

# Subtle Matter in Descartes' physics and metaphysics: between principle and reality

**Masato Sato**

Postdoctoral Research Fellow, Japan Society for the Promotion of  
Science/The University of Tokyo

03940B RENAISSANCE AND EARLY MODERN PHILOSOPHY (B)

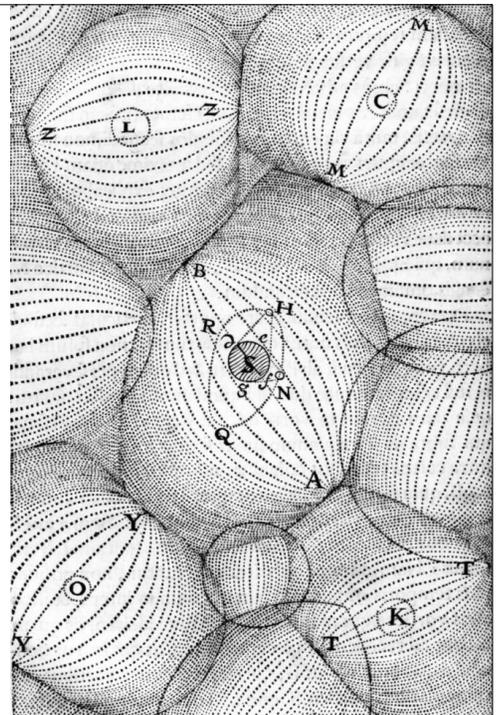
Room EG29, China National Convention Center

14th August 2018



## Vortex theory of Descartes

- The universe is full of vortices, i.e., rapid circular currents of small particles, which moves planets around fixed stars



## Vortex theory of Descartes

- This theory, widely accepted in European continent (17th c), is refuted by Newton's law of universal gravitation
- Philosophically, Cartesian theory cannot simply be discarded.  
Why? → Because it plays a significant role in Cartesian cosmology, inseparably linked with his metaphysics

## Why subtle matter ?

- Subtle matter: General name of all the small particles (1st, 2nd & 3rd elements)
- 2nd element: medium size, compose mainly the air, the space & the vortices (fluid in circular motion).
- 3rd element: large size, compose the earth & planets.
- 1st element: small size, fill the interspaces of the 2nd & the 3rd elements.

## Why subtle matter ?

- Vortex is one of the various forms taken by subtle matter.
- Subtle matter is the most fundamental element in Cartesian physics.

## *Le Monde (The World)*

- Implicitly based on the “doctrine of the creation of the eternal truths”.
- God created the eternal truths as efficient and total cause, and leads the world to its perfection collectively.
- The laws of nature in particular are based on divine attributes (immutability, simplicity, timelessness...)

### *Discours de la méthode (Discourse on the method)*

- It doesn't explain the laws of nature in detail, but emphasizes the veracity of the laws based as a whole on the infinite divine perfection.
- Even with its style of fable, hypotheses or suppositions, Cartesian physics presents nothing but the truths, because they are based upon the first truth of the Creator.

### Autonomous development of the universe

- The laws of nature exist both in the universe & in our mind: they link these two things completely different.
- Consequence of the laws of nature: autonomy of the universe. Once the laws are given, the universe is able to develop by itself.

## Role of subtle matter

- Subtle matter is omnipresent in the universe from its beginning, and serves the materials for the formation of the universe according to the laws of nature.
- The particles of subtle matter interact with one another and are not able to move straight forward, despite the law, but they are compelled to move more or less in circle.

## Difficulty of air

- Motion of a body is inevitably influenced by air - it can be facilitated or resisted by various motions of air.
  - Actual motion of air is so complex due to its interaction that it is an “issue of fact”, that its calculation “does not belong to science” & “*positis ponendis*”.
- “We can digress much from the truth”.

## Gap between theoretical movement and actual movement

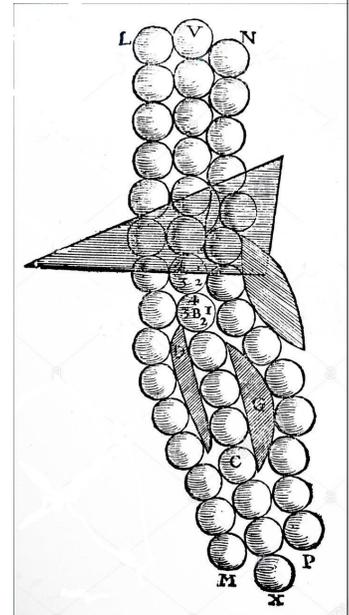
- For Descartes, rectilinear motion is a perfect representation of the law based on the divine simplicity.
- The space is filled with air and subtle matter without any void  
→ The actual space is not in an ideal condition for calculation.
- The circular motion of subtle matter affects all bodily motions, including the sky, which is the cause of vortices & gravity.

