

**BRIDGING THE GAP BETWEEN THE HUMANITIES AND SCIENCES: AN
EXEMPLARY MODEL OF CORE TEXT, HUMANISTIC EDUCATION**
An ACTC-National Endowment for the Humanities, National
Curriculum Project
The Project Syllabus

Year I: Location: St. Johns College
Motion and Natural Law in a Philosophical and Political World

Day 1: “Science, Wholeness, and Beauty: the Classical Mathematical Cosmos.”

This session will introduce participants to the idea of the liberal arts, the ordering of knowledge, and the tensions between a purely rational analysis of the cosmos and the demands of observation. This section also brings to the fore the importance of aesthetic criteria in scientific understanding.

Morning: Platonic Cosmology: Selection from **Plato**, *Republic*, Books VII 524a to 530 e. (Any edition is fine, Bloom’s preferable; Plato on the ordering of the Liberal Arts); Plato, *Timaeus*, Kalkavage translation 27a-47e2; 53c-56e; 86b1-92c9.

Afternoon: Mathematics as a Way to Truth: **Euclid**, *Elements*, Greenlion edition: Book I, Definitions, Common Notions, Propositions 1,4,5. Book V, Definitions 1-13; enunciations of Props. 1-2; Book VI, Definitions, Prop. 1, 2, Book VII, Defs 1-5, 20 only

Laboratory, 7:30 PM: A laboratory visit to a planetarium at St. John’s will demonstrate the observed motions of the planets and the heavens.

Day 2: “Saving the Phenomena”: Making Rational Explanation Account for Appearances

This section brings to the fore the problem of experience and its analysis. We open with Aristotle’s opposition to the Platonic mode of treating experience in order to illustrate the way in which nature can also be approached through a qualitative “physical” analysis of nature that gives primacy to sensory experience. The second session then illustrates the way Ptolemy’s Hellenistic astronomical treatise represents a synthesis of the approaches of Plato, Euclid, and Aristotle to create an exact predictive mathematical model of the heavens. We see Ptolemy’s attempt to take into account the claims of experience, Aristotle’s physical assumptions about motion and rest, and the idealizing mathematical treatment of phenomena of Plato and Euclid.

Morning: The Aristotelian approach to nature: Readings, all in McKeon edition: **Aristotle**, *Physics*, Book II. chps. 3-4 (194b16-196b 10); chp. 7, 8 (198a12-199b33); *De Caelo*, Book I, chps. 1-2 (268a 1-269b.18); Book II, chps. 13-14 (293a15-298a20); Book III chp. 2; (300a 20-301b35); Book IV, chp. 1 (307b 30-310a 15); *Metaphysics*, Book 12, chps. 7-9, (1072a20-1075a5).

Afternoon: Integration: Ptolemy’s system of the World: Readings, **Ptolemy** *Almagest*, opening discourse and Book I (as found in Crowe, 42-65); Selections from Book III, iii. We will work through the geometrical demonstration of the equivalence of the eccentric and epicycle-deferent systems to allow participants to see exactly how Ptolemy is using Euclid to generate a system in which the exact observational “phenomena” can be saved.

Laboratory 8:30: Leave St. John’s for laboratory on naked eye astronomy in the evening. Back by 10:00. The crescent moon; Jupiter, the zodiac.

Utterly optional laboratory at 4:30 AM. This naked-eye observation may allow us to see Mercury precede Venus into the morning sky before sunrise. Mars also will be visible.

Day 3: “Cosmology, Theology and Poetry: Dante’s Cosmos”

This day will be entirely devoted to **Dante’s** *Divine Comedy* as a work of literature, theology, and scientific cosmology displaying the integration of these elements in the great epic of the high middle ages, illustrating how the cosmology of Aristotle, with some aspects of Ptolemaic astronomy, are used as a framework for developing this great medieval epic.

Morning: *Inferno* Cantos 1-2, 34; *Purgatorio* Canto 1; *Paradiso* Cantos 1-6 (Allen Mandelbaum trans.)

Afternoon: *Paradiso* Cantos 10,13, 18-20, 21, 27, 30-33.

