Tom Fadial
3194-1468

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# Shoemaker's "Freeze World"

## PROBLEMS WITH THE NOTION OF CHANGELESS INTERVALS

Shoemaker's "freeze world" is advanced as a scenario allowing for the justifiable belief in the possibility of time without change. However, several inconsistencies in the scenario's presentation (including conflicts with its own definition and physical laws), and underlying theory (inadequate descriptions of time and change) prevent it from being a convincing argument.

I will begin with an overview of Shoemaker's scenario, and will then describe problems in the scenario's description – namely a contradiction in Shoemaker's response to anticipated challenges, and conflicts with physical laws. I will later explore a problem with Shoemaker's theory (of time and change) and reasoning. Shoemaker's "freeze world" scenario, first proposed in "Time Without Change" (1969), describes a discrete possible world consisting of three zones: A, B and C. Under normal conditions, the inhabitants of each zone are able to observe and communicate with each other. However, a mysterious phenomenon occurs occasionally whereby all change in a zone ceases, meaning no motion, growth or decay occurs. During these "local freezes", inhabitants of the other unfrozen zones can observe that all activity has, indeed, stopped (while their zones remain active). Individuals in the frozen zone do not immediately detect the freeze, as their activities will simply resume as if no freeze had occurred. Frozen observers focused on one of the other zones would notice large, instantaneous changes as they become acquainted with the post-freeze world. In Shoemaker's example, these local freezes are found to occur cyclically (every three years in Zone A, every four in Zone B, and every five in Zone C) and last for one year each time. The cycles are in phase (see figure), so every sixty years, the frozen periods of each zone align to create a "total freeze" where absolutely no change occurs in the entire world. The term of this total freeze would be undetectable to the world's inhabitants who had previously referenced other zones' clocks or their own perception of other zones' change to recognize the freeze. This scenario establishes the idea that one in sixty years will be what Shoemaker calls a "changeless interval".

Shoemaker preempts a few objections in describing his scenario. First is the criticism of types of change. What does it mean for a zone to be frozen? What type of change is *not* occurring? In its most basic form, change occurs when some entity has a property P initially and some other property at a later time. However, there are types of change that satisfy this definition, but cannot be "frozen" in the sense that a physical property can. Two classes of potentially unfrozen change described by Shoemaker are first defined by McTaggart and Goodman ("McTaggartian" properties and "grue-like" predicates respectively). "McTaggartian" properties produce change even in frozen zones because they, for example, include attributes defining an entity's age. Thus, Shoemaker's otherwise changeless intervals would continue to have change with respect to properties like "Zone A is *n* seconds old". Goodman's "grue-like" predicates are similarly insulated from Shoemaker's frozen zones and describe cases of predicate and reference change. Shoemaker discounts these classes of change as trivial, and rightly so. A more careful examination of *why* suggests that the alternative changes carry no physical weight, that is, a change in a McTaggartian or "grue-like" property does not (on Shoemaker's account) require any changes in the physical world, aside from, presumably, time. The second objection Shoemaker anticipates is the problem of "unfreezing": what could thaw a total freeze? At the end of every sixty-year cycle, everything in the possible world is frozen, including any possible causes for an unfreezing. For this, Shoemaker proposes the concept of "action at a temporal distance", a counter-intuitive patch allowing that some pre-freeze cause could have its effect at the time of unfreezing one year later.