## “All of my physics” and subtle matter

- To explain the subtle matter, “all of my physics” must also be explained.
- “All of my physics” are inseparably connected with and based on his metaphysics, especially the doctrine of the creation of the eternal truth.

## Light and subtle matter

- The subtitle of the *World*: “*Treatise on the light*”
- Chap. I - XII: things in the universe & the laws
- Chap. XIII & XIV: characteristics of the light
- Difference between the formal (mathematical) ray and the material (physical) ray



## Omnipresence & transformations of subtle matter

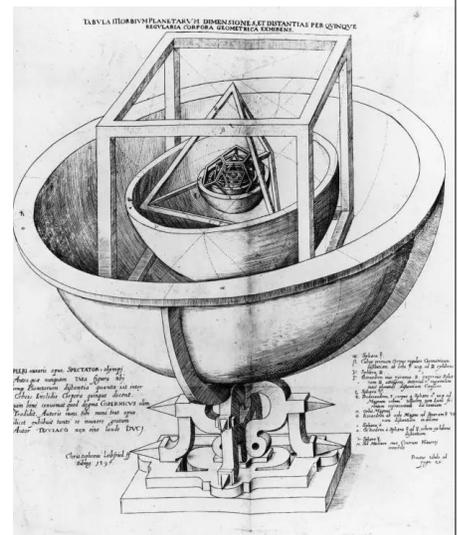
- Subtle matter takes various forms: ray, vapor, cloud, wind, rain, snow, animal spirits in nerves & blood vessels... etc, and exists everywhere in the universe.
- All of Descartes writings on physics - *World*, *Dioptrics*, *Meteors*, *Man*, *Principia II-IV*... are the studies on subtle matter.

## Kepler and Descartes on the universe

- Kepler is a “teacher of the optics” for Descartes.
- Yes: circular motion of the sky transporting planets
- No: what transports planets is *species immateriata*, immaterial force which can be calculated.
- For Descartes, subtle matter is not immaterial nor calculable.

## Kepler's cosmology: Geometry as ontological structure of the universe

- For Kepler, the universe is made according to the geometric solid models in God.
- Perfect models are: sphere & five regular polyhedrons (Platonic solids)



Kepler's cosmology:  
*species immateriata* and magnetism

- Cause of motions of planets and of light:  
1) *anima motrix* from the Sun → 2) *species immateriata*  
They function like a kind of magnet.
- *Species immateriata* observes geometric proportions in the orbits and in the configuration of the universe.

Descartes' cosmology: subtle matter and vortex  
vs. Kepler's geometric harmony

- *Species*: immaterial force
- Subtle matter: the whole of variously sized material particles
- Both rotate in the universe in the manner of vortices.
- Descartes plagiarized Kepler's idea? (Leibniz)

## Laws of Descartes vs. Laws of Kepler

- Descartes' laws: true for every motion in the universe. Descartes has already unified before Newton the rules of celestial and terrestrial motions.
- Kepler's laws: true only for the planetary motions.
- Focus on the discovery of geometric rules was a key to Kepler's success.

## Newton's search for the first cause

- Despite his refusal of hypothesis, Newton yearned for the first cause of all the phenomena in the universe.

“the main Business of Natural Philosophy is to argue from Phænomena without feigning Hypotheses, and to deduce Causes from Effects, till we come to the very first Cause, which certainly is not mechanical” and which is in fact “a Being incorporeal, living, intelligent, omnipresent” (Newton, *Opticks*, book III, p. 344; p. 345).

- Newton needed his *Principia Mathematica* to be completed by and to be based on the metaphysical principles of God.

Conclusion:  
The Creator, Laws of nature & subtle matter -  
unity in the system

- Aether or subtle matter is necessary to explain physically the universe → “laws of equilibrium”
- Subtle matter, laws of nature & the first cause go together for the systematic unity of materiality & intelligibility in the autonomous configuration of the universe.

Thank you very much for your kind attention!

Masato Sato

PhD. in Western philosophy à la Sorbonne  
Postdoctoral Research Fellow, Japan Society for the  
Promotion of Science / The University of Tokyo

e-mail: [ms4385@gmail.com](mailto:ms4385@gmail.com)