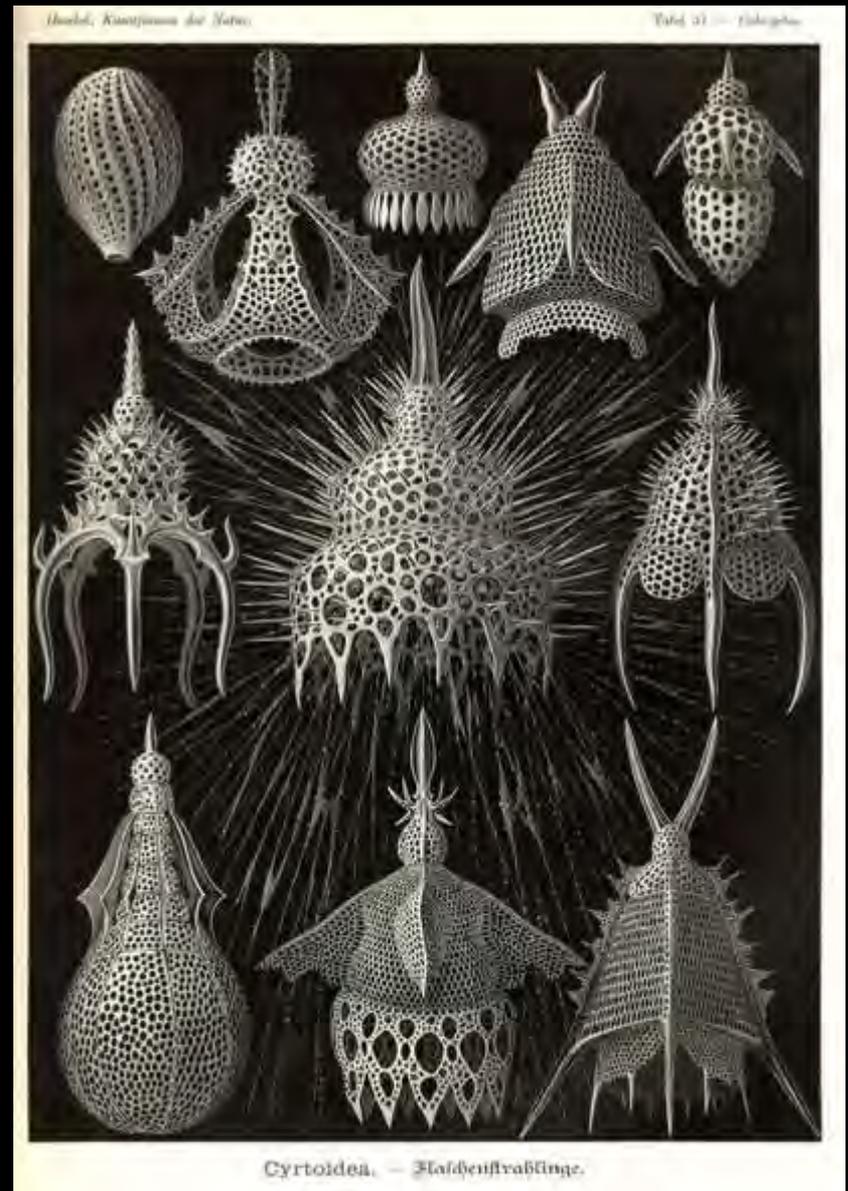
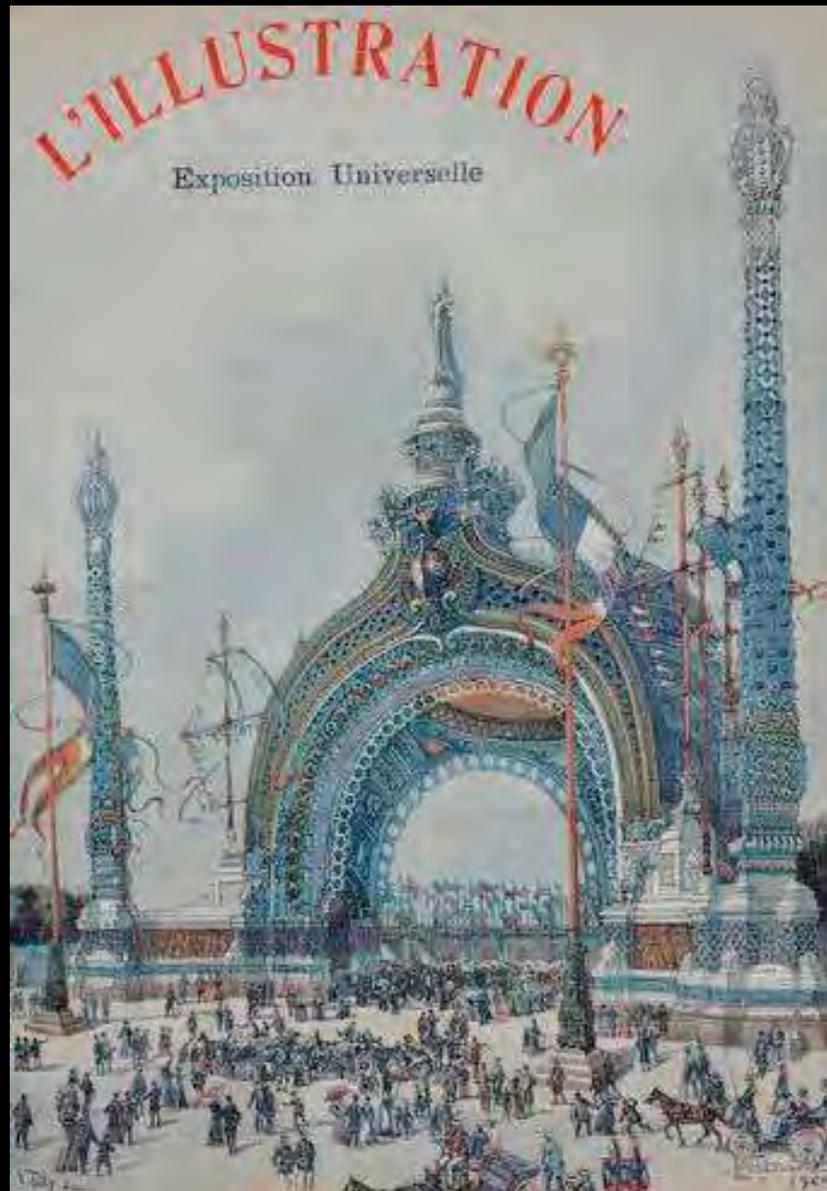
Frederic Edwin Church
Rainy Season in the Tropics, 1866,