Shoemaker deftly avoids both these worries, but what about issues he didn't anticipate? The solutions he provides for the objections described above work when taken separately (and charitably), but there is a conflict when they're considered together. Shoemaker dismisses McTaggartian properties because they do not produce real changes, changes like what one might be able to observe directly in a physical object. However, when we consider the temporally distant causes Shoemaker uses for unfreezing, we see that he cannot have both (dismiss the unreality of McTaggartian properties, while positing causes that act at a temporal distance). Reversing a total freeze is a difficulty because the state of the world before and after the freeze is exactly the same, as there is no change happening. Shoemaker requires *temporally distant* causes because any event in the pre-freeze world that could cause unfreezing would have done so immediately, not some time later. As a result, Shoemaker's action at a distance requires some real property that is sustained through the total freeze, not unlike a McTaggartian property. Shoemaker never explores in detail the form of this delayed trigger, but it must be a *real* cause and we cannot dismiss it in the manner that Shoemaker does for McTaggartian properties. What we also find is that the delayed trigger actually changes during the period of the total freeze. Shoemaker, because of his earlier dismissal, cannot use something like McTaggartian properties here, meaning the delayed trigger cannot be a similarly time-indexed (and therefore changing) event. The alternative, however, is equally dissatisfying as it descends into a vicious cycle of unexplained causes. Without a proper, time-indexed definition, the delayed trigger remains in a dormant state for most of the freeze before *changing* into the active state capable of unfreezing the world. In addition to violating the world's frozen laws, the delayed trigger now itself requires some cause to effect its transition. So, either McTaggartian properties are real and show that changeless intervals are not possible (to freeze McTaggartian properties is to freeze time, recall the "*n* years ago" example), or the unfreezing problem remains and invalidates the scenario's supposed conceptual possibility.

The "freeze world" scenario also presents some physical inconsistencies. Shoemaker notes that his scenario should not be challenged for its physical possibility, only whether it is logically or conceptually possible. However, it is worth noting that our understanding of time is fairly primitive, and stretching this understanding into even nearby possible worlds grates the conceptual realm too. Do we know what time is to discern whether Shoemaker's freezings are logically possible (more on that later)? Furthermore, if we are meant to relate the outcome of the scenario to time in our world, it is important that we not offend too many of our physical laws, particularly if we are to elevate the scenario from "thought experiment" to a (meta)physically viable counterexample. One such conflict involves attempts to observe frozen zones. If a zone is frozen, then it cannot interact with other entities in the way unfrozen zones do, meaning light waves cannot be reflected off frozen objects and it becomes unclear what unfrozen observers would *see*. Observation of frozen zones is critical for Shoemaker's scenario because it supports the possibility of total freezes (without observation, we would have less reason to believe all zones freeze every sixty years). Some patch can probably be made – a darkened force field surrounding the frozen zone, for example – but these further weaken the scenario. The most jarring conflict is related to the possibility of freezing itself. As far as we can understand, motion and change are critical to the very persistence of matter. The constant movement and vibration of atoms and subatomic particles are required to maintain the tenuous structural and electrical integrity of these entities. Take the phenomenon called absolute zero, for example, the temperature (0K, -273°C) at which molecular motion mostly ceases. Reaching absolute zero is theoretically impossible, an asymptotic limit similar to the speed of light. Even approaching absolute zero causes wild variations in a substance's properties including quantum effects like superconductivity (Newton-Smith, 29). The impossibility of reaching absolute zero therefore raises serious doubts on even the logical feasibility of Shoemaker's scenario.

The final critique of Shoemaker is theoretical in nature and involves the ideas of time and change in the "freeze world" scenario. The terms are not well defined, and the lack of clarity ultimately leaves Shoemaker begging the question. What exactly does it mean for time to pass in frozen zones, what do these "changeless intervals" refer to? In the scenario, time can be observed to pass when one or two zones are frozen because of the remaining reference zone(s). When the frozen zones thaw, they can consult clocks or observers in the unfrozen zone to learn that their zone had indeed been in a freeze. However, in a total freeze, no such reference exists, and to say that the zones continue frozen for one year is to gratuitously assume the conclusion that changeless time is possible. During the single local freezes, the passage of time is still relative to changes occurring in the unfrozen zone(s). To inhabitants of the frozen zone, the one year freeze passes instantaneously and would have gone unnoticed were it not for observers in the unfrozen zones. However, during the total freeze, all changes in the world cease, and without the reference of changes in unfrozen zones, the intervening period *does* pass instantaneously and inhabitants of the world would never know. Shoemaker's scenario is therefore reducible to the total freeze (there is still time and change during single local freezes), and the conclusion that there is a one-year changeless interval is not adequately supported.

Shoemaker's frozen world scenario, while an ingenious design, suffers from a few critical flaws that prevent it from convincingly proving its conclusion that time without change is possible. Problems with the example's own accommodations (the McTaggartian properties), general conflicts with physical laws, and a fallacious leap to the scenario's conclusion leave the "freeze world" scenario as a much less persuasive thought experiment.

Tom Fadial
3194-1468

# Works Cited

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