Day 4: “Transforming Natural Philosophy I: Reordering the Heavens”

This section focuses on the conceptual restructuring of the heavens by Copernicanism and the wider implications of these changes for literary thought and theology.

Morning: readings in **Copernicus**, *On the Revolutions of the Heavenly Spheres*; read all as found in Crowe anthology: 100-133. Possible supplementary reading: Book III, Chapter 15: Copernicus’ equivalency proofs.

Afternoon: Readings of selections from **Galileo**, *Starry Messenger* (as found in Crowe anthology) and *Dialogues on the Two Chief World Systems* (Short handout to be distributed at seminar); Galileo “Letter to Castelli” (a short version of Letter to the Grand Duchess on science and theology, to be handed out at the seminar).

Day 5: “Transforming Natural Philosophy II: Ratio and the New Science of Motion.”

This unit will analyze Galileo’s novel ways of relating demonstrative mathematics and natural phenomena in his final work. It will also be intended to show the complexity of his new “experimental” discourse. At issue will be the following questions: “What does it mean for nature to be lawful?” “What does it mean for experiment to be necessarily approximate but nevertheless to “prove” a law of nature?” “What is the exact relationship between rational construct and natural phenomena?”

Morning: Galileo, *Two New Sciences*: from the introduction, pp. xvii-xxi; pp. 5-8, “Letter to the Reader” and “Letter of the Publisher,” First Day, pp. 61-69; 79-88; Opening discussion from “Third Day.”

Afternoon: Galileo, *Two New Sciences*; Third Day, “On Local Motion”; “Opening Discussion” and Definitions and Axioms. Read just enunciation of Propositions 1-6 on “Uniform Motion” and the section on “On Naturally Accelerated Motion,” through Proposition II, Theorem II (pp. 153-67); Fourth Day, just pp. 232-34.

Laboratory 4:00 PM: A laboratory on the Inclined Plane and Pendulum will be used to illustrate the complex ways in which rational construct and experience interact in this simple experiment from physics. (This accompanies the reading of Galileo).

Day 6: “Transforming Natural Philosophy III: The World as a Rationally Mastered Machine”

This Session is devoted to the larger conceptual revisions of natural philosophy taking place in the early modern period that attempt to synthesize the piecemeal transformations in cosmology, mechanics, and

philosophy. In this we will see the explicit development of modern notions of “laws of nature” as distinguished from the Stoic-Medieval conception of “natural law.” The session will also explore the new ways of conceiving the relation of the world to divine action. This session will again raise in a new way the complex interaction of rational constructs and empirical experience.

Morning: read **Descartes**, *Discourse on Method* (Cottingham edition) (pp. 109-151); selections from *The World (Le Monde)* (pp. 81-98)

Afternoon: Descartes, “Author’s Letter” to the *Principles of Philosophy* and selections from Part II (pp. 223-247), IV (pp. 267-292) of the *Principles*; Selection from *Treatise on Man* (pp.99-108).

Day 7: Mastering the Political World: This session explores the ways the new science of Galileo and Descartes provides a framework for a reconceptualization of a new “science of politics” in the work of Thomas Hobbes.

Morning: read **Hobbes**, selections from *Man and Citizen* (Hackett Publishing), “Author’s Preface,”; “Liberty” chps. 1-3; “Dominion” chp. 7, 12; “Religion” chp. 15 (illustrating connection of the natural philosophy and political theory).

Afternoon: Reading: “Newton’s Philosophy of Nature”:

This session introduces, selectively, the powerful synthesis by Isaac **Newton** of the various strands of natural philosophy previously encountered in readings from Copernicus, Galileo, and Descartes into a comprehensive solution to the issues of celestial mechanics. With this, we will have reached the culmination of the first great break in scientific thought away from classical scientific reasoning. This session will also be concerned to illustrate the ways in which this Newtonian synthesis can be developed in practical ways into current or to-be-developed curricula of our participating institutions.

Readings: Newton, (In Cohen and Westfall, Norton Anthology) excerpts from *Principia* pp. 221-238 (preface, definitions, laws of motion)

Laboratory 9:00 PM: Telescopic Observations: St. John’s observatory and additional provided telescopes.