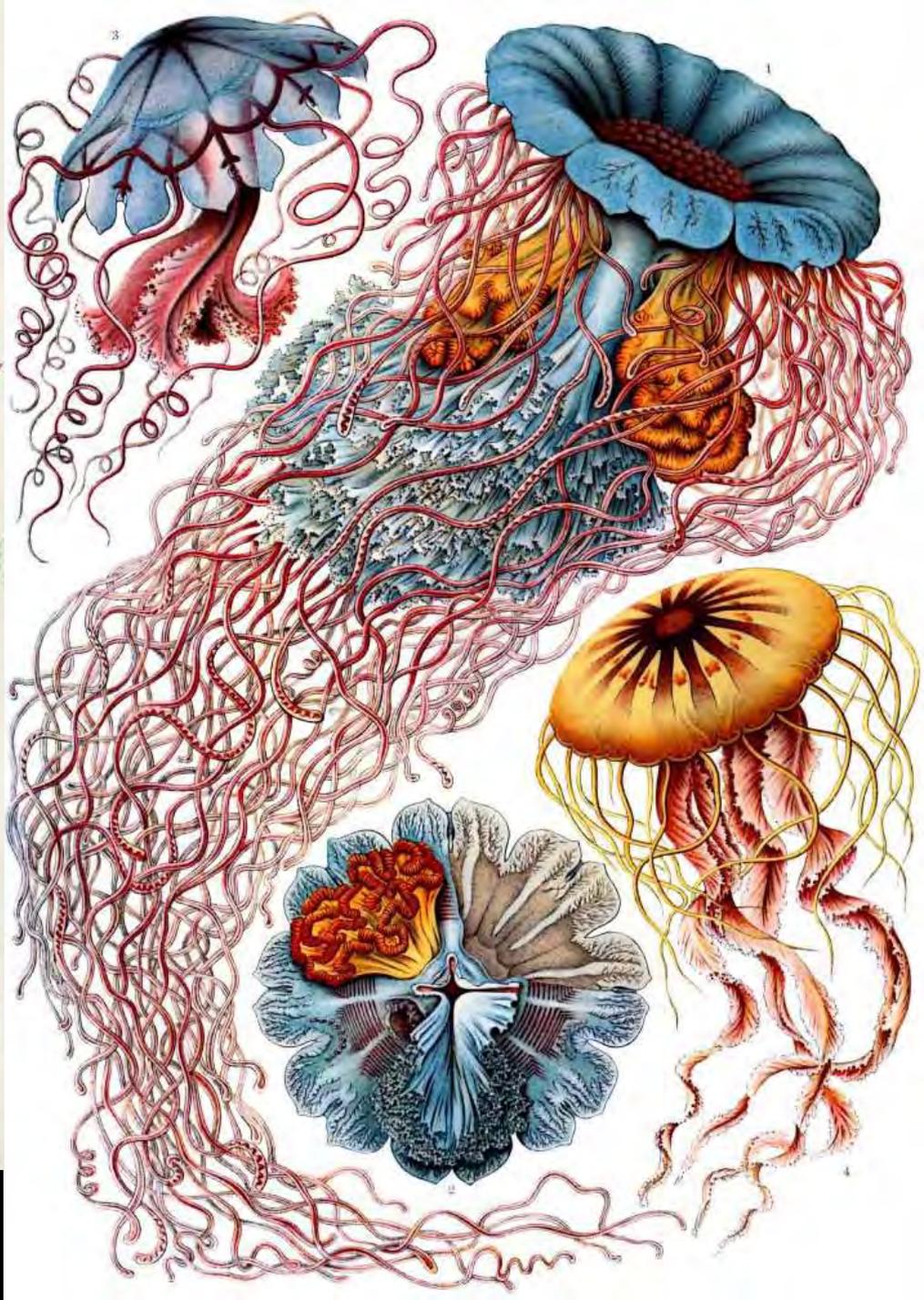
