Course I (Fall 2014): History of the Rise and Development of the Natural Sciences

Course II (Spring 2015): Philosophy of Nature and the Modern Empirical Sciences

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Lecture Location/Times: [TBD] / fifteen lectures on Wednesdays, 16:00-17:30 (17 Sept – 24 Dec 2014)

General Description: This two-course sequence examines, largely from the perspective of an Aristotelian-Thomist philosophy of nature, the modern empirical sciences (MESs) as a form of human knowledge and as an intellectual virtue by examining their historical development, roots in Christian faith understood as animating philosophical and theological principles, methodological epistemology, institutional loci and commitments. The courses also provide a survey of the major areas studied by the MESs (including drawing careful distinctions between the formal and material objects the various sciences study) and what scientists actually do on a day-to-day level. Throughout the two courses we will examine (with case studies) interpretations of scientific findings, including but not limited to the following:

1. The Five Ways of St. Thomas Aquinas,
2. Creationism, Intelligent Design, and Neo-Darwinism,
3. The Mind-Brain and Artificial Intelligence debates,
4. Quantum Mechanics, Relativity, and Cosmology,

Objectives of the Courses:

1. To obtain factual knowledge: (a) understanding the major areas investigated by the MESs, (b) understanding some of the main principles, theories, and laws of the MESs, (c) understanding the historical and cultural development of the MESs including the philosophical principles and Christian ideas upon which the MESs depend;

2. To gain a broader understanding and appreciation of the MESs: to instill an appreciation of observation, science, and the scientific method as means for investigating the world and to see science as a developing discipline requiring constant study that values honesty, verification, and truth.

3. To broaden support for the natural sciences by: (a) properly locating the natural sciences within speculative knowledge in the search for truth, so that (b) students are intellectually well-equipped and confident to face head on reductionist interpretations of the findings of the natural sciences.

Course I Content:

1. Philosophy of nature in Ancient Greece: the conceptualizations of (in particular) change, substance, and mathematics
2. Contributions of the early Church Fathers
3. The role of western (Roman) Catholic institutions in medieval intellectual development: the catharsis of debilitating ideas and fertilization of the mind with a realist philosophical basis and Christian worldview
4. The rise of the palace schools and (later) the universities
5. The role of Medieval Scholasticism (including prominent figures)
6. Why science was stillborn in ancient and medieval cultures except in the unique Context of western (Roman Catholic) Europe, from which it arose as an intellectual virtue and self-sustaining human endeavor

Relevance to UCU Mission: [TBD] These courses strive to support of the mission of the Ukrainian Catholic University through…
Course I Required Texts:


NOTA BENE I: You are not required to purchase these texts: they will be made available online to download as pdf files. You may print them, although it is recommend you download the files to an iPad, Kindle, Nook or electronic reader of your choice that supports annotation functions (bookmark, underline, etc.). Additional handout readings will be posted/distributed as required.

NOTA BENE II: PowerPoint presentations will form the basis for all lectures and will be made available online to students prior to the actual reading of the lectures. Students are encouraged to print the lectures and to use them for note-taking purposes in class.

Suggested References: Please refer to the Bibliography below

Schedule of Readings: [TBD] Other readings will be distributed as required. Course schedule forthcoming.

Assessment & Grading: [TBD]

Relevant Quotes:

*Life is served by the sciences, it is governed by wisdom.* (Seneca; Epistulae)

..., but Thou hast ordered all things in measure, and number, and weight. For great power always belonged to Thee alone: and who shall resist the strength of Thy arm? (Wisdom of Solomon 11:21f-22)

The scientist does not study nature because it is useful; he studies it because he delights in it, and he delights in it because it is beautiful. If nature were not beautiful, it would not be worth knowing, and if nature were not worth knowing, life would not be worth living. (Henri Poincaré, French mathematician and physicist)

Science can purify religion from error and superstition. Religion can purify science from idolatry and false absolutes. (Saint Pope John Paul II)

The heavens declare the glory of God, and the firmament proclaims His handiwork. (Psalm 19:1)

Who hath measured the waters in the hollow of his hand, and meted out heaven with the span, and comprehended the dust of the earth in a measure, and weighed the mountains in scales, and the hills in a balance? (Isaiah 40:12)