Day 8:

Morning: Readings: Newton, excerpts from *Principia* Book I, Book III (Rules, Phaenomena., Moon proof. Law of Universal Gravitation. (in Cohen and Westfall, pp. 238-246; 257-273). We might use Sloan’s commentary (emailed) on this material along with this.

Afternoon: Newton, General Scholium. (pp. 339-341) Queries to the *Opticks* (pp. 184-190). Literary reactions to the Scientific Revolution: **Donne**, “Anatomie of the World,” in First Anniversary, (website printout); Selections from Crowe Anthology: **Pascal**, *Pensees*; **Milton**, *Paradize Lost*; **Addison**, “Ode,” and **Young**, “Night Thoughts.”

Days 9-10 Review of curricula of schools in light of curriculum discussed, here. Discussions and suggestions by all participants will focus on two issues: (1) means of integrating the texts discussed into current courses, (2) suggestions from participating institutions for developing new humanistic curricula that utilize the insights gained from the experience with these primary texts.

Year Two: Location: The University of Notre Dame

The Problem of Life and Humanity's Changing Conception of Life and Science (syllabus subject to revision)

This workshop builds upon the themes and texts introduced in the St. John's workshop, but it will not necessarily presume all participants have attended the first year. This will also introduce more explicitly issues of the history and philosophy of science and a different body of primary literature, while still using laboratories and primary text work. This model is intended to develop a more direct application to "core-text" humanities programs or to general education requirements in science outside of "great books" programs.

Day 1: The Problem of the Organism in a Physical Universe:

This session is to introduce the group to some of the classic issues facing any integration of living organisms into the world of modern physics, but they will also see that this issue is much less of a problem for classical thought. We will also look at some literary discussions.

Morning: "What is Life? Classical Reflections"

Readings: Aristotle, *On the Soul*, Book II; Galen, Selection from *On the Natural Faculties*; Hans Jonas, selection from *The Phenomenon of Life*

Afternoon: Readings: Selection from Galen, *On the Usefulness of the Parts* (on the heart); William Harvey, *On the Motion of the Heart and Blood*.

This will also have a dissection laboratory on the heart and lungs.

Day 2: "Mastery of Life"

This session explores the ideal of a "mastery" of life through science. It begins with the "mechanization" of Harvey's theory by Descartes, and then moves into the new "biophysical" conception of "mechanism" illustrated by the work of French chemist Antoine Lavoisier.

Morning: Readings: Descartes, Selection from *Treatise on Man*; Antoine Lavoisier, "Experiments on Respiration (1777)" and selection from "Memoir on Heat (1780)".

Demonstration laboratory on gas chemistry and respiration.

Afternoon: Claude Bernard, *Introduction to the Study of Experimental Medicine* esp. from second part including the Vivisection chapter; H. G. Wells, *The Island of Dr. Moreau*.

Day 3: Nature as a Work in Progress I: What is Nature?

This session is devoted to literary and philosophical reflections on the notion of "nature" and the possibility that it is not a static machine, but a dynamic, developing system: It opens with literary readings on the concept of nature, and then some of the scientific developments mirroring these reflections: We will first encounter this in terms of pre-Darwinian "evolutionary" views.

Morning: Readings: Buffon, "First View of Nature" and Emerson, "Nature" (short version); Tintern Abbey?

Afternoon: Robert Chambers, Selection from *Vestiges of the Natural History of Creation*; Tennyson, "In Memoriam"

Day 4: "Nature as a Work in Progress II: The Darwinian Revolution" This session now engages us with the work that converted the *scientific* community to an evolutionary point of view which earlier evolutionary speculations did not. The day will devote the morning to the *Origin* and the afternoon to the *Descent of Man*.

Morning: Readings: Darwin, *Origin of Species* chps. 1-4, 6, 14

Afternoon: Readings: Darwin, *Descent of Man*, chps. 1-7

Day 5: The World as an Interconnected System

This session builds upon the "ecological" dimensions of Darwin's *Origin*, esp. chp. 3, but then also incorporates the elements of Romanticism that together give us the foundations of "ecology".