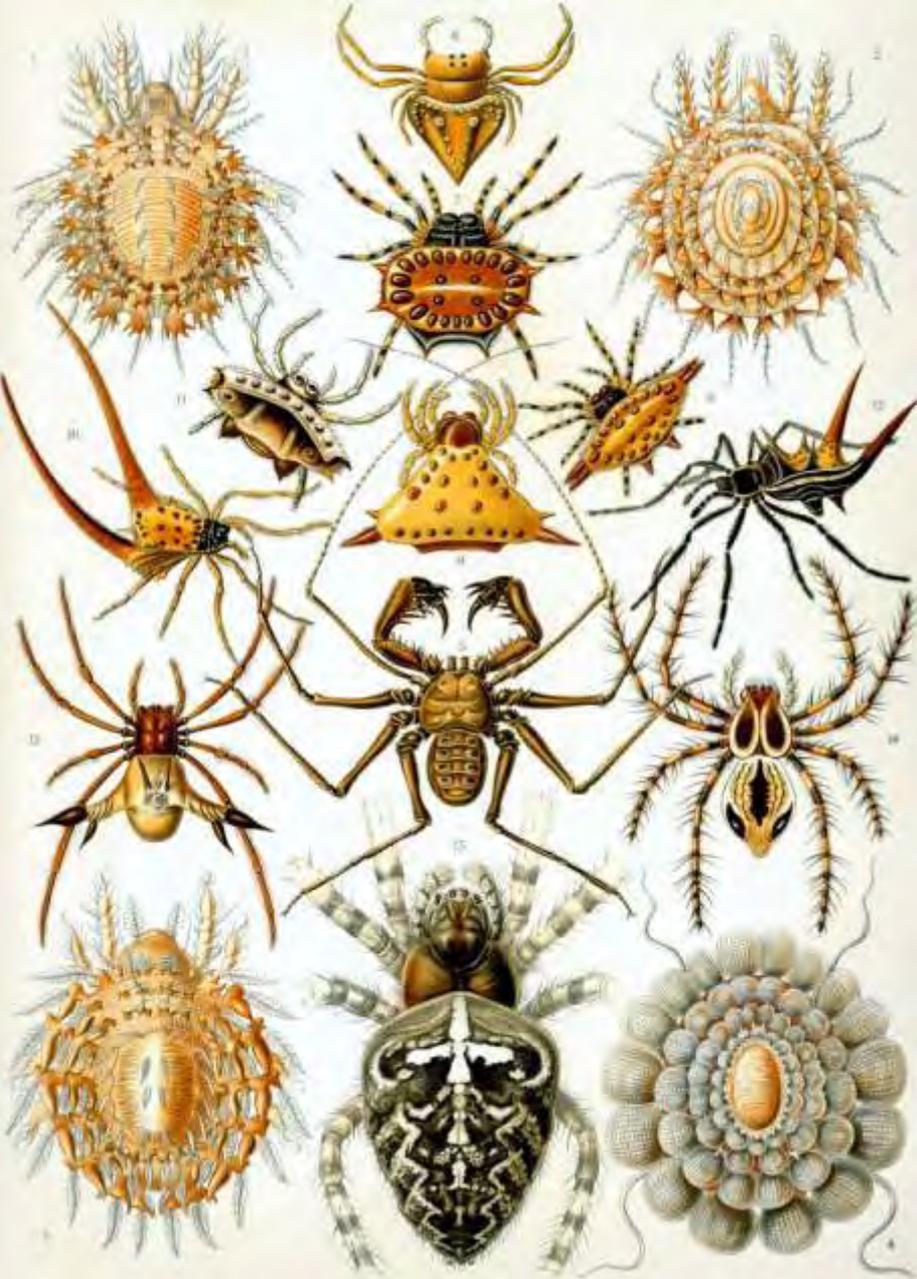
Ernst Haeckel 1834–1919

