

**SCIENCE AND HUMAN NATURE – PHYSICAL SCIENCE
COR 402
FALL 2013 SYLLABUS**

COR402 - Science and Human Nature: Scientific Revolutions – Tuesday, Thursday 9:45-11:15 AM

Instructor: Dr. Rulison [Office G-318 (See office door for scheduled [office hours](#)), Phone 364-8409,
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Purpose: This core course investigates the practice of science by focusing specifically on scientific revolutions. It is during such periods of upheaval that we can most clearly see how science is actually practiced. What causes a new idea to challenge the scientific *status quo*? What determines whether the new idea will be accepted, or not? When seeking new explanations for natural events, what guides the scientist's search? What clouds the scientist's judgment regarding existing theories and rivals to his or her own contribution?

This scientific way of understanding, or knowing, our universe is distinct from other ways of knowing. By its very nature, scientific understanding is continually changing and evolving - it is provisional. The primary distinguishing characteristic of physical science is its reliance upon experimentation for the determination of scientific value, and for the resolution of conflicts among the practitioners of science. Central to the considerations of this course will be examination of the many facets of scientific investigation including the underlying assumptions, limitations, provisional nature, and power of the scientific process. The concurrent influences between the scientific enterprise and other areas of human activity will also be considered.

Modern western society is largely science-dominated, and the consideration of science and its role in society is essential for any educated person. Specifically, this course has two primary goals. The first is to equip the student with the necessary tools and background to seek answers to the questions posed above, and others, for such questions are increasingly a part of each of our lives if we live those lives reflectively. The vehicle we will use for our considerations is the ancient topic of cosmology, specifically the Copernican revolution and also the currently ongoing cosmological revolution. Thus, the second goal is to acquaint the student with the historical development of cosmological theories from those of the earliest human civilizations through to our present-day conception of the universe, as well as the influence that these changing cosmological theories have had on other aspects of civilization.

Texts: The Sleepwalkers by Arthur Koestler.

The Copernican Revolution by Thomas Kuhn.

The Book of the Cosmos edited by Dennis Danielson.

Alpha & Omega by Charles Seife.

Additional Readings will be distributed, and online readings will occasionally be used.

Prerequisites: None, although some basic algebra and geometry will be used from time to time, and familiarity with the content of other core courses is assumed.

Quizzes/Tests: There will be weekly reading quizzes beginning the week of August 27. These will be brief (~5 minutes) to encourage you to keep up with the course reading. The best 12 of these quiz grades will count toward your final grade. There will be a midterm exam. There will be a comprehensive final exam at 8:00 AM Thursday, December 12. **NO MAKE-UP QUIZZES / TESTS OR POSTPONEMENTS WILL BE GIVEN.**

Papers: There will be two papers assigned on topics relating to the history of cosmological thought and the Copernican revolution, and one paper on a topic dealing with modern cosmology. The schedule of topics and due dates will be distributed separately. Each paper will be approximately 5-7 pages in length.

In & Out Writing: From time to time I will ask you to respond to a question in class, or I may give you a question to respond to *briefly* to be turned in at the next class meeting or via the web.

Presentation: The class will be divided into 3-person groups. Each group will be assigned a topic to research and present. These presentations will be held in groups outside of class time. It will be your responsibility to attend one of these outside presentation sessions in addition to your own.

Extra Credit: You may earn up to 6 additional points toward your final grade in one of three ways. (1) You may write an additional paper on a topic, related to the course, of your choosing. (2) You may do a project and report on the project. I will provide a list of suggested projects, or you may suggest one of your own. (3) You may construct a web page dealing with a topic of your choice, related to the course. In each case the proposed paper, project, or web page must be approved by me, and the decision to pursue the extra credit must be made no later than October 17.

Class Attendance: Poor class attendance inevitably has a negative effect on learning. Simply reading the texts will not be sufficient to do well in this course. Some class time will be devoted to demonstrations or activities, for which there is no substitute. Therefore, class attendance is required. The student is responsible for all material and information covered in class (including changes of assignment and schedule). The class discussions will expand on, and clarify, the readings. You are allowed a maximum of three unexcused absences. Beginning with the fourth absence there will be a penalty of 3 points for each absence.

Dropping the Course: The course may be dropped with a grade of W through Thursday, October 31 (provided that the student's work to that point has been of passing quality). After that time the grade of W will be assigned only in the case of prolonged illness or withdrawal from the university.