... scientific achievements proclaim the dignity of the human being and greatly clarify man's unique role in the universe. (Saint Pope John Paul II, “Science and human values”)

We regard promissory materialism as superstition without a rational foundation. The more we discover about the brain, the more clearly do we distinguish between the brain events and the mental phenomena, and the more wonderful do both the brain events and the mental phenomena become. Promissory materialism is simply a religious belief held by dogmatic materialists... who often confuse their religion with their science. (John C. Eccles, The Wonder of Being Human: Our Brain and Our Mind)
Bibliography:


_______, Commentary on Aristotle’s De Anima; Commentary on the Sentences; Commentary on Aristotle’s Metaphysics; Commentary on Aristotle’s Physics; De principiis naturae; De Trinitate Boethii; Summa Theologica; Summa Contra Gentiles (all available online at www.josephkenny.joyeurs.com, see also www.newadvent.org).


Aristotle: essentially all works available online at www.classics.mit.edu/Browse/brose-Aristotle.html.


Augros, Michael, “Reconciling Science with Natural Philosophy,” The Thomist 68 (2004): 105-41


De Wulf, Maurice, History of Medieval Philosophy (http://www2.nd.edu/Departments/Maritain/etext/homp.htm).


Gilson, Etienne, God and Philosophy (Yale University Press, 2e: New Haven, 2002).


_______, The Unity of Philosophical Experience (Ignatius Press: San Francisco, 1999).


McInerny, Ralph, *Studies in Analogy* (available online at http://www2.nd.edu/Departments/Maritain/etext/SIA.htm)

McInerny, Ralph, *The Logic of Analogy* (available online at http://www2.nd.edu/Departments/Maritain/etext/LOA.htm).


Ante Studium
(a prayer of St. Thomas Aquinas before studies)

Ineffable Creator,

From the treasures of your wisdom,
You have established
three hierarchies of angels,
have arrayed them in marvelous order
above the fiery heavens,
and have marshaled the regions
of the universe with such artful skill:

You are proclaimed
the true font of light and wisdom,
and the true origin
raised high beyond all things.

Pour forth a ray of Your brightness
into the darkened places of my mind;
disperse from my soul the twofold darkness
into which I was born:
sin and ignorance.

You make eloquent the tongues of infants.
Refine my speech
and pour forth upon my lips
the goodness of Your blessing.

Grant to me
keenness of mind,
capacity of remembering,
skill in learning,
subtlety in interpreting,
and eloquence in speaking.

May You guide the beginning of my work,
direct its progress,
and bring it to completion.

You are true God and true Man,
and You live and reign, world without end.

Amen.

Creator ineffábilis,

qui de thesáuris sapiéntiæ tuæ
tres Angelórum hierarchías designásti
et eas super cælum empýreum
miro órdine collocásti,
atque univérsi partes
elegantíssime distribuísti:

Tu, inquam,
qui verus fons lúminis
et sapiéntiæ díceris
ac superéminens princípiu.

Infúndere dignéris
super intelléctus mei ténebras
tuæ rádium claritátis,
dúplices, in quibus natus sum,
a me rémovens ténebras,
peccátum scílicet et ignorántiam.

Tu, qui linguas infantium facis disértas,
linguam meam erudias
atque in lábiis meis gratiam
tuæ benedictiónis infúndas.

Da mihi
intelligéndi acúmen,
retinéndi capacitátem,
addiscéndi modum et facilitátem,
interpretándi subtilitátem,
loquéndi grátiam copiósam.

Ingréssum ínstruas,
progréssum dirigas,
egréssum cómpleas.

Tu, qui es verus Deus et Homo,
qui vivis et regnas in sǽcula sǽculórum.

Amen.
Course Rationale
(to be read prior to the first lecture on 17 September 2014)

A dominant “value” modern society incessantly impresses upon people is that technological and scientific progress are almost unquestionable goods: a certain scientistic triumphalism trumps even the philosophical basis upon which the fundamental principles of the modern empirical sciences (MESs) were so painstakingly developed in Western (Roman Catholic) Europe during the Middle Ages.

