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DISCUSSION

A SPATIAL ANALOGUE OF SHOEMAKER'S GLOBAL FREEZE ARGUMENT

By John J. Conlon

I argue that there could be observational evidence for absolute motion. My argument employs a spatial analogue of Shoemaker's classic 'global freeze' thought experiment, wherein he imagines a world whose inhabitants would seem to have strong evidence that a period of time without change had occurred. The inhabitants of my own imagined world, I claim, would have strong evidence that everything in the universe had moved the same distance in the same direction and, thus, strong evidence for absolute motion. This conclusion seems to pose a problem for spatial relationists insofar as they cannot account for absolute motion.

As we watch a race ending, we might ask whether the sprinter is moving over the stationary finish line or whether instead the finish line (and the earth) are rushing, like the track of a treadmill, under her. We might conclude, as some have, that there is no answer here, that motion just is change in the spatial relations between objects, or to put it differently, that all motion, necessarily, is *relative motion*. Such a position seems to be a consequence of so-called spatial relationism: that is, the view that space is, necessarily, just the arrangement of objects amongst themselves, and not an independent entity.[1] Alternatively, the spatial substantivalist, who takes space to be an independent entity, would say that there could be an answer to our question. The sprinter is moving, that is, she is in *absolute motion*, toward the finish line if she is moving relative to absolute space, and the Earth is not moving if it is not moving relative to absolute space.

In this paper, I argue that there could be observational evidence for absolute motion. I give a spatial analogue of the thought experiment given by Shoemaker (1969), who, in response to the view that time necessarily involves change, imagined a world whose inhabitants seem to have observational

[1] Leibniz, famously, held this view. See his fourth letter in the Leibniz–Clarke correspondence (Alexander 1956). There, he explicitly denies the possibility that everything in the world could move the same distance in the same direction, which is exactly the conclusion I argue one could have evidence for.

evidence for a period of time wherein nothing changes. I briefly summarize his argument before turning to my own.

Shoemaker's argument (with some details changed) goes like this. Imagine a world with three planets, Alpha, Beta, and Gamma, and nothing else. Every three years, everything on Alpha 'freezes' for a year. That is, nothing on Alpha moves until exactly one year has passed, whereupon everything unfreezes, resuming the motion it had just prior to the freeze. No one on Alpha, of course, notices its occurrence (since their brains are also frozen for the year), except that Beta and Gamma appear suddenly to 'jump ahead' a year. To Betans and Gammans, Alpha appears to go dark for a year (for photons around Alpha also do not move, and thus cannot reach the other planets), only to reappear exactly as it had been before the freeze. The inhabitants of this world conclude that, every three years, nothing on Alpha changes for a year. This world of *local freezes*, even to those who think time necessarily involves change, seems plausible enough. After all, things are still changing during the year of the local freeze, just not things on Alpha.

But if this seems plausible, so too does the following. Imagine that, as before, Alpha undergoes a local freeze every three years, but now Beta undergoes one every four years and Gamma every five years. Then, for sixty years things go on about as they did in the first world, with the planets freezing at their prescribed times but always with at least one planet remaining unfrozen. But now, every sixtieth year, when the pattern of freezes would seem to predict that every planet (and thus everything in the universe) should undergo a freeze, no one on any of the planets notices a freeze at all. No planets, it seems, go dark, and no one notices any other planet seeming to jump ahead. Shoemaker argues that the inhabitants of this world should conclude not that no freeze occurs, but that a *global freeze* occurs. That is, they should conclude that nothing moves, and thus nothing changes, for a year. The alternative hypothesis, that the regular patterns of local freezes are interrupted every sixty years just when they would seem to line up, is quite ad hoc and, it seems, should be rejected by the world's inhabitants. If that is right, then there could be observational evidence for a period of time without change.

I now turn to my own argument. The world I eventually describe is one whose inhabitants, I claim, have observational evidence that everything in the universe moves the same distance in the same direction. Such motion would leave unchanged the spatial relations between objects. Thus, the inhabitants of my imagined world have observational evidence for absolute motion.

