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Absolute Space: An Assessment of Leibniz's Arguments Against the Reality of Space

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Abstract:
The Leibniz and Clarke correspondence encompasses the substantivalist relativist debate on the reality of space. Clarke represents Newton's view, advocating substantivalism. Leibniz on the other hand, heavily influenced by Descartes, advocated relationism and discounts the existence of absolute space, that material objects can only be described by their relations to other objects, not by objective locations within some sort of underlying space. Within the correspondence he gives three main refutations to Newton: a critique of God's mind as a sensorium, the Principle of Sufficient Reason [PSR] and the Principle of Identity of Indiscernibles [PII]. I will not be addressing the former in this essay, instead I will evaluate the arguments formed around the two principles and assess the examples Newton gives to counteract this. I argue that Leibniz's arguments against the reality of space are unconvincing as he fails to respond to Newton's confutations against PSR and PII.

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The Leibniz and Clarke correspondence (Clarke, et al. 1965) encompasses the substantivalist relativist debate on the reality of space. Clarke represents Newton's view, advocating substantivalism. His view that absolute space, a medium upon which material objects exist, is built upon his laws of motion, chiefly the law of inertia which states that in the absence of external forces a moving body will continue moving in a straight line. His argument is further based on the existence and empirical evidence of absolute acceleration. Leibniz on the other hand, heavily influenced by Descartes, advocated relationism and discounts the existence of absolute space, that material objects can only be described by their relations to other objects, not by objective locations within some sort of underlying space. Within the correspondence he gives three main refutations to Newton: a critique of God's mind as a sensorium, the Principle of Sufficient Reason [PSR] and the Principle of Identity of Indiscernibles [PII]. I will not be addressing the former in this essay, instead I will evaluate the arguments formed around the two principles and assess the examples Newton gives to counteract this. I argue that Leibniz's arguments against the reality of space are unconvincing as he fails to respond to Newton's confutations against PSR and PII.

The first argument that Leibniz highlights is the Principle of Sufficient Reason. He states that there must be a sufficient reason for something to occur and something else to not occur in its place. Leibniz expresses this in a theistic manner; if space is substantival, things occur with respect to absolute space. So why would God place an object or have something occur in a specific location when it would have been perfectly acceptable for it to occur somewhere else? Leibniz suggests that this problem can only be solved through relationism. If the defining properties of events and objects are only in relation to each other then there is no way of questioning why they occur in a specific place as there is no such thing as absolute space. If event 2 occurred in relation to event 1, there are no alternatives for event 2 to occur, as long as event 1 occurs, so will event 2, there are no absolute spatial properties, only relative ones.

Intuitively, this seems like a causal argument, which is an interpretation that both Clarke and Sklar (Sklar 1977) adopt. Clarke refutes Leibniz's argument by asking why God's will is an insufficient reason for something to occur. To suggest that God would be unable to make a decision if there were two equally favourable locations for an event to occur, would be suggesting that God lacks the power to do so and is thus no longer omnipotent. Leibniz's argument does not match our omnipotent attributes of God and suggests He is 'no wiser than Buridan's ass' (Sklar 1977).

The principle can also be interpreted in an atheistic manner. Sklar refutes PSR by firstly restating it as 'everything must have a sufficient cause' (Sklar 1977). This raises the problem of the location of material objects. Sklar suggests that the most common view adopted by scientists and philosophers today is that an event is in a certain location due to the forces that led up to it. He gives the example that Jupiter is where it is in relation to the Earth today due to previous velocities and forces. Sklar states that causal relations are widely accepted to be a sufficient cause and therefore makes a substantivalist view compatible with the PSR. Thus, by interpreting the PSR as a causality principle, both theistically and atheistically, Leibniz's arguments against the reality of space can be solved by the substantivalist.

In the same vein, the second principle that Leibniz propounds is the Principle of Identity of Indiscernibles. Leibniz claims that the PSR is much more than a causality principle and is still compatible with God's will. He states that if there were two equally fruitful possibilities then God will choose neither; everything must have a sufficient reason to occur and God's will cannot be that reason. This refuted Clarke's argument against the PSR (although Sklar's claim still holds) and led Leibniz to introduce the PII. This states that no two entities can exist in nature that are completely indistinguishable. The principle plays an important role in Leibniz's views on the reality of space and is used to argue against substantivalism through two shifts: static and kinematic.

Leibniz proposes static shifts in the following way. Imagine if every object in the universe was moved by *x* metres, there would be no way of knowing if it had moved or not. Therefore, the same scenarios in different spatial locations are indiscernible, and according to Leibniz's PII, this would mean they cannot exist. This would not pose a problem for the relationist, objects are only defined by their relation to other things, so moving everything by *x* metres would not create a different scenario as the relations remain untouched. The substantivalist would argue that objects having spatial locations is precisely the solution. Everything existing within absolute space can be given arbitrary spatial coordinates. Therefore, when everything is moved by *x* metres, whilst at face value nothing seems to have changed, the spatial coordinates will have altered, and the two scenarios will not be indiscernible. Hence, static shifts do not support Leibniz's argument against the reality of space.