In today’s world it is almost unquestioningly accepted that if something is not “scientifically verifiable” or “measurable” (such as “beauty,” “personhood,” “wisdom,” “virtue,” “substance,” “dignity,” etc.) it count not as “real” knowledge and the “existence” of such things is deemed (at best) irrelevant. Purpose, meaning, moral categories, human free will, and dignity are ostensibly “scientifically” argued away. In fact, the real problem is flawed “philosophical” (read: “scientistic”) interpretations are imposed upon scientific discoveries. This is ironic since science is itself a deeply teleological (that is, purposeful) endeavor intentionally directed at seeking the truth of the world about us, and even the secular scientific establishment demands moral accountability in scientific research.

Perhaps this should not surprise us for we live in a culture saturated with science and powerful technological applications. We pay an overly-high tribute to modern science while other forms of intellectual inquiry strive label themselves “scientific” when, in fact, their mode of inquiry is not modern-scientific in either methodology or goal. But this is precisely the thinking behind those who gripe “why can’t philosophy and the other humanities be more like science?” In our everyday language, for example, we habitually employ the adjective “scientific” as a synonym for “true,” “excellent,” “dependable,” etc.

Modernity believes in progress, and society’s idolization of scientific progress as the solution to our problems bolsters the “culture of death” and its nihilistic backdrop. We swim in a sea of technological wonders and instant access to information, and wonder why these wonders make us—to echo Mother Teresa’s sentiments—even more unsure of who we are, even more afraid. Our very identity as human beings—what it means to be human in the light of the Incarnation—is incessantly offered the forbidden Hobbesian fruit of a utilitarian triumph over Nature, perhaps hardening our hearts even more than Pharaoh’s—utterly expunging charity and humility in exchange for power and efficiency.

The unequivocal admiration for (if not idolization of) technological wonders, that borders on worship of industrialization and the size of human construction as a mark of progress is, in fact, a profoundly Stalinist telos. Whereas Stalinist iconography would plant a sea of high-tension wires and a giant chimneys belching black smoke (while tromping under foot tens of millions of victims of multiple famines and political purges), technological iconography celebrates the elevation of personal isolationism through i-gadgets, genetic manipulation of, experimentation upon, and ultimately removal of those unborn “inconveniences.” Technological progressives are to the “transhumanists” or self-proclaimed “brights” what Stakhanovites were to Stalin: both saw nature as an enemy, something to be beaten into submission... and for human nature itself not to be perfected in grace and wisdom but manipulated in a lust for power, fame, and superficial beauty. The Greek philosophers of nature listened to nature to learn her secrets; today’s physicists rip her to shreds in the Large Hadron Collider.

Is it not morally suspect to credit science with all the wonderful gadgets that provide us with a level of material comfort and well-being unknown to even kings of earlier periods, while at the same time neglecting to assign a share of responsibility for Auschwitz and Hiroshima—not to mention all those wonderfully efficient technologies that allow us to dispose of those who inconvenience us so, e.g., the unborn and the infirm? Is it any wonder that secular scientists increasingly view human beings as mere objects for experimental research—with cloning and embryonic stem cell research as only two examples? The more we subdue and master nature, the more we seem to forget the Lord who gave us the earth and all the good things it contains. Indeed, it appears Mark 8:36 may ring more true today than possibly ever before.

Who ceded to modern science an entitlement to determine what counts as knowledge and a green-light to conduct scientific research—as much as practically possible—unfettered with ethical concerns? The answer is complex... and we should take care not to permit such an investigation to negatively reflect upon the knowledge and unquestionably good things which the MESs and technological progress have provided humankind.

