THE CATHOLIC UNIVERSITY OF AMERICA  
SCHOOL OF PHILOSOPHY  

Phil. 329: Science, Nature and Human nature  

Fall 2008

Credit hours: 3  
Prerequisite: Phil. 201-202

T-Th 9:35-10:50  
Classroom O'Boyle 109  
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Course Description: The major theme of this course is the impact of modern natural science on the way we understand ourselves. In order to get at this, we must study a debate in the history of philosophy and in contemporary science: unity of science based on Method versus plurality of sciences based on Kinds of being; or the homogeneity of laws versus the heterogeneity of kinds. The human kind is the most important, i.e., most in need of being correctly understood and rightly disposed, because our species—unlike any other—has unlimited capacity to run amok.

Instructional Method: Old-fashioned: the teacher presents (in class), and all discuss, the course material.

Required Texts and Reading Materials, to be handed out in class:  
Packet of lecture notes, “Phil. 329: On Science, Nature and Human Nature,” $7.00  
Excerpts from Einstein and Infeld, The Evolution of Physics.  
A selection, based on student needs and interests in each semester, of:  
Excerpts from N. D. Mermin, Space and Time in Special Relativity.  
Excerpts from Schroedinger, What is Life? and Mind and Matter.  
Excerpts from Richard Lewontin, The Triple Helix.

Course Goals: (1) To provide the student with an understanding of the development of natural science from its 17th-century origins against the background of the premodern tradition. (2) To provide the student with a critical sense of the range and limitations of natural science, i.e., with the ability to judge knowledgeably what science truly says about nature and human nature, and what are exaggerated claims unwarranted by the scientific results.
Goals for Student Learning: (1) To learn that, in the present lamentable clash between zealous proponents of science and zealous proponents of religion, there is a middle way, that of unassisted reason in the form of philosophy and prescientific knowledge. (2) To appreciate the importance and the difficulty of doing justice to both the biological rootedness of our nature and the distinctively and irreducibly human. (3) To be able to give at least one serious argument against each side in the fundamental debate between unity of science and plurality of sciences.

Course Requirements: Two midterm examinations and a final examination. A short internet project consisting of downloading, succinctly summarizing, and evaluating current findings and claims in particular scientific specialties that impinge on human self-understanding, e.g., brain plasticity, synthetic biology, aging science, evolutionary psychology.

Expectations and Policies

Academic honesty: Academic honesty is expected of all CUA students. Faculty are required to initiate the imposition of sanctions when they find violations of academic honesty, such as plagiarism, improper use of a student’s own work, cheating, and fabrication. The following sanctions are presented in the University procedures related to Student Academic Dishonesty: “The presumed sanction for undergraduate students for academic dishonesty will be failure for the course. There may be circumstances, however, where, perhaps because of an undergraduate student’s past record, a more serious sanction, such as suspension or expulsion, would be appropriate. In the context of graduate studies, the expectations for academic honesty are greater, and therefore the presumed sanction for dishonesty is likely to be more severe, e.g., expulsion. ...In the more unusual case, mitigating circumstances may exist that would warrant a lesser sanction than the presumed sanction.” (Quotation from http://policies.cua.edu/academicundergrad/integrityprocedures.cfm). Please review the complete texts of the University policy and procedures regarding Student Academic Dishonesty, including requirements for appeals, at http://policies.cua.edu/academicundergrad/integrity.cfm and http://policies.cua.edu/academicundergrad/integrity.cfm.

Other Policies or Expectations: Attendance in class is necessary for understanding this material, which is unfamiliar, strange, and, often, does not come into focus until the end of the term—despite the simplicity of the basic idea. Asking questions and thereby contributing to classroom discussion benefits everybody; I (the teacher) like it especially. Greater weight is, of course, given to the final examination in comparison to the midterms. Please turn off cell phones while in class.

Accommodations for students with disabilities: Any student who feels s/he may need an accommodation based on the impact of a disability should contact the instructor privately to discuss specific needs. Please contact Disability Support
Services (at 202 319-5211, room 207 Pryzbyla Center) to coordinate reasonable accommodations for students with documented disabilities. To read about the services and policies, please visit the website: http://disabilitysupport.cua.edu.