Morning: Readings: Thoreau, *Walden*, Something from John Muir

Afternoon: Readings: Something from Clements on ecosystems.

Day 6: Mastering Human Nature

In this session the aim is to see how the efforts to understand inheritance through physics and chemistry, initiated in the new “mechanistic” conception of life explored in Day 2, is developed into a reductive conception of life that extends to human inheritance.

Morning: Readings: Jacques Loeb, “The Mechanistic Conception of Life;” Erwin Schrödinger, *What is Life?* (1944).

Afternoon: Readings: The Watson Crick Papers; Film *Life Story* (on the Watson-Crick work); Readings on the Human Genome Project

Day 7: Understanding Scientific Change:

This pair of sessions will now look back over the issues raised in the first two years with an examination of the issue of scientific change and its interpretations:

Morning: Reading: Thomas Kuhn, *The Structure of Scientific Revolutions*

Afternoon: Interpretations and assessments of Kuhn: Readings from critics in *Gutting Paradigms and Revolutions*

Day 8: Reports by Teams on the integration of first year texts.

Day 9-10: Review of syllabi and projected integration of second year of texts.

Year 3: Location: University of Dallas
Technology, Art, Values, and the Problem of Technoscience
(syllabus subject to revision)

The sessions from this year will turn more explicitly to issues of technology, interpretations of scientific change, and assessment of the three-year program.

Day 1: Techne and Nature:

This session opens the workshop with a reflection on the relations of nature, science, and art, giving us both ancient and modern reflections on this issue.

Morning (Nature as a work of craftsmanship): Readings: Plato, Selections from *Timaeus* ; Galen, Selection on the Hand from *On the Usefulness of the Parts* ; Paley, selection from *Natural Theology*.

Afternoon (Nature as a craftsman): Readings: Aristotle, Selections from *Physics* Books II, VII . Aristotle, *Poetics* ; Goethe, *On the Metamorphosis of Plants*

Day 2: Seeing Art in Nature:

This session will look at the way in which the formal and the aesthetic can be seen within the scientific view of nature. It will also look more closely at art as actual art

Morning: Joshua Reynolds, 8th Discourse on Art (and also examination of Reynolds paintings); Svetlana Alpers, *The Art of Describing*

Afternoon: D’Arcy Thompson, *On Growth and Form* (this work integrates morphology, mathematics, and architecture in the examination of animal form)

Day 3: From Beauty to Mastery: Science and Technology (knowledge is power). This session is intended to develop the interrelation between the “magical” ideal of control and domination, and the scientific ideals of the new sciences. It will also introduce literary responses to the ideals of technological control.

Morning: Readings: Shakespeare, *The Tempest* (to give literary development of magical ideals); Bacon, selection from *Novum Organon*;

Afternoon: Swift, the flying island of Laputa from *Gulliver's Travels*; Rousseau, *Discourse on the Arts and Sciences*

Day 4: Using Art to Master Nature:

In this session we look at *techne* as a way of controlling and manipulating the natural. It will pick up some themes of Day 1, but move it in a different direction showing how human “art” can become manufacturing power that can either liberate or enslave human beings.

Morning: Readings: Ure, *The Philosophy of Manufacture*; Dickens, *Hard Times*

Afternoon: Readings: Marx, *Capital*, Book I.

Day 5: Technoscience Applied to Humanity: The Revolution in Biotechnology

Morning: Readings: Huxley, *Brave New World*;

Afternoon: Readings: Hans Jonas, *The Phenomenon of Life*; Film *Gattaca* and discussion.

Day 6: Understanding Technoscience and the Problems of Technology

This pair of sessions is devoted to a critical assessment of the relations of science and technological change.

Morning: Reading: Heidegger, *The Question Concerning Technology*

Afternoon: **Readings:** Bruno Latour, *Science in Action*; Pinch and Collins, some case histories from *The Golem*

Day 7: Relation of Humanities to Sciences: What do we conclude?

Day 8: Integration of Year 3's materials into core curricula.

Day 9: Lessons learned from humanities and science curriculum.

Day 10: Developing plans with participating institutions to spread insights and successes of project.