Without a doubt, in this light it is important to understand the pedagogical formation of students in the context of (1) how the sciences are perceived and valued by society at large, (2) how they are taught starting from the high school level, and (3) what intellectual building-blocks are missing in a student’s intellectual formation. While the first part is clear, the latter two are more difficult, and yet must be understood and corrected to counter—if not turn back—the encroachment of a pure-MES mindset into other fields of intellectual inquiry. The MESs are not the epistemological arbiters of human knowledge (otherwise known as scientism), so the proper intellectual and spiritual formation of all students (to the extent possible and not limited to science majors) is crucial t restoring a healthy balance to faith and reason as envisioned by Pope John Paul II of Blessed Memory and as strongly supported by the Holy Father, Pope Benedict XVI—the latter who wisely observed in his speech to Catholic Education at Catholic University of America (17 April 2008):
With regard to the educational forum, the diakonia of truth takes on a heightened significance in societies where secularist ideology drives a wedge between truth and faith. This division has led to a tendency to equate truth with knowledge and to adopt a positivistic mentality which, in rejecting metaphysics, denies the foundations of faith and rejects the need for a moral vision. Truth means more than knowledge: knowing the truth leads us to discover the good. Truth speaks to the individual in his or her entirety, inviting us to respond with our whole being. This optimistic vision is found in our Christian faith because such faith has been granted the vision of the Logos, God’s creative Reason, which in the Incarnation, is revealed as Goodness itself. Far from being just a communication of factual data—“informative”—the loving truth of the Gospel is creative and life-changing—“performative” (cf. Spe Salvi, 2). With confidence, Christian educators can liberate the young from the limits of positivism and awaken receptivity to the truth, to God and his goodness. In this way you will also help to form their conscience which, enriched by faith, opens a sure path to inner peace and to respect for others.

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In their book A Meaningful World, Benjamin Wiker and Jonathan Witt correctly note:

“All men desire to know,” is the opening line in Aristotle’s Metaphysics. We are rational animals—we cannot not want to know, for it part of our very nature to know. The truth about human nature is that humans take immense joy in knowing for its own sake. Indeed, the scholar’s intellectual exhilaration often increases the further the object is removed from considerations of our animal existence.

But knowing by itself is not enough. Knowing must be ordered to the truth, and our minds and hearts must also be ordered to truth. The utility of science is technological or productive. It builds bridges and cures diseases… and this is good. But scientific knowledge can also… be used to bomb bridges and to scatter disease on the winds. Science gives us atomic or thermonuclear energy for constructive or destructive purposes, but it does not tell us whether to make peace or war, or how to govern a just and free society, or how men can become wise and happy after they have been made powerful and comfortable.

Unfortunately, at the grade school level—from the moment students are first exposed to the modern empirical sciences—certain prejudices and misleading intellectual habits are introduced and reinforced that make it difficult for students to then correctly situate the MESs within a richer framework for mature intellectual inquiry. This, in turn, skews a proper anthropological, philosophical, moral, and spiritual understanding of the human person to fit a modernist-pragmatist vision which takes advantage of technique, scientific and technological progress, and certain politically-fashionable ideas to, among other things, sacrifice the weakest members of society to the whims of the strongest. Moreover, those who seek certain limits on scientific “freedom” for ethical reasons are, more often than not, dubbed irrational fanatics.

The secular scientific establishment has thus lost sight of the fact that the methods of the MESs cannot vindicate the ends of science, and the knowledge acquired by the MESs cannot always justify the particular research used to acquire it. (Who can reasonably doubt that what we can do ought not by itself determine what we choose to do? Aren’t most secular scientists at the forefront of decrying the use of nuclear weapons, even while we continue to improve them and their means of delivery?) As a result, we end up with the dangerous irony that while the MESs can have no say as to the moral content of particular research, secular scientists apparently have no qualms in claiming experimentation upon human embryos is “good”—with much of our society absorbing, almost without question, this grave error.

Science textbooks at both the high school and undergraduate levels frequently begin with what is more remote and obscure from everyday experience (cells in biology, atoms in chemistry) and then attempt to build back up to the things that students can actually experience (living things, common substances). In physics, where more common things are typically dealt with in terms of the laws of motion, the analytic and predictive tools of mathematical physics are promoted without being properly situated as a very powerful yet highly reductive kind of knowledge of things and their natures, powers, and activities. For example, the mathematical formalisms employed by physics (whether in their familiar Newtonian or esoteric quantum-mechanical forms), rather than correctly understood as abstractions that leave much of reality behind in order to gain a descriptive efficacy of the physical phenomena observed, are illicitly attributed ontological significance. The equations themselves are seen as actualizing reality, and in the case of quantum mechanics, reality itself is imputed with an essential “randomness” (violating the ontological Principle of Sufficient Cause) simply because the equations employed (correlated from observations with inherent epistemological limitations) are cast in the form of probability functions.