Kinematic shifts pose a different problem. Leibniz gives the example of existing within Galileo's moving ship. Below deck it would be impossible to know whether you are still or moving at some sort of inertial velocity. The problem of indiscernibility arises again. Much like in the static shifts, the relationist is exempt from this problem. Both scenarios are the same as the motion of objects are characterised by their relations, and as the relations do not change in a kinematic shift there is no indiscernibility. A substantivalist, however, is committed to believing that no kind of detection is possible to calculate the absolute motion [motion with respect to absolute space] of any inertial frame. Newton argues in the *Scholium* that whilst it is true that absolute velocity cannot be detected, changes in the velocity, absolute acceleration, can be. Through the thought experiments concerning a rotating bucket of water and rotating globes, Newton is able to provide an argument against Leibniz's relationism.

Firstly, we are given the example of a rotating bucket. Suppose that there is a bucket filled with water suspended with a rope. The rope is twisted and released and so the bucket spins. Initially the water is flat, but gradually as it gains momentum, the speed of the water becomes the same as that of the buckets and a concave shape is formed on the water-surface. Newton states that the concave shape occurs due to a rotation in relation to absolute space. A relationist is unable to explain this phenomenon. Descartes suggested that for a relationist, real motion occurs when 'a body moves in relation to its immediate surroundings' (Dainton 2001). Thus, maximum curvature would occur when there is a maximum disparity between the speed of the water and the bucket. This happens as soon as the rope unwinds, at which point we can see that the water is flat. Maximum curvature occurs when there is no disparity and the speed of the bucket and water are equal. Ergo, Descartes' argument for relationism does not hold. A relationist could attempt to argue that the water is moving in relation to the observers, this however, would also not work, as whilst the water may rotate when the bucket is moving and the observer is stationary, the relationist would have to argue that the same phenomenon would occur if the bucket was stationary and the observer ran around it at a high velocity. As this does not follow, the relationist is unable to account for this problem.

Secondly, Newton gives the example of a rotating pair of globes. Suppose there are two possible worlds [W_1 and W_2], both a complete vacuum with two globes situated within them, joined together by a cord with a tension measuring device. We know that if the globes are stationary, there is no tension within the cord, but as soon as they start to rotate, due to circular motion, tension arises. If tension was measured in the cord in W_1 but not in W_2, we would intuitively know that the globes were rotating in W_1. As the globes are in a vacuum in both worlds, the rotation is not occurring relative to anything else. Newton would say that in W_1 the globes are rotating with respect to absolute space, however the relationist can make no such claim. As the globes are rotating at the same speed there is no relative motion in either W_1 or W_2 and so the relationist cannot account for the disparity in the tension readings. Thus, Newton's examples give strong evidence for the existence of absolute space, and in turn refute Leibniz's relationist argument against the reality of space.

Conversely, Leibniz argues against the concept of absolute acceleration in an attempt to save the relationist view. As Dainton outlines, it is accepted that absolute velocity has no empirical consequences as it cannot be detected. How can absolute acceleration have any significant consequences, as acceleration is just a change in velocity? Although Leibniz died before he was able to outline his replacement theory for absolute acceleration, a few of his ideas can be deduced from his earlier correspondences. In his fifth paper he argues that absolute acceleration occurs, not to movement relative to absolute space, but to forces. It occurs when the 'immediate cause of the change is within the body' (Clarke, et al. 1965). This argument holds for examples of causal forces such as a rocket accelerating due to the firing of a motor. Friedman points out that for uniform rotational motion, this is not the case. Absolute rotation is not controlled by external or causal forces like the rocket is. A rotating disk will continue rotating at a uniform rotational velocity without any external forces, yet if the centripetal force is large enough acceleration occurs and parts of the disk can fly off (Friedman 1983). Therefore, Leibniz's argument against absolute acceleration does not hold for rotational motion and cannot be used against the existence of absolute space.

Additionally, in an attempt to refute Newton's globes example, Leibniz argues against the existence of a vacuum. If a vacuum cannot exist there can be a relationist explanation for the tension in the cord in W_1 and therefore Leibniz's argument against the reality of space will still hold. As Ballard states, it was difficult for Leibniz to refute Clarke's empirical evidence, such as Torricelli's barometer, for the existence of a vacuum (Ballard 1960). Leibniz argues that matter is more perfect than a vacuum, it gives God the medium in which He can exercise his will and goodness and therefore a plenum must exist, and a vacuum cannot. Clarke contends that it could be possible that the amount of matter we have in the world right now is the most convenient, and therefore a greater [or lesser] amount would be inconvenient and would not be a perfect option for God to bestow goodness. Leibniz argues that there is no sufficient reason for God not to fill the world with matter, as perfection exists with the greatest number of compossibles. To take this position, however, Leibniz would have to justify why perfection is to be equated with a plenum. Leibniz, however, assumes this in his argument. Due to the lack of justification and the overwhelming amount of empirical evidence, I will disregard this postulate as a valid argument against the reality of space.

Thus, it can be concluded that Leibniz is unable to give sufficient arguments against Newton's criticisms of PSR and PII and is therefore unable to effectively argue against the reality of space. It must be acknowledged that Leibniz provides sound metaphysical arguments within his other works and towards the end of the correspondence. He is, however, unable to advocate relationism in the face of Newton's bucket and globes experiments which advocate absolute acceleration and space. I conclude that Leibniz's arguments against the reality of space are unsatisfactory.

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