Kunstformen der Natur (1904)
Art Forms of Nature



Porte Monumentale (Porte Binet)
Exposition Universelle et Internationale de Paris 1900

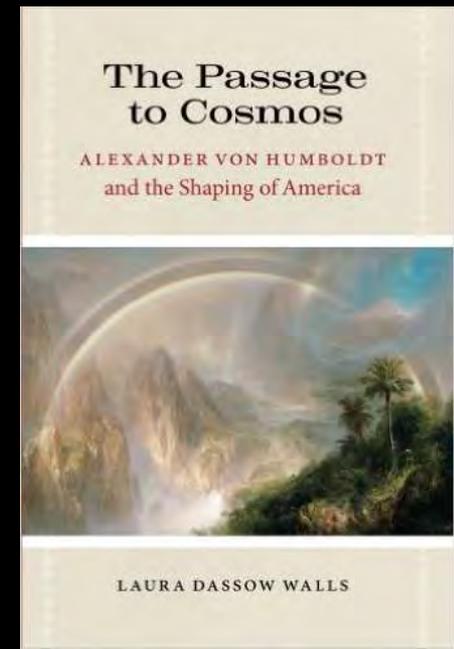
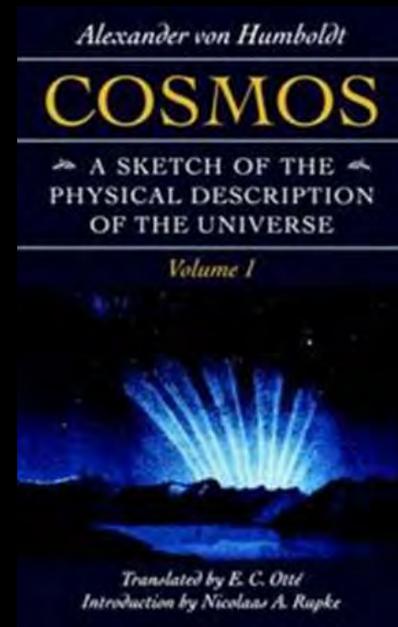
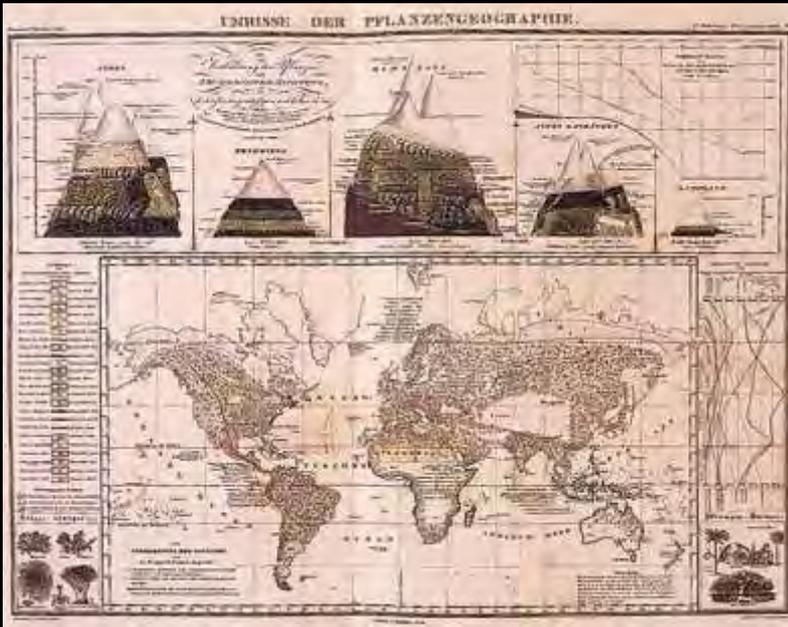




