

# BERKELEY'S CRITERION OF A MECHANIST VIEW AND HIS ATTACK ON THE MECHANIST VIEW

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## **The Argument**

In this article an attempt will be made to present the criterion adopted by Berkeley for a view to be defined as a mechanist view. In other words, I will discuss the way Berkeley describes the controversy between mechanists and anti mechanists in the 17 th and 18 th centuries. This criterion is different from the main acceptable criterion nowadays, the mathematization criterion, suggested for example by Dijksterhuis in1950.

I will show that Berkeley's opinion in this controversy follows both from his instrumentalist view about the term "Force" and from his unique metaphysics.

According to the criterion that Berkeley adopts, a mechanist is one who tries to explain all phenomena only by material causes. This criterion does not fit the mathematization criterion, according to which a mechanist view not only uses mathematics in scientific explanation, but it's basic concepts are mathematical concepts.

Berkeley claims that science deals with sensual ideas, and the rules of their appearance. In other words, the material bodies with which science deals are collections of ideas that exist in our minds. Ideas are passive. One idea is not the cause of another idea, but it's sign. Since ideas are passive, science does not supply a causal explanation. In order to know what are the causes of phenomena we have to deal with minds, that the research about them is done in metaphysics. Since Berkeley thinks that the material objects which are dealt in science cannot supply causal explanation, he will be defined as an anti mechanist.

Berkeley claims that the term "Force", which many physicists think that it represents a cause of phenomena as velocity changes, does not represent a real quality beyond movement. Berkeley is defined as an empiricist. But in order to preserve scientific achievements and the ability to connect between phenomena and to predict, he claims that we have to use the term "Force", although it does not represent any real idea or real quality. The term "Force" represents in his opinion a mathematical fiction that enables us to connect between phenomena and to predict. This view is called "Scientific Instrumentalism". This unique view of Berkeley is part of a philosophy of science that was "a head of it's time", and is relevant in some aspects to modern physics.

Berkeley's instrumentalist view is another pillar of his anti mechanist view, in addition to his idealist metaphysics.

## INTRODUCTION

The mechanist view as formulated by philosophers and scientists in the 17<sup>th</sup> and the beginning of the 18<sup>th</sup> century, had a few properties:

The mechanists thought that knowledge has to be based on experience. Science is supposed to formulate regularities of phenomena. Such an empiric method was suggested by Bacon.<sup>1</sup>

A mechanist view forbids explanations by occult inherent qualities. The mechanists thought that phenomena ought to be explained by external material causes, that is by matter and motion.

When the mechanists referred to the explanation in terms of matter and motion, most of them meant explanation by particles. They defined primary qualities, such as the shape of the particles, their size, order, and movements. According to the mechanists, the primary qualities are the qualities of a body that is external to our minds. Moreover, the secondary qualities such as taste and color do not exist in an external body, but merely in our minds.<sup>2</sup>

An attempt will be made later to show that Berkeley negates the division between primary and secondary qualities which was adopted by Locke and many other mechanists. Berkeley claims that all the qualities should be defined as sensual ideas in our minds.

It was assumed by many mechanists that the material world was composed of particles with void between them. It was assumed also that the smallest particles are atoms- undivided particles (as Gassendi for example suggests).<sup>3</sup>

Descartes however, one of the prominent mechanists, refused to accept the atomist theory. His theory was based on an assumption of a continuous matter.

The mechanists' explanation was based on the assumption of action by touch. The term "Force" represents the ability of a body to act on another body by touch. Newton, though, formulated a different model of forces, thus describing action from distance between bodies (it should be noted that his view is more complicated).

The mechanists used an image of nature as a machine. Usually the machine dealt with was a watch. But the actual model which they used in science was the atomist model.

Another feature of the mechanist view is the mathematical formulation of phenomena and explanations in science. Galileo claimed that the philosophy of nature should be mathematical because nature in its construction is mathematical. This claim might be represented in different wording, by quoting Plato's claim that "the book of nature is written in the language of mathematics"

Descartes' physics was based on Geometry. According to Descartes, the scientific method was based on mathematical principles: "I do not accept principles if they were not accepted by mathematics."<sup>4</sup>

Dijksterhuis claimed that the criterion of mathematization - as a feature of science and philosophy in the 17<sup>th</sup> and the 18<sup>th</sup> century, and of the mechanist view - is going much further than the attempt of mathematization during the middle ages. Science actually became a branch of mathematics. The basic concepts were mathematical.<sup>5</sup>

Among other things, the 17<sup>th</sup> century revolution became a transition from essentialism to functional relations, a transition which has been dramatically strengthened by modern physics.

