

What new conceptions of matter developed in the course of the seventeenth century, and why were these important?

Introduction to the History of Science Essay

November, 2018

Introduction

In this essay I will detail, compare, and contrast the new ideas surrounding matter that were produced in the 17th Century; how they were integrated into the attitudes of the era and the metaphysical and ontological implications of them. I will look at Descartes, Gassendi, Spinoza, and Leibniz's conceptions of matter. These will be explored and the implications for the ways of thinking into the Enlightenment and beyond.

I will show how the attitudes changed in regards to the metaphysics, ontology, epistemology, and natural philosophical methods of thought. Overall a large change in the ways that we thought about the world had occurred and broad and wide-reaching ideas needed to be made. I also talk about the religious climate at the time and how philosophers were at the mercy of the church when it came to some of the more controversial statements that they made.

Literature Review

Descartes' ideas surrounding matter were given in two accounts, in *Principles* and *Second Replies*, In *Principles* he defines substance as "All we can mean by 'substance' is 'thing that exists in such a way that it doesn't depend on anything else for its existence'." [Descartes, 1644, I.52] In *Second Replies* the definition of substance given differs, saying instead that it is a subject that has modes but is not a mode of anything else [Robinson, nd]. Descartes rejects the atomist view, saying that if there was a length that is divisible in thought, God must be able to bring about that division. [Descartes, 1644, II.20]. Descartes however outlines a dualist theory rather than a monist one (as we will see later), stating that mind and body are separate substances; and that mind is not physical. In meditations he states that "bodies are not perceived by the senses or faculty of imagining but perceived only by the mind" [Descartes, 1641, 26]

Spinoza, however is mostly critical of the way that Descartes sets out his views on metaphysics. His view of substance is that God (or Nature) is the substance itself [Manning, 2016]. This is in direct opposition to Descartes' substance dualism (as this is a monist theory). Another peer of Descartes and Spinoza. Leibniz says "Spinoza would be right, if there were no monads" [Hicks, 1917] but what is a monad? Monads, as opposed to Spinoza's conception are indivisible parts that which are created by God. This was a competing theory to the epicurean-styled atomism that was picking up popularity in the 17th Century [Burnham, nd]. These ideas broadly describe a new idea about the universe that instead of there being four elements each with their own telos (final goal) that everything is in essence, the same thing with different properties attached to it. Even in Descartes' substance dualism, everything in the material world shares the same pattern with the monists, we have only one type of material substance and that everything acts like a machine rather than with telos.

Discussion

The first implication that these conceptions had was that of a mechanical metaphysics, that every material thing (at least, in the monist view) were fundamentally the same just with different at-

tributes attached. This led to an understanding of the whole universe as a big machine, which in turn led to new models of logic. To remove the idea of the Aristotelian *telos* and replace it with a model much more in line with cause and effect allows for methods such as Bacon's inducivism to come into repute. New tools were created to explore the new matter which led to new scientific discoveries which led to an overall better understanding of that which made up the world around us.

Corpuscularism, similar to epicurean atomism, rose which helped to explain many physical phenomena for the mechanical philosophers even if, for example, Gassendi's theories did not fit well with his mechanical ideas [Fisher, 2014].

Philosophers were at odds with this new mechanical understanding of the universe and quite where God fit into this picture [Robinson, nd]. This led to a wide range of ideas and proofs of God's existence often with a lot of pushback from The Church. Spinoza was for example excommunicated from the Jewish community. This shows a need for the philosophers to fit the new epicurean-styled ideas into that of the European's churches theology at the time. Those that assigned *telos* to matter had a clear explanation of the ultimate fate that all things have; this created a nice harmonious picture of motion describing a fate for all objects just as God provides as fate for all people. To debase this idea was dangerous and led to a lot of friction from the church.

I think it is an interesting leap from the Substance Dualism of Descartes to the Monism of Spinoza and Leibniz, Descartes' dualism is much more in line with the ideas that Aristotle had regarding the sublunary and celestial realms. Most importantly Descartes demolishes separation between the earth and the heavens allowing for theories about the celestial bodies to be aligned with the church (even though Galileo was persecuted). In essence the removal of this separation allows for predictions made based on things that occur on the Earth to apply to things that occur in the heavens, which leads on to explaining the solar system. A direct improvement to the astronomical knowledge of the time which contributed to Newton's ideas regarding how the solar system worked, and thus gravity.

Of course this distinction had broader philosophical, metaphysical consequences. This led to the ideas of everything being one, the monist approach. The revival of the epicurean atomist theory also proved to be powerful. One of the most important ideas surrounding this was that of the primary-secondary quality distinction, whereas most previous theories had been based off of only the secondary, that is the observed qualities of an object; measuring only the primary qualities allows us to create predictions that are separate to any observer.

This mode of thinking led us into that of the Enlightenment era thinkers and the revolutionary ideas that they brought with them has directly effected the constitution of society as a whole. Seeing matter as the same throughout the universe has directly and indirectly effected how we view other societal issues like sexism and racism; if everyone is made of the same stuff ¹ we can start to move towards greater equality. Also realising that the all things were made of the same stuff with different properties added on allowed for a greater interest in quite how those properties manifested and changed, which led to a greater interest in Hermeticism, and thus (Hermetic) alchemy which directly led into the modern chemistry and the development of modern medicine.

These developments also brought about new technologies, the prime example is Galileo's telescope one of the most important developments for Astronomy. The idea of measurement over 'casual' observation is key to creating new technologies to measure with. Part of the French Revolution in the following years was that of the SI, a standardisation of all measurement to allow for easier transaction of knowledge. With machines such as the printing press quickly becoming widespread these ideas were the key to widespread philosophical dissemination which, again lead to the Enlightenment ideas. Another development that came from a shared framework of measurements is that of trade, a commonality became expected which expanded the reaches of the Europeans trading networks, thus spreading more European ideas throughout the world.

¹as opposed to the 'three types of substance' Aristotelian thinkers promoted, that which defined men as the only being with a synthesis of all

Conclusion

Overall these conceptions of matter started to mark a turning point in the way that we placed ourselves in the world, leading directly into Enlightenment thinking. A greater shift towards the measurement, and prediction of occurrences rather than that of pure observation. A larger framework for formal logic and mathematics were also formed as a result of the mechanical view of the universe. All of which contributed to the development of a more formal 'science' as opposed to natural philosophy.

I think that one of the more subtle ideas to have come out of a shift in thinking is the larger implications that were brought to light in the Enlightenment, that of a greater degree of freedom of thought. As above, the beginnings of a greater harmony with nature and the understanding that that brought about is in some part the start of humanist thought.

Not only this but the start of serious thought deriving from epicurean atomism had created a world that cared about the primary qualities of things rather than that of the secondary which allowed for a greater advancement in many scientific disciplines through measurement and experiment over observation. This of course leads to what we think of as modern science which is vitally important for our every day technologies.

Words in text: 1428

Words in headers: 30

Words outside text (captions, etc.): 24

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