**Assessment:** Examinations are graded on a curve, i.e., relative to the performance of the class as a whole in each semester. (This is not ideal but is probably less unfair than an absolute grading scale.) The relative weighting of the grade components is typically .25Test1 + .25Test2 + .40Final + .10Project.

**University grades:**
The University grading system is available at [http://policies.cua.edu/academicundergrad//gradesfull.cfm#II](http://policies.cua.edu/academicundergrad//gradesfull.cfm#II) for undergraduates and [http://policies.cua.edu/academicgrad//gradesfull.cfm#iii](http://policies.cua.edu/academicgrad//gradesfull.cfm#iii) for graduate students. Course grades are available at the end of each term on [http://cardinalstation.cua.edu](http://cardinalstation.cua.edu).

**Course Plan and Schedule:**

Numbers on the right refer to pages from Einstein and Infeld, and to pages of the appendix of the course packet (a collection of quotations from the history of philosophy and natural science).

### I Scientific and Nonscientific

E&I, 3-5

On the scope and limitations of science: is science comprehensive or partial? The problem of self-reference.

A hallmark of modern science: unification of different classes of phenomena. How science is like a mystery story.

“Searching for Simple Rules of Complexity”

A1

Some characteristics of physics. Issue: simplicity of mathematics versus comprehensiveness of knowledge.

From Galileo to Einstein: three centuries of “simplicity” in scientific reasoning.

A2-A3

From physics to natural science generally: what is modern science?

Demarcation; rough consensus on hypothetico-deductive method and falsifiability.

Scientific versus prescientific knowledge.

Madison, *Federalist* 10, on opinionated factions.

A4

Aristotle, *Politics* 4.11, on the ethical qualities of the middle class.

A5

What is mathematizable and extra-mathematical?

Two kinds of explanatory terms: the common and the specific.

Spinoza, *Ethics* 2.37, on common properties; Aristotle, *Politics* 1.2, on the human specific difference.

A6

Holism and reductionism.

Kant and Hegel on the organic.

A7
**II  The Mechanical View and Alternatives**

Newton, *Principia*, Laws of Motion.  
A8

Law of gravitation and solar system. Cosmic design or blind watchmaker?  
Newton, from the General Scholium to the *Principia*.  
A8  
Aristotle, Pascal, Nietzsche, F. J. Dyson on purpose and indifference in nature.  
A9

Anthropic principle and many-worlds cosmology.

Reductionism and classical determinism.  
Newton, *Principia*, First Preface, the grand analogy.  
A10  
Newton and Laplace on universal reductionist determinism.  
A10  
Descartes, Spinoza, Newton on the malleability of forms.  
A11

Significance of the mechanical view in the history and philosophy of science.

Implications of the mechanical view: what price do we pay for conceiving nature as particles and forces?  
Helmholtz on the complete comprehensibility of nature.  
A10

A contrasting account: nature as form and matter.  
Aristotle, *Physics* 1.2, on the definition of nature.  
A12

Comparison with Newton’s law of gravitation (two types of intelligibility in nature).

Classical and (a little bit of) quantum physics: a major difference between them.  
Bohr and Heisenberg, against Newton’s grand analogy.  
A13

Comparison of three accounts of nature: the mechanical view, form and matter, quantum physics.

**III  Being “scientific” in the account of human things.**

Contemporary examples of scientific approaches to human problems.  
“Science and Sensitivity.”  
A14-A15  
“Living Within One’s Genes.”  
A16  
Roger Masters on the refrigerator as a divorce-maker.  
A17  
“Children Face Developmental Risks.”  
A18  
Report on developmental neurobiology (human specific difference scientifically grounded)

**IV  Electricity and Magnetism**

Odd experiments with electroscopes.

Electromagnetic phenomena (time permitting).  
Baconian science: nature vexed, nature mastered.  
Bacon and Descartes on the mastery of nature.  
A19-A20
Reunion with Newton’s First Preface: forces, particles, laws; experiment and transformation. The moral-political problem of “enjoyment without pain.”

Review: Unity of science based on Method versus plurality of sciences (and prescientific knowledge) based on Kinds of being. Two opposed conceptions of science, nature and human nature.

Last class: Th Dec. 4

Final examination: T Dec 9, 8:00-10:00am
“The final exam must be given on the day and time assigned by the Registrar. Final examinations must be administered in the final examination period. Please plan accordingly for travel, work or appointments” (Office of the Provost).