Dijksterhuis thought that the mathematization criterion is most suitable to represent the dispute between mechanists and anti mechanists. According to this criterion a mechanist view demands using mathematics in explanations. But the mechanist view does not demand only formulizing the explanation by mathematics, it demands that the basic concepts will be mathematical.<sup>6</sup>

It is crucial to clarify that the concept "Force" was not fully mathematized by most of the philosophers and scientists, unlike the concepts " Velocity" and "Acceleration". The following part of the article will present the fact that Berkeley was the only one in his time to perform a full mathematization of the term " Force". But I will claim, that unlike Dijksterhuis, Berkeley does not adopt the criterion of mathematization as a criterion of a mechanist view.

<sup>1</sup> Dijksterhuis, The Mechanization of The World Picture ,PP 399,401. Francis Bacon, Novum Organum, PP 33,34,95-97.

<sup>2</sup> Steven Shapin, The Scientific Revolution ,Pg 46. The Excellencies of Robert Boyle, Pg 246.

<sup>3</sup> Dijksterhuis, PP 425-426.

<sup>4</sup> Rene Descartes, Meditations on the Primary Philosophy, translated to Hebrew, PP 161,163. Rene Descartes, Principles of Philosophy, translated to Hebrew, Pg 72.

<sup>5</sup> DIJKSTERHUIS, PP 499-501.

<sup>6</sup> DIJKSTERHUIS , pp 501

## **Berkeley's criterion of a mechanist view and the metaphysical background to his view about the controversy between mechanists and anti mechanists.**

According to the criterion of a mechanist view that is implied from Berkeley's writings, a mechanist view is a view which explains all natural phenomena only by material causes.

Berkeley claims that the material world is a collection of sensual passive ideas in our minds. These sensual ideas cannot exist outside our minds.<sup>7</sup> An idea is only a sign of another idea and not a cause. For example, an idea of fire is a sign of an idea of heat and not its cause. The relations between ideas are not necessary according to Berkeley because they are not causal relations. Since Berkeley attacks the mechanist view he is defined as an anti mechanist.

Berkeley attacks Locke's theory of representation, according to which we perceive in our minds ideas that are produced by external objects. According to the representation theory, the objects themselves (or more accurately some of their qualities) are not perceived.<sup>8</sup> Berkeley claims that the assumption of an external unperceived object, that produces the ideas, is mistaken. This assumption is wrong according to Berkeley, because it leads to skepticism. We would not be able to perceive the external object including its qualities, with which our ideas are supposed to match.<sup>9</sup> The article will not deal with Berkeley's additional arguments against Locke's theory.

Berkeley does not accept the distinction between primary and secondary qualities. According to this distinction, the primary qualities (those of geometrical character) exist in the external objects, and the secondary qualities exist in our minds. Berkeley claims that both primary and secondary qualities are relative. Therefore- there is no reason for the distinction between them. All the qualities are ideas in our minds. For instance color or taste do not exist outside our minds. These qualities are perceived together with the primary qualities, extension for example. Therefore the primary qualities do not exist outside our minds. Thus nothing exists outside our minds.<sup>10</sup>

Since the material objects are collections of passive sensual ideas, science cannot explain phenomena by means of material causes. For instance the Ideas of configuration, extension, motion, cannot produce an idea of color.<sup>11</sup>

Berkeley rejects the corpuscular theory, which was presented by Locke. According to this theory, the particles are external, unperceived beings that have primary qualities. The particles produce the primary and secondary ideas (qualities) in our minds. According to Berkeley, a term is meaningful if it represents a perceived idea. According to the corpuscular theory the particles are unperceived. Therefore the term "Particle" is meaningless in Berkeley's opinion. He also claims, that the primary qualities of the particle cannot be active and produce secondary ideas. Primary qualities are passive ideas.<sup>12</sup>

Berkeley also claims that there is no need to adopt a corpuscular theory. In addition to his criticism of the mechanist model (matter has no existence out of our mind, and it does not affect our minds) – the corpuscular model is unnecessary. No phenomenon can be explained by that model which cannot be explained by another adequate model, such as Berkeley suggests.

