Friday, June 25 AM 9:00-12:00, Room 141

Session 1 (room 141): **Early Modern Science**

Adam R Shapiro, “Two Hypotheses of Cartesian Will”
Júlio Vasconcelos, “Galileo against ‘Circular Inertia’”
Kathryn Morris, “Dynamics and the Limits of Hobbesian Geometry”
Luis Miguel Carolino: "Does God act as a craftsman? The theological controversy 'De Auxiliis' and the Molinist account of Nature"

“Twp Hypothesis of Cartesian Will”
Adam R. Shapiro

In the *Principles of Philosophy*, Descartes sets out his system of body and motion, claiming that “If a body collides with another body that is stronger than itself, it loses none of its motion; but if it collides with a weaker body, it loses a quantity of motion equal to that which it imparts to the other body.” He does not make exception for human bodies, or acts of human will, in this law. In discussing free will Descartes avoids making explicit his opinion of whether the mind acts on the body by redirecting motion or by creating and absorbing it.

The differences between these two hypotheses have great consequences for Cartesian theories of mind and of human relationship to God. Examining Descartes' claims of a "union of the soul and body," the mechanisms by which acts of will are physically manifested in the body show a great dependency on the relationship between "action" and "passion" and a careful distinction between "motion" and "movement." Understanding Descartes particular use of these concepts is central to determining which of the two hypotheses underlies Descartes' work.

Leibniz imputed to Descartes the former hypothesis (only to mock its plausibility,) while most recent work has favored the latter. By surveying several of Descartes works—in particular the Latin and French editions of the *Principles* and the *Passions of the Soul*—this paper points towards understanding Cartesian will as conserving motion. In articulating this reading, it is argued that Descartes’ failure to exempt human will from the laws of nature in the *Principles* was no oversight, but an intended and precise formulation of his theory.

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"Galileo Against 'Circular Inertia'"
Julio Vasconcelos

According to the scholars who propound 'circular inertia' as one of the main aspects of Galileo's conceptual frame, the Italian pioneer of modern physics believed that only circular motions around the center of a cosmic body like the earth could persist without action of a force. This widely accepted interpretation is based upon excerpts from the two Galileo's masterpieces, the 1632 **Dialogue Concerning the Two Chief World Systems (Dialogo)** and the 1638 **Two New Sciences (Discorsi)**. Those scholars, nevertheless, do not take into consideration other passages from those books in which Galileo's words do not fit their interpretation. These passages will be brought to light during the talk in order to reject the 'circular inertia' interpretation and in order to support the viewpoint that Galileo's concept of inertia does not take into account the path of a motion, but deals solely with the "degree of speed … indelibly impressed" on a moving body.

Two of these passages will bring evidence that Galileo dealt with rectilinear upwards inertial motions. In the first one, in the **Dialogo**, Galileo argues against the belief that the earth whirling would extrude terrestrial bodies. A horizontal line whose length is comparable to the earth radius is then considered as the line that "the projectile would continue to follow with uniform motion if its weight did not bend it downward". The second excerpt, from a *scholium* in the Third Day of the **Discorsi,** shows Galileo explaining naturally decelerated upward motion on an inclined plane as a "kind of mixture of equable ascending and accelerated descending motion".

Other two quotations will be directed against the conservation of angular velocity that Paul Feyerabend explicitly assigns to 'circular inertia'. Surprisingly, Feyerabend et al. do not realize that this conservation implies variations in linear velocity when the distance from the center changes and the circular motion persists. Yet, these variations of "degrees of speed" without "external causes" of acceleration or retardation are unacceptable to Galileo, who clearly rejects them at least twice in the **Dialogo**. One of these rejections happens during the discussion about the fall of a cannon ball from the moon's orbit to the earth's center; another one is stated when Galileo compares vertical upwards shots on a rotating earth with shots to birds in the air. The proposition that hunters succeed because "they fix their sights on a flying bird and follow it by moving the fowling piece" is soundly rejected because "motion … cannot multiply itself in the air".

The talk comes to its end with the statement that Galileo's pronouncements concerning conservation of motion – including the ones that provide the foundations for the 'circular inertia' interpretation – may be shown to be coherent in the light of the following words from the **Discorsi,** which turn to be Galileo's effective conception of inertia: "… whatever degree of speed is found in the moveable, this is by its nature indelibly impressed on it when external causes of acceleration or retardation are removed…".

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"Dynamics and the Limits of Hobbesian Geometry"
Kathryn Morris, University of King's College

In Part III of *De Corpore* (1655), Thomas Hobbes presents what he promises will be a thoroughly mathematical mechanics. His project has two parts: Hobbes begins with an account of kinematics, in which he proposes and demonstrates the use of geometrical figures to represent the spatio-temporal effects of various sorts of motion. This is followed by a discussion of the effects of moving bodies on other bodies. Unfortunately, Hobbes' dynamics is much less satisfying that his kinematics, as his account of force and dynamic interaction are rarely quantitative and riddled with inconsistencies.

In this paper I will offer an explanation for Hobbes' failure to provide a mathematical dynamics. I will begin by discussing Hobbes' distinctive concept of force. For Hobbes, all effects must be understood as products of the motion and impact of bodies, and force is a measure of the ability of one body to either move, or resist the motion, of another. More specifically, he understood the force of a moving body to be equal to the aggregate of the motions possessed by each of the imperceptibly small parts that make up that body's magnitude. The merits of this conception of force, and the attendant understanding of dynamic interaction, were debated by, among others, Descartes and Leibniz.

In the second part of the paper I will discuss Hobbes' attempt to represent the magnitudes of forces geometrically. I will argue that his attempts to mathematize force were thwarted by his philosophy of mathematics and, in particular, by his contention that heterogenous magnitudes should not be compared. Hobbes believed that his materialist geometry would provide the foundation for a complete and consistent mechanics, but it ultimately undermined his attempts to provide a mathematical account of the natural world.

"Does God act as a craftsman? The theological controversy 'De Auxiliis' and the Molinist account of Nature"
Luis Miguel Carolino

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