2017 HSS ANNUAL MEETING
Toronto, Ontario 9-12 November 2017

PANEL

PRE-MODERN EXPERIENCES AND THE LIMITS OF SCIENCE

Our knowing is limited by physical and cognitive boundaries such as corporeal matter, individual particularity, natural exceptionality, and human reason. The history of science may be viewed as the progressive evasion of these limits through the formulation of theories and the creation of speculative and technical instruments that made possible a deep comprehension of reality that regularly transcended the reaches of sense experience and reason. This panel presents four examples of how, in the pre-modern period, a progressive liberation from the limits of knowing laid the basis for the emancipation of different disciplines and inventions. At the same time, the continuity of questions on the limits of experience, knowledge, and science is accompanied by processes of discontinuity or even fracture in dense histories of opposing paradigms, contrasting perspectives, and tacit revolutions paving the road to the trailblazing developments which ranged from the telescope and the microscope to the discovery of new life worlds in the Americas and East Asia. Vincenzo Carlotta will illustrate how ancient alchemical explanations challenged philosophical paradigms and fashioned new knowledge of ultimate structures of reality in a longue-durée history. Yehuda Halper will portray how conceding the limits of metaphysics instigated a turn to the Aristotelian physical sciences and the questioning and rethinking their very foundations. Katja Krause will illustrate how novel connections between the medieval disciplines of medicine and zoology reshaped knowledge of the living body well into the Renaissance. Nicola Polloni will discuss how medieval shifts in conceptions of prime matter moulded Early Modern mathematizations of physics.

*
* *

‘Science’ of the Elements?
Theory and Practice in Stephanus’ Alchemical Works

VINCENZO CARLOTTA
Humboldt Universität Berlin

Greco-Egyptian and Byzantine alchemists called themselves ‘philosophers’ and some of them were even committed to placing their own discipline within the broader framework offered by the philosophers of their times. Yet whether this meant that these alchemists were truly successful in harmonizing their discipline with the contemporary speculation on nature remains to be addressed: Was ancient alchemy primarily conceived of as a science, namely as a branch of philosophy, or as a discipline in its own right? To what extent was the theoretical foundation of alchemy influenced by the practices of alchemy? Although many different approaches were displayed by Greek alchemists in

reply to these questions, the alchemical works – falsely or not – attributed to Stephanus of Alexandria (6th-7th c. CE) present a particularly interesting case. He explained alchemical transmutations by making a synthesis of the Platonic theory of the geometric structure of the elements on the one hand and Aristotle's analysis of metals as mixtures of two different exhalations on the other. Thus, Stephanus proposed his own definition of the ultimate constituents of the physical substances, and questioned the structure, role, and properties of the four traditional elements of philosophical physics. Stephanus' discussion of these fundamental aspects of reality within an alchemical context offered a new explanation of nature, whose elaboration requires to be clarified. The purpose of my paper is to begin to shed light on the ambiguous definition of Greek alchemy by considering Stephanus' exciting case in its own right, and by thinking about its potentially long-term implications.

*
* *

No Science of the Divine?
The Turn to the Physical Sciences in Late Medieval Jewish Thought

YEHUDA HALPER
Bar Ilan University

Like their Christian and Muslim counterparts, medieval Jewish Aristotelians understood the *Metaphysics* to contain or at least point to the most complete human understanding of God. Accordingly, many scholars from all three traditions took metaphysics to be the chief science and the ultimate goal of all scientific undertaking. Yet despite this exalted status, the prevailing attitude in Hebrew discussions was that its attainment by humans is quite limited. Thus, we find relatively few Hebrew commentaries on Aristotle's *Metaphysics*, and detailed discussions of its contents in other contexts are much rarer than we might expect. This attitude may be due to Moses Maimonides, the most important Jewish medieval thinker, whose *Guide of the Perplexed* focuses, *inter alia*, on the limitations of human knowledge of the divine. Following Alfarabi, Maimonides and many other Jewish thinkers saw the human scientific endeavour as reaching its peak in political science or a science of the Law, a view that colluded well with Rabbinic and Talmudic approaches to study and learning. Other thinkers took the limitations of metaphysics as a spur to study physics and astronomy, the "second best" sciences which were considered necessary preconditions for the study of metaphysics. Here we shall examine two such thinkers, Levi Gersonides (1288–1344) and Hasdai Crescas (1340-1411), who turned to physics because of the limitations of metaphysics. Yet such limitations also called into question basic principles of natural science, leading them to re-examine those basic principles as well.

*
* *

A Science of the Living Body? Knowledge of Animals and Humans from Albert the Great to Konrad Gessner

KATJA KRAUSE
Durham University / Harvard Divinity School

Can animals be known scientifically? The Latin medieval sage, Albert the Great, was deeply committed to providing a positive answer to this question. In 1251, he presented a comprehensive natural scientific programme to the Latin West for the first time, which built upon, but went well beyond, the *corpus Aristotelicum*. In his *Physics*, Albert insisted that all natural sciences be studied in the proper order, and he assigned the study of animals its righteous place among them as "the completion of the natural sciences." Yet when he finally commented on the Stagirite's *De animalibus* in the early 1260s, Albert went well beyond Aristotle's text. For in Albert's eyes, the science of animals (*scientia de animalibus*) was not limited to their non-rational representatives, but necessarily had to include their rational counterparts as well. Albert's procedure to put this in place was to include large parts of Galenic-Avicennian medical knowledge on anatomy and physiology into his science of animals, thus widening its subject matter considerably to include Latin medieval theoretical medicine (*medicina theorica*). To what extent, however, did Albert's inclusion of medical material influence later generations in the *De animalibus* tradition in its sixteenth-century revival in Pomponazzi and Ficino as well as in the early modern Humanist Conrad Gessner, whose *Historia animalium* dealt with animals in an increasingly descriptive manner? The purpose of this paper is to shed some light on the novel methodological approach to the science of animals in Albert's *De animalibus* and on its longue-durée history.

*
* *

Sciences of Matter? Knowledge of the Material Substrate in the two Bacons

NICOLA POLLONI
Durham University

Separated by more than three centuries, the figures of Roger Bacon (ca. 1220 - ca. 1292) and Francis Bacon (1561 - 1626) are exemplar cases of the problematic relation between philosophy and science. Both attempted to revolutionize the scientific method of their day by criticizing causes of error, albeit under opposite circumstances. On the one hand, Roger attacked the 'scholastic method' as entangled in the passive use of philosophical authorities rather than in knowledge- making based on experience. On the other, Francis elaborated a new speculative method which, in his eyes, could supersede the Aristotelian tradition grounded on late scholasticism, which included Roger's views. Both thinkers thus studied physics with their peculiar interest, yet both had to also address the problem of matter as the irreducible root of physical reality. Roger

lamented the lack of a detailed discussion on matter in the Aristotelian *corpus*, whereas Francis stressed the excesses of the Aristotelian approach to physics in answering the question of the knowability of matter, that is, if matter in itself—rather than what is material—can be known. My paper will focus on this fundamental aspect of the history of a "science of matter" in the Middle Ages and in the Early Modern Period. In particular, I will show how and why the birth of the "science of matter" would require the definitive sacrifice of the philosophical notion of matter proper to the Aristotelian tradition, and replace it with a quantitative (and thus mathematizable) concept of matter.