It is important to remark that the corpuscular theory includes the assumption of atoms which cannot be divided.

In this article I do not deal with the question whether unperceived particles exist in principle according to Berkeley. I shall just mention that it is possible to claim that Berkeley does not negate the assumption of unperceived particles, that do not exist outside our minds and cannot cause effects. These particles will be perceived in the right terms. But in "Principles of Human Knowledge", "3 Dialogues" and "De Motu", he does not suggest using such an assumption. This question was dealt among others by Margaret Atherton and Lisa Dawning.<sup>13</sup>

Berkeley claims that the universal mind does not need the complex composition of animals and plants to create phenomena (meaning may be also the assumption of particles). But this composition is needed for creating phenomena according to the regular appearance of ideas that are formulated by the laws of nature.<sup>14</sup>

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<sup>7</sup>GEORGE BERKELEY, A TREATISE CONCERNING THE PRINCIPLES OF HUMAN KNOWLEDGE, sections 2, 3, 10, 12, 19, 25,50, 91.

<sup>8</sup> John Locke, Essay Concerning Human Understanding, translated into Hebrew, PP 106-107.

<sup>9</sup>Principles, section 86.

<sup>10</sup> Principles, section 10,11.

<sup>11</sup> Principles, section 25. GEORGE BERKELEY, DE MOTU, Section 22.

<sup>12</sup> Principles, section 102.

<sup>13</sup> Margaret Atherton, Corpuscles, Mechanism and Essentialism in Berkeley and Locke, Journal of the History of Philosophy, Volume 29, number 1, p 51, 58, 60, 66, 67,

Liza Dawning, Berkeley's Natural Philosophy of Science, The Cambridge Companion to Berkeley, p 6, 7.

<sup>14</sup>Principles, sections 60, 62.

As an alternative to the corpuscular theory, Berkeley suggests that phenomena will be explained by induction, that is by laws which describe inclusions of different perceived situations. In other words, phenomena can be explained by reducing them to observational regularities within universal laws.<sup>15</sup>

A phenomenon is explained mechanically if one can reduce it to laws of nature, and if it fits these laws, meaning, it can be deduced from these laws. In other words, to understand a phenomenon is to know to what observational inclusion it is connected, and not to know its cause. The conclusions about particular cases follow mathematically from the laws of nature.<sup>16</sup> As we have shown, according to Berkeley, science deals purely with passive ideas. It is of course not only an inductive explanation that is involved, but also deduction is involved.

Berkeley claims that the laws of Newton were proved by experiments, processed by reason and made universal. The laws of nature are a basis of universal theorems on the one hand and particular explanations on the other hand.

Science deals with ideas, their regularities and the links between the ideas.<sup>17</sup> We can explain any phenomenon by reducing it to universal observational laws. There is no necessity for explanation with the assumption of external objects or unperceived particles. Therefore Berkeley's criticism does not destroy the achievements of science.<sup>18</sup>

The sensual ideas are produced, in an order and coherence, by the universal mind (God). The laws of nature are the rules according to which the real ideas are planted in us. The laws of nature are called by Berkeley "the language of God".<sup>19</sup> We learn about the real sensual ideas by experience. These ideas are not produced by our will.

According to Berkeley there is no difference between his view and the view of an ordinary person. The phenomenon is the essence, and there is no "real hidden nature".<sup>20</sup>

The world of our ideas is real in Berkeley's view, because it describes lawfulness, order and coherence, and not because it fits any external reality. Berkeley claims that the reality of nature continues to exist, but in our minds.

Berkeley claims, that the difference between an investigator of nature and any other person, is not that the investigator knows the causes of phenomena (since only minds can be causes), but that the investigator has a wider scope of understanding. With this wider scope he can find analogies, harmonies and explain phenomena. Meaning that the phenomena are deduced from general laws. The laws which are based on analogies enable us to guess phenomena that happen in other places and times, and to predict them.<sup>21</sup>

### **Berkeley's instrumentalist view**

The term "Force" describes, according to those who use it, the cause of movement. But according to Berkeley, when we use the term "Force" in science it does not have any meaning beyond movement. The term "Force" does not represent some real quality, but only a mathematical fiction, in his view.<sup>22</sup> This fiction is invented and inserted into the formulation of the equations in order to enable us to deduce observational conclusions and predictions. The same can be said about the terms "Action" and "Attraction". In other words, the equations of physics do not describe the world, but they are instruments for deductions from one set of ideas to another. The equations of physics are, in fact, mathematical hypotheses. This view is called "Scientific Instrumentalism", and it negates the view called "Scientific Realism", according to which the term "Force" represents a real force. The instrumentalist view enables Berkeley to preserve the achievements of science, but still to be an empiricist. In other words, this view enables Berkeley the empiricist to use the term "Force", although it does not represent a real idea or quality.