Academic Honesty: Persons who come to Oglethorpe University for work and study join a community that is committed to high standards of academic honesty. The honor code contains the responsibilities we accept by becoming members of the community and the procedures we will follow should our commitment to honesty be questioned. The students, faculty and staff of Oglethorpe University expect each other to act with integrity in the academic endeavor they share. Members of the faculty expect that students complete work honestly and act toward them in ways consistent with that expectation. Students are expected to behave honorably in their academic work and are expected to insist on honest behavior from their peers.

Oglethorpe welcomes all who accept our principles of honest behavior. We believe that this code will enrich our years at the University and allow us to practice living in earnest the honorable, self-governed lives required of society's respected leaders.

Our honor code is an academic one. The code proscribes cheating in general terms and also in any of its several specialized sub-forms (including but not limited to plagiarism, lying, stealing and interacting fraudulently or disingenuously with the honor council). The Code defines cheating as "the umbrella under which all academic malfeasance falls. Cheating is any willful activity involving the use of deceit or fraud in order to attempt to secure an unfair academic advantage for oneself or others or to attempt to cause an unfair academic disadvantage to others. Cheating deprives persons of the opportunity for a fair and reasonable assessment of their own work and/or a fair comparative assessment between and among the work produced by members of a group. More broadly, cheating undermines our community's confidence in the honorable state to which we aspire."

The honor code applies to all behavior related to the academic enterprise. Thus, it extends beyond the boundaries of particular courses and classrooms *per se*, and yet it does not extend out of the academic realm into the purely social one.

Examples of cheating include but are not limited to:

- 1.1 The unauthorized possession or use of notes, texts, electronic devices (including, for example, computers and mobile phones), online materials or other such unauthorized materials/devices in fulfillment of course requirements.
- 1.2 Copying another person's work or participation in such an effort.
- 1.3 An attempt or participation in an attempt to fulfill the requirements of a course with work other than one's original work for that course.
- 1.4 Forging or deliberately misrepresenting data or results.
- 1.5 Obtaining or offering either for profit or free of charge materials one might submit (or has submitted) for academic credit. This includes uploading course materials to online sites devoted, in whole or in part, to aiding and abetting cheating under the guise of providing "study aids." There is no prohibition concerning uploading exemplars of one's work to one's personal website or to departmental, divisional, University or professional society websites for purposes of publicity, praise, examination or review by potential employers, graduate school admissions committees, etc.
- 1.6 Violating the specific directions concerning the operation of the honor code in relation to a particular assignment.
- 1.7 Making unauthorized copies of graded work for future distribution.
- 1.8 Claiming credit for a group project to which one did not contribute.

- 1.9 Plagiarism, which includes representing someone else’s words, ideas, data or original research as one’s own and in general failing to footnote or otherwise acknowledge the source of such work. One has the responsibility of avoiding plagiarism by taking adequate notes on reference materials (including material taken off the internet or other electronic sources) used in the preparation of reports, papers and other coursework.
- 1.10 Lying, such as: Lying about the reason for an absence to avoid a punitive attendance penalty or to receive an extension on an exam or on a paper’s due date; fraudulently obtaining Petrel Points by leaving an event soon after registering one’s attendance and without offering to surrender the associated Petrel Point, or by claiming fictitious attendance for oneself or another; forging or willfully being untruthful on documents related to the academic enterprise, such as on an application for an independent study or on a registration form.
- 1.11 Stealing, such as: Stealing another’s work so that he/she may not submit it or so that work can be illicitly shared; stealing reserve or other materials from the library; stealing devices and materials (such as computers, calculators, textbooks, notebooks and software) used in whole or in part to support the academic enterprise.
- 1.12 Fraudulent interaction on the part of students with the honor council, such as: Willfully refusing to testify after having been duly summoned; failing to appear to testify (barring a *bona fide* last-minute emergency) after having been duly summoned; testifying untruthfully.

Students pledge that they have completed assignments honestly by attaching the following statement to each piece of work submitted in partial fulfillment of the requirements for a course taken for academic credit:

“I pledge that I have acted honorably.” (Followed by the student’s signature)

The honor code is in force for every student who is enrolled (either full- or part-time) in any of the academic programs of Oglethorpe University at any given time. All cases of suspected academic dishonesty will be handled in accordance with the provisions established in this code. The honor council has sole jurisdiction in matters of suspected academic dishonesty. Alternative ways of dealing with cases of suspected academic fraud are prohibited. In cases of alleged academic dishonesty on the part of students, the honor council is the final arbiter.

