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"Gődel's 'Time-Traveling Universes: True or 'Refreshing Surprises'?"

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A wrong guess brings a refreshing surprise
John Archibald Wheeler

Abstract
In this discussion, I offer further reflections on matters John L. Bell discusses in his, "Time and Causation in Gődel's Universe" (Dec. 2002). *Inter alia*, I point out that a principled defense of time travel must include consideration of "personal identity"—especially if we appeal to Bell's "ramifying universes" so as to evade the vexing "Grandfather Paradox."

In his thought-provoking piece, "Time and Causation in Gődel's Universe,"[1] John Bell lucidly describes the consequences of countenancing solutions to the Einstein Field Equations (EFE) which contain closed timelike curves (CTCs)—i.e., universes in which time travel is metaphysically possible.[2]

Bell avers that there are three possibilities:

1) Time travel is impossible
2) Time travel is possible (without a "Many Worlds" interpretation)
3) Time travel is possible (but only with a "Many Worlds" interpretation).

In this brief note, we will rehearse arguments against the latter two options, then conclude with some remarks on the significance of time travel's impossibility. (For discussion of the "Many Worlds"-option, see Deusch and Lockwood.[2])

One puzzle which Bell (following Gődel) offers is the following syllogism:

Argument (T):

a) If the EFEs are true and complete, then time travel is possible

b) If time travel is possible, then there can be no objective lapse of time

c) The EFEs are true and complete

∴d) There is no objective lapse of time.[3]

Yet Bell seems to overlook another way to see the above argument. "One philosopher's modus ponens is another's modus tollens," it's often said. In this spirit, we can juggle the premises and conclusion of the above "a-b-c/:.d"-syllogism to yield an argument of the form, "a-b-~d/:.~c:"

Argument (T*):

a') If the EFEs are true and complete, then time travel is possible

b') If time travel is possible, then there can be no objective lapse of time

~d') But there are objective lapses of time

∴(~c) Time travel is not possible—and (~a) Einstein's EFEs are either false or incomplete.

Now, argument (T*) is deductively valid if argument (T) is. So, which of the two arguments is more apt; which argument has the more plausible set of premises? The so-called "Grandfather Paradox" militates against argument (T).[4] If we couple plausible premises concerning human free-will/autonomy with time travel's possibility, then we can derive a contradiction. This would rule out Option #2, in our previous paragraph.[6]

Bell is aware of this, of course. Thus, he writes, "…it would seem to follow that the 'past' into which the [time traveler] has traveled is in fact a different "past" from the one which the [time traveler] originated."

Well. Now we don't have to worry about a time traveler's "free will" giving rise to contradictions. But there's still a problem, this time concerning personal identity. To wit, when we talk (or see a movie) about travel into the past, we assume that the people the time traveler meets (after stepping out of the time machine) are identical to the people he knew in the past. E.g.: When, in the Time Machine, H.G. Wells' character returns to London in 1895, we assume he's telling his story to the same people he left before. Again, if we enter a time machine intending to meet our childhood friends, we want to meet the selfsame human bodies which caused our memories of the past—not replicas from some "parallel universe."[8] So this "Personal Identity"-paradox, albeit more subtle than the "Grandfather Paradox," tells against option #3 in our second paragraph.

So, with options #2 and #3 challenged, then (prmia facie), we're only left with option #1: that time travel is impossible. Or, at the very least, the friend of time travel will need to articulate better views of human agency or personal identity, if s/he is to overcome the "Grandfather Paradox" or the "Argument from Personal Identity," respectively. In lieu of substantive responses to these common-sense arguments, I fear I must conclude that time travel is metaphysically (and physically) impossible.

I'm surprised that many people are surprised by my bold-seeming conclusion. But knowledge of physics' history tells us to be wary of strange consequences of the physics-du-jour. For instance, classical physics entailed the "ultraviolet catastrophe," in connection with the thermal properties of a "blackbody." Physicists' reaction to this paradox wasn't to conclude that unbounded energies are possible; rather, they concluded that classical physics needed refinement. The result, of course, was our quantum-mechanical understanding of the world.[10] Again, loopholes in Special Relativity allow for the bare possibility of "tachyons"—particles that travel faster than light.[11] Yet decades of experimental research have failed to turn up substantive evidence of these superluminal particles. Conclusion: that, while tachyons are mathematically consistent with Special Relativity, there's no reason to think that they really could exist.

In the same way, it may turn out that time-traveling solutions to Einstein's EFE's are not indications that time travel is possible, but rather that Einstein's equations need (hopefully slight) refinements. It will be intriguing to see if time-traveling scenarios are still possible in a unified theory of quantum-gravity—whenever, that is, we get around to framing it. If so, then that would be quite a coup. But in the meantime, when it comes to "time traveling" solutions to Einstein's EFEs, we ought to take to heart physicist John Archibald Wheeler's skeptical stance: "When you see a breathtaking corollary of the physics," he once said, "your first reaction should be, 'How beautiful!'"

"…and your second reaction should be, 'How probably wrong!'"

Endnotes

[1] Bell, J.L., "Time and Causation in Gődel's Universe," Transcendental Philosophy vol. 3, no. 2 (December 2002).
[2] Deusch, D. and Lockwood, M., "The Quantum Physics of Time Travel" vol. 270, no. 3 Scientific American (March 1994): 68-74.
[3] In 1st order logic, the argument would be regimented as follows:

a') $E \rightarrow TT$

b') TT → ~O
c') E
∴ ~O

[4] For discussion, see David Lewis's classic, "The Paradoxes of Time Travel" vol. 13 American Philosophical Quarterly (1976): 145-152. For a summary of highlights in philosophical research on time travel, see Alasdair Richmond, "Recent Work on Time Travel" vol. 44 Philosophical Books (October 2003): 297-309. For a previous contribution of mine, see, "Time Travel: How Not to Defuse the Principal Paradox" vol. 12 Ratio (September 1999): 296-301; my article is a discussion of Peter Riggs' "The Principal Paradox of Time Travel" vol. 10, no. 1 Ratio (1997): 48-64.

[5] For discussion of the "Autonomy Principle," and its telling against time travel, see my "Time Travel: How Not to Defuse the Principal Paradox." See also Ted Sider, "A New Grandfather Paradox?" vol. 57 Philosophy and Phenomenological Research (1997): 139-144.

[6] If time travel turned out to be a reality, in fact, then the Grandfather Paradox would take on the character of Zeno's Paradoxes. Even if engineers succeeded in building time machines, in other words, we (philosophers) would still be left with the job of explaining where the "Grandfather Paradox" goes awry. See my "Time Travel: How Not to…," for details.

[7] For primers on the problem of Personal Identity, see John Perry, Personal Identity (Berkeley: UC Press: 1975), and his gripping, Dialogue on Personal Identity and Immortality (Indianapolis: Hackett, 1978).

[8] For discussion of this worry concerning personal identity, see Lewis, "The Paradoxes of Time Travel," op. cit. Lewis is reacting to Jack Meiland's proposal, "A Two-Dimensional Passage Model for Time Travel" vol. 26 Philosophical Studies (1974): 153-173.

[9] I originally offered this point in my, "Time Travel: How not to Defuse the Principal Paradox," op. cit., and expanded upon it in my talk, "What Do We Owe Time Travel's Foes?" delivered at MIT's series, Time Travel: Philosophy and Physics (17 January 2001).

[10] For a primer, see John Polkinghorne, The Quantum World (Princeton: Princeton U. Press, 1986).

[11] See Gerald Feinberg, "Particles That Go Faster Than Light" vol. 222 Scientific American (February 1970): 69-77.