According to Berkeley we cannot assume in science material causes. The real cause of phenomena is God, the "supreme spirit" that plants in our minds the regular ideas which are called "nature". But the domain in which we deal with minds is metaphysics.<sup>23</sup> As we have said, Berkeley's instrumentalist view is another pillar of his anti mechanist view in addition to his metaphysical idealism.

When we hold a heavy body we feel an effort. We also see that bodies fall in the direction of the center of earth. Scientists conclude that there is a reason for the accelerated movement, and call it "Gravitation". But the term "Gravitation" does not represent anything perceived. In other words, the term represents, when it is used in this way an occult quality. The

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<sup>15</sup> Principles, section 104.

<sup>16</sup> D.M., sections 36, 37, 42, 71.

<sup>17</sup> Principles, section 101.

<sup>18</sup> Principles, section 34, 35, 50

<sup>19</sup> Principles, sections 30,33.

<sup>20</sup> Wienrib, Rationalism and Empiricism, written in Hebrew, Pg 178.

<sup>21</sup> Principles, section 105.

<sup>22</sup> D.M., sections 17, 28, 39.

<sup>23</sup> Principles, section 29, 30, 33, 57, 146. D.M., sections 25, 34, 69.

same can be claimed about the term "Force".<sup>24</sup> Berkeley does not accept the assumption of occult qualities, because they cannot explain anything. According to Berkeley's view, the term "Force" does not have any meaning beyond movement, and force is not perceived differently from movement. It is important to mention also, that in Berkeley's opinion when the body is in rest it is meaningless to argue about "Dead force" or "Gravitation". It cannot be claimed that a body hanging on a spring operates a force, because otherwise the spring would return to an un tensioned position.<sup>25</sup> Similarly it is impossible to argue that a body lying under another body operates a force on the upper body because it prevents it from going down.

When we feel a pressure of a body which is lying on our palm, the question is whether it is because an action of a gravitation force. Berkeley claims that this is actually a movement of a body transferred to the nerves of our palm. Berkeley opposes any claim that the movement of a body is the cause of our feelings. There is no activity in our ideas.<sup>26</sup> An acting cause can be only a spiritual entity. It is important to note also, that according to Berkeley, the attraction between stars is not a genuine quality of stars and that there is no attraction force which operates between the stars.<sup>27</sup> The same can be claimed when we try to convert equilibrium power into components, we do not get anything real.<sup>28</sup>

Berkeley argues that the terms "Force" and "Gravitation", represent in fact mathematical fictions. They are useful when concluding about movements, but not for the comprehension of the causes of movements.

In other words, there is nothing in movement beyond mass space and time. Movement of course is a perceived idea.<sup>29</sup>

The term "Force" is problematic according to Berkeley's view in the common use, because no matter what view is adopted about the nature of the force, the phenomena explained is the same phenomena. Newton argues, that in case of collision between two bodies, the force of the offending body acts to change the movement of the offended body and does not stay in it. The body has inertiality (his velocity stays the same when no force acts on it). According to Borelli and Torichelli however, the force of the offending body stays in the offended body as an impulse. But the results (phenomena) are the same according to both views. That is, no matter if you argue that the offended body moves because the offending body struck it, or because of the impulse that stays in the offended body, the phenomenon stays the same – one body ceases to move and the other starts to move. Therefore Berkeley concludes that the term "Force" signifies a mathematical fiction, and the statement in which this term appears is a mathematical hypothesis.<sup>30</sup> This claim does not signify any real cause.