Consider again a world in which there are three planets, Alpha, Beta, and Gamma, and nothing else. Betan and Gamman astronomers have noticed that every three years, Alpha appears suddenly to begin moving at sixty miles an hour to the left (to pick an arbitrary name for the direction it appears to move). It stops after one minute and therefore appears to move one mile to the left. To Alphans, of course, Beta and Gamma appear suddenly to move one mile to the right. This *local shift* seems unproblematic, regardless of one's views about absolute motion.

But now consider, unsurprisingly, the following world. As before, Alpha appears to undergo a local shift every three years. But now, in addition, Beta appears to make a similar shift every four years, and Gamma every five years. And, every sixtieth year, when these patterns would seem to suggest that each planet should undergo a local shift, it appears to the inhabitants of each planet as though none of the planets shifts.

I claim that the inhabitants of this second world have evidence that, every sixty years, there occurs a *global shift*, wherein every planet (and thus everything in the universe) shifts a mile to the left. If so, then they have evidence for absolute motion. To claim that no global shift occurs would require a complicated hypothesis wherein the shifting of the planets normally occurs at regular intervals, but for one exception; the shifting does not occur every sixtieth year. Like that denying a global freeze in Shoemaker's example, this hypothesis would be quite ad hoc, and the people of this universe would have reason to reject it.

We can add more details (as Shoemaker does in the temporal case) to make the denial of a global shift even more implausible. Imagine that, while the shifts always start at exactly the times described above, their duration now varies, seemingly at random. Additionally, for an interval of time prior to every local shift, a red glow permeates the area around the soon-to-be-shifting planet. When this glowing will begin, and therefore how long it will last before the subsequent shift begins, is entirely unpredictable. But, after careful observation, it has been found that the duration of a planet's local shift is always exactly proportional to the duration of the preceding glow. Call this function, from glow duration to shift duration, the 'glow-function'. The glow-function perfectly predicts the duration of the subsequent apparent shifts, at least when only local shifts occur. As expected, a red glow surrounds each planet every sixtieth year. Usually, the times the glowing starts around each planet, and thus the duration of the glow around each planet, will differ. But after the glows cease (all at once), no planet seems to move for a while. Then, at the time the glow-function would predict that the planet with the shortest period of glowing should have stopped shifting, the other two planets appear to begin shifting. Further, these two apparent local shifts last exactly the amount of time the glow-function would have predicted based on their periods of glowing *minus* the time since the glows ended.

Here, I claim, it would be very implausible to say that global shifts do not occur. The hypothesis that the planets always undergo local shifts every three, four, or five years whose durations are exactly proportional to the duration of the red glow is much simpler than its alternative. To insist that global shifts do not occur would require that, every sixty years, the usually perfect correlation between the occurrence and duration of the red glow and the duration of the subsequent shifts breaks down. The rule for the sixtieth year would be complicated and glaringly ad hoc, and this world's inhabitants would have strong reason to reject it. Thus, the inhabitants of this world would have strong observational evidence that, every sixty years, everything in their universe moves the same distance in the same direction. So I conclude that there could be observational evidence for absolute motion.

Russell writes, 'The chief objection [to the substantivalist's position] is that absolute space is absolutely unknowable, and cannot therefore be a necessary hypothesis in an empirical science' (1945: p. 71). My thought experiment does not show that absolute space *is* a necessary hypothesis for *our* empirical sciences, since different physical laws obtain in my imagined world than do in the actual world. But I think it does show that absolute space *could* be a necessary hypothesis for *an* empirical science, assuming that the strong evidence described for absolute motion (and thus for absolute space) would suffice to make absolute space a 'necessary' hypothesis. Absolute space is not absolutely unknowable, since we could know of it if the world were like the one I described. It is simply unknown, since the world is not that way. So this 'chief objection', it seems, has been met. What's more, for the spatial relationist who believes that absolute motion is metaphysically, not just physically, impossible, my imagined world seems to pose a problem.

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Ohio State University, USA