Humboldtian Science - A Vision of the Unity of Nature – Empirical Holism

Unity in diversity, and of connection, resemblance, and order, among created things most dissimilar in their form, one fair harmonious whole... Kosmos, 1845

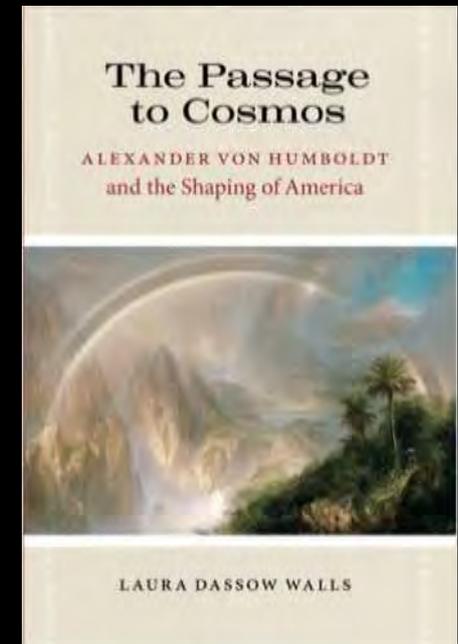
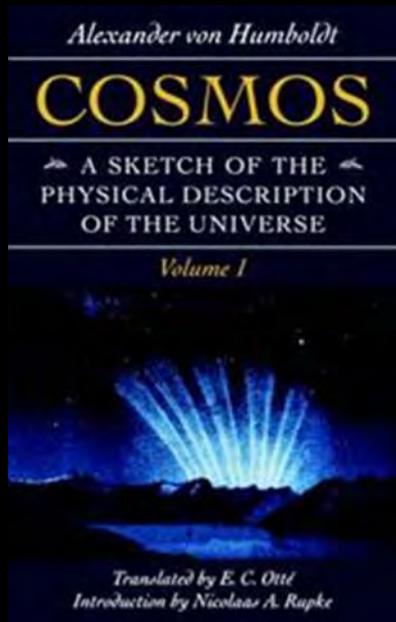
Does science then turn on and kill the imagination that gave it birth? On the contrary, argues Humboldt: the prejudice that science must kill the feelings is wrong. The excitement of discoveries, of “mysteries to be unfolded” and the “inextricable net-work of organisms,” carries thought forward. Wonder and the pleasure of discovery feed the desire to know, and knowledge leads back to wonder, in an ascending spiral fed by imagination at every turn that ever enlarges and will never end. Nature is without limit, “ever growing and ever unfolding itself in new forms,” and even “when thousands and thousands of years have passed away,” the surface of the earth, its interior, its oceans, its atmosphere, will forever “open to the scientific observer untrodden paths of discovery.” – Laura Dassow Walls



Mind and Nature

Where humans believe themselves to be separate from or above nature, Humboldt constantly uses metaphors of permeation: “the mind is penetrated by the grandeur of nature”; natural scenery leaves an “impression” on the mind; the physical world “is reflected on the inner susceptible world of the mind,” in a “mysterious communion with the spiritual life of man”; the physical “influences” the moral world, in “a mysterious reaction of the sensuous on the ideal”; clarity and serenity of mind “correspond with the transparency of the surrounding atmosphere”; we are “moved” with emotion; majestic scenes of nature “mingle with all our feelings of what is grand and beautiful.”

The body of the world has stolen through our senses into the deepest recesses of our mind, where it shapes our thought and language at the most fundamental level. - Walls





*Geographie der Pflanzen in den Tropen-Ländern;
ein Naturgemälde der Anden,*

gegründet auf Beobachtungen und Messungen, welche vom 10^{ten} Grade nördlicher bis zum 10^{ten} Grade südlicher Breite angestellt werden sind, in den Jahren 1799 bis 1805.

von ALEXANDER VON HUMBOLDT und A. G. BONPLAND.

To Humboldt, Cosmos is both ordered and beautiful, through the human mind. He created a dynamic picture of the universe that would continually grow and change as human conceptions of nature and the depth of human feeling about nature enlarge and deepen.