GRADING

A.....90-100	(A-....90-93)	Quizzes	13%
B.....80-90	(B-....80-83,B+....87-90)	Papers	42%
C.....70-80	(C-....70-73,C+....77-80)	In & Out	8%
D.....60-70	(D+....67-70)	Midterm	12%
F.....0-60		Final Exam	15%
		Presentation	10%

		Total	100%

Note that Incomplete (I) is given only under the rarest of circumstances. Refer to section 5.2.21 of the 2012-2014 [Bulletin](#) for a summary of requirements.

**SCIENCE AND HUMAN NATURE
FALL 2013 SCHEDULE**

WEEK OF	TOPIC	READING
August 20	Ancient Cosmologies	Part 1 (SW) Ch. 1-3 (CR)
August 27	Pre-Socratic Ideas	
September 3	Plato and Aristotle	
September 10	Later Greeks through Ptolemy	
September 17	Middle/Dark Ages through Renaissance/Reformation	Part 2 (SW) Ch. 4 (CR)
September 24	Copernicus, Brahe, Kepler	Parts 3-4 (SW) Ch. 5-6 (CR)
October 1	Galileo, Descartes	
October 8	Newtonian Synthesis	Part 5 (SW) Ch. 7 (CR)
October 17	18 th and 19 th century Post-Newtonian Ideas	Ch. 1-2 (AO)
October 22	Geometry, Light, Atoms	Ch. 3 (AO)
October 29	The Dynamic Universe	Ch. 4-5 (AO)
November 5	Big Bang and Inflation	Ch. 6-7 (AO)
November 12	Big Bang and Inflation	Ch. 8-10 (AO)
November 19	Dark Matters, Whither the Universe	Ch. 11-12 (AO)
November 26	Other Possibilities	Ch. 13 (AO)
December 3	Looking Back, Looking Forward	

SW = The Sleepwalkers
CR = The Copernican Revolution
BC = The Book of the Cosmos
AO = Alpha & Omega

Common Texts:

Koestler, Arthur. 1959. *The Sleepwalkers: A History of Man's Changing Vision of the Universe.*

Kuhn, Thomas. 1957. *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought.*

Individual Text Selections:

- Seife, Charles. 2003. *Alpha & Omega.*
- Danielson, Dennis (Ed.). 2000. *The Book of the Cosmos.*
(See list of authors following)

Torah, Sacred Poetry, Apocrypha, New Testament

Heraclitus and Parmenides

Empedocles and Anaxagorus

Leucippus, Democritus, Epicurus, Lucretius

Plat

Aristotle

Aristarchus and Archimedes

Eratosthenes

Cicero

Plutarch

Ptolemy

Proclus

Martianus Capella and Boethius

Moses Maimonides

Dante Alighieri

Nicole Oresme

Nicholas Cusanus

Nicholas Copernicus

Fernand Hallyn and Thomas Kuhn

John Calvin and Johannes Kepler

Tycho Brahe

Thomas Digges

Giordano Bruno

Galileo Galilei

Samuel Edgerton

Johannes Kepler

Tommaso Campanella

Robert Burton

John Wilkins

René Descartes

Blaise Pascal

John Milton

Bernard le Bouvier de Fontenelle and Aphra Behn

Isaac Newton

Richard Bentley

Christiaan Huygens

William Derham

Gottfried Wilhelm Leibniz and Samuel Clarke

Edmond Halley and "Astrophilus"

Cotton Mather

Thomas Wright of Durham

Immanuel Kant

Johann Heinrich Lambert

William Herschel

Pierre Simon Laplace

William Paley

H.W.M. Olbers

Mary Fairfax Somerville

Alexander von Humboldt

Edgar Allen Poe

Maria Mitchell

William Huggins

Agnes Mary Clerke

Giovanni Schiaparelli and Percival Lowell

G.H. Darwin

G.K. Chesterton

Robert Osserman

Albert Einstein

Richard Feynman

John Archibald Wheeler

Annie Jump Cannon

Cecilia Payne-Gaposchkin

George Bernard Shaw

Edwin Hubble

Arthur Eddington

Georges Édouard Lemaître

Fred Hoyle

Werner Gitt

Arthur C. Clarke

Hans Blumenberg

James Lovelock

Steven Weinberg

John Barrow and Frank Tipler

Stephen Hawking

Kitty Ferguson

George Smoot

Martin Rees

Lee Smolin

Alan Guth

David Berlinski

Vera Rubin

Freeman Dyson and Brian Greene

John S. Lewis

Paul Davies

Owen Gingerich