Fundamentally-important philosophical concepts are glossed over or even ignored, such as the notion of (all things being equal) “laws” that only become intelligible under the artificial conditions of an experimental apparatus. This strongly reinforces a kind of neo-Gnostic quality of scientific materialism that the knowledge gained by the MESs is somehow understood as the “really real” aspect of reality lying beneath and obscuring an illusory “mask” that is the world of common experience. As examples:
(1) human beings are portrayed merely as complex collections of roughly $5 \times 10^{28}$ atoms—stripping any meaning from the term “personhood”;

(2) altruism and dignity are reduced to a neo-Darwinian mechanism geared solely to the survival of the species, allegedly captured as complex patterns of electrochemical signals neural synapses observable as patterns on magnetic resonance imaging or positron-emission tomography equipment—hence reducing the immaterial mind to the material brain;

(3) relative sizes and distances of particles at the quantum level are used to project a (flawed) image of material beings (including ourselves) as mostly empty space—thus reinforcing an already increasing nihilistic view of reality;

(4) non sequiturs are drawn that equivocate the ontological statuses of chimpanzees and humans merely on the basis that chimpanzees share upwards of 98.5% of their genes sequences with humans.

These examples (of which there are many more), as well as the disordered understanding of the place of the MESs in intellectual inquiry, lead to profound misunderstandings about the nature and limits of knowledge gained by the MESs, and create intellectual habits that are very hard to break later on in the professional world as well as in general throughout modern society.

A well-ordered pedagogical approach must be geared to understanding fundamentally important issues such as the order of knowledge (how the mind always moves from the better known to the less known), the fact that science studies what can be known as individually existing and unified things (substance), the fact that scientific knowledge is not about things in their particularity and individuality but rather in the characteristics and properties that are true of all things of that sort (essence), the fact that things have both structure and organization (form/act) as well as material components and tendencies (matter/potency), the fact that things have intrinsic powers and capacities (per their natures) and tend to act in the same way under the same circumstances (potency/act/teleology), and so forth.

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The highly organized forms of knowledge we call the natural sciences—more precisely, the modern empirical sciences (MESs)—focus their investigations upon specific kinds of material objects (“material” from the perspective of logic) delimited by the particular subject matter (i.e., “formal” object). Physics studies matter in motion (not “mobile being” or “natures” which are the subject matters of a realist philosophy of nature) by modeling physical “objects” according to mathematical and mechanical rules and employing terms such as force, energy, mass, charge, etc. Similarly, chemistry is concerned with the composition, structure, and properties of matter, as well as the changes matter undergoes during chemical reactions; biology studies living things—examining their structures, functions, growth, origin, distribution and classification.

**An understanding of the physical world as accessible through the modern empirical sciences is fundamental for us in order to reason to verities inaccessible to the five primary senses**... or, as Aristotle and St. Thomas Aquinas correctly teach us: while all our knowledge of the real (extra-mental) world comes through the senses, not all knowledge is sensory knowledge (Ps 19:1, Wis 13:1, Fides et ratio): nihil in intellectu nisi prius in sensu (nothing in the intellect unless first in the senses). Scientific knowledge of the real world is most fundamental to us... but it is neither the only nor the most important form of knowledge.

To understand the efficacy of scientific investigations of the natural world and the importance of the natural sciences for their utility as well as intellectual formation, and at the same time to understand the limitations of the natural sciences as well as the great potential for their misuse to serve less than noble goals, one must have a prior understanding of the historical, philosophical, religious, institutional, and methodological development of the natural sciences. These courses will strive to:

(1) present the broad historical development of the MESs as arising from the medieval Catholic universities and scholastic thinkers,

(2) compare and contrast various debilitating notions and ideas in other cultures that prevented the MESs from developing as a self-sustaining human endeavor in those cultures,

(3) acquaint students with the content and methods of the MESs,

(4) provide an overview of the disciplines and areas of study of the natural sciences—concentrating primarily on the basics of physics with application to other scientific areas.

(5) from the perspective of an Aristotelian-Thomistic philosophy of nature locate the MESs in proper context and relation to each other as well as to other intellectual disciplines,

(6) survey the most well-known interpretations and controversies of scientific findings, and understand their implications for continued development of science and for human society.