The terms "Action" and "Reaction" in the third law of Newton designate mathematical hypotheses and not principles of movement. In cases such as a stone being attracted by a horse, or two bodies colliding, both are attracted or repelled equally according to the third law of Newton. As long as we are in the domain of science, the attraction and repulsion that are dealt with here, are mathematical fictions, and no real cause is signified here.<sup>31</sup> But the law fits regardless if the body is active or passive. The equations and laws of motion do not change.<sup>32</sup>

Berkeley does not assume that bodies have vitality. To live means to move oneself. Berkeley thinks that matter is passive and inert, meaning that matter can persist in a situation of rest or constant velocity, if not forced to change its velocity. In other words, matter is not vital. Only a spirit or a mind are vital.<sup>33</sup>

#### **Berkeley's criterion of a mechanist view – conclusion**

In this article I have made an attempt to show that Berkeley does not adopt the mathematization criterion to describe the controversy between mechanists and anti mechanists.

According to the criterion which describes accurately Berkeley's view about the controversy between mechanists and anti - mechanists, a mechanist view tries to explain all the phenomena with material causes only. Whereas anti mechanist view finds it impossible to explain all the phenomena merely with material causes, and one should look for explanation by immaterial causes-minds.

Berkeley's unique attack on the mechanist view results from his view that science deals with observational passive ideas, and not with real causes. In other words, a scientific explanation cannot supply a cause because matter is passive. The term "Force" in science represents a mathematical fiction. While opposing any causal explanation in science, Berkeley's view abandons what seems an intuitive explanation in science. Real causes are dealt with only in metaphysics, and these causes are immaterial (minds). The cause of natural phenomena is, in Berkeley's view, the universal mind (God), and the

<sup>24</sup> D.M., section 4.

<sup>25</sup> D.M., sections 11-12.

<sup>26</sup> D.M., section 13.

<sup>27</sup> D.M., section 67.

<sup>28</sup> D.M., section 18.

<sup>29</sup> D.M., section 43.

<sup>30</sup> D.M., section 67.

<sup>31</sup> D.M., section 70.

<sup>32</sup> D.M., section 28.

<sup>33</sup> D.M., section 33.

discussion of God's activity is done in the domain of metaphysics. Berkeley is an anti mechanist according to the criterion that he formulated.

Berkeley attributes to Newton the view according to which God is the source of movement, and he is interfering constantly to preserve it. Therefore, according to Berkeley's criterion Newton is an anti mechanist.

The same view is attributed to Descartes by Berkeley.<sup>34</sup> Still, it can be shown that both Newton's and Descartes' view is an ambivalent view. This paper will not deal with their views.

As it was shown, Berkeley adopts an instrumentalist view as far as the terms "Force" and "Gravitation" are concerned. According to this view these terms represent only a mathematical fiction and not an entity which is the cause of movement. Berkeley formulates a philosophy of science which is similar to Osiander's philosophy, a philosophy which he presented when he interpreted Copernicus' view.<sup>35</sup> Berkeley preceded Ernst Mach's instrumentalist arguments by two hundred years.<sup>36</sup> Berkeley was a precursor when claiming that scientific explanation does not describe unperceived entities, but it is an explanation that has undergone full mathematization. The scientific explanation uses mathematical fictions which enable predictions.

Popper claims that Berkeley's importance lies in the fact that Berkeley is not an essentialist. According to Berkeley matter does not have a real ability to apply a force (there is no real force). Berkeley opposes an assumption of an unperceived material entity.<sup>37</sup>

It is important to note that although Berkeley made a full mathematization of the term "Force", his criterion for a mechanist view is not the mathematization criterion, but the claim that a mechanist explains phenomena only with material causes.

#### **Additional concluding remark**

In "Principles", "De Motu" and "Three Dialogues Between Hylas and Philonous", Berkeley does not use the assumption of the existence of unperceived particles, because matter, in his opinion, is groups of sensual ideas (though it can be shown that he does not negate in principle this assumption. But in this article we did not discuss this question).

In a later book that Berkeley wrote – "Siris", he developed a theory dealing with ether particles. The discussion of these particles was not presented in this article. Still, it can be shown that in spite of the changes in Berkeley's view in "Siris", his instrumentalist view about the term "force" and about the dispute between mechanists and anti mechanists is the same as in "Principles", "De Motu" and "Three Dialogues Between Hylas and Philonous".

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<sup>34</sup> D.M., section 32.

<sup>35</sup> Wienrib, Pg 179.

<sup>36</sup> KARL POPPER, section 14.

<sup>37</sup> D.M., section 31. Karl Popper, A NOTE ON BERKELEY AS A PRECURSOR OF MACH AND EINSTEIN, section