Gödel's Temporal Idealism: A Reply to Prof. Kahle

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In his Kurt Gödel Award 2021 essay, "The Philosophical Meaning of the Gödel Universe," Prof. Kahle takes a fresh look at the philosophical ramifications of Gödel's cosmology and helps clarify what Gödel's intentions were and what the significance is of his arguments. I have several reservations, however, concerning Kahle's discussion. To begin with a minor point, he states in his opening that,

"During his time at the Institute for Advanced Studies, Kurt Gödel became a close friend of Albert Einstein, and in particular studied the theory of relativity."

This gives the misleading impression that it was due to his friendship with Einstein that Gödel studied relativity, though it's well known that Gödel's initial focus in his university studies was on physics. How deep his knowledge of physics was can be gleaned from the fact that he suggested in a letter to John von Neumann in 1934, "with regard to his stay at the IAS … that he would gain a great deal from the opportunity to hear von Neumann lecture or direct a seminar on quantum mechanics, a subject in which he had a 'lively interest'… To Veblen, too, Gödel expressed his interest in the seminar …"[2] This was long before he became a friend of Einstein. Further, Gödel himself said that the inspiration for his cosmology was not his friendship with Einstein, but rather his philosophical interest in (the reality of) time, in particular, with respect to Kant's philosophy: "My work on rotating universes," said Gödel, "was not stimulated by my close association with Einstein. It came from my interest in Kant's views. In what was said about Kant and relativity theory, one only saw the difference, nobody saw the agreement of the two. What is more important is the nature of time. In relativity there is no passage of time, it is coordinated with space."[3] Solomon Feferman notes, further, that, at that time, "Einstein himself was preoccupied, as he had been for a long time, with constructing a unified field theory, a project about which Gödel was skeptical."[4]

And there's more about Kahle's take on the relationship between Einstein and Gödel I find potentially misleading. The standard view, I take it, is that in his writings on relativity, Gödel the logician turned into a part time physicist (which took his colleagues at the IAS by surprise). By contrast Kahle chooses to view the relationship "through logical glasses," and concludes that it wasn't Gödel who became a part time physicist, but

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[2] John Dawson, 1997, *Logical Dilemmas: The Life and Work of Kurt Gödel*, Wellesley, Massachusetts, A.K. Peters, 92.

[3] Hao Wang, 1996, *A Logical Journey: From Gödel to Philosophy*, Cambridge, Massachusetts, The MIT Press, 88.

[4] Solomon Feferman, 1986, "Gödel's Life and Work", in S. Feferman et al. eds., *Kurt Gödel: Collected Works, Volume I*, New York, New York, Oxford University Press, 1 – 36: 13 – 14.

rather Einstein, though not a logician, who nevertheless acted like one. Thus Kahle writes:

It is true that Einstein himself was not a logician. But we can obtain the special theory of relativity absolutely with the help of certain logical guidelines. The central idea is: the knowledge that there is an absolute speed of light c, which is at the same time the physically highest speed, can be set up as a kind of axiom, so that all further theory components of a physical description of our universe must be compatible with this axiom.

Kahle says similarly that Einstein obtained the general theory of relativity by deducing, logically, consequences that follow from another basic axiom:

"Viewed through logical glasses, one could say that Einstein developed both the special and the general theory of relativity by thinking through new axioms: He reworked the existing theories to the point where they were consistent with these axioms."

As for the Gödel universes, Kahle says that,

"the qualitative conception is a purely logical one: the axiomatic version of the theory of relativity in its field equations admits non-standard models; i.e., in particular, that it is formally incomplete. One could characterize Einstein's procedure to the effect that he investigated what follows from the constancy of the speed of light. Gödel then examined in his turn what is compatible with the result of Einstein's investigations."

There is something to this way of viewing things, to be sure, but one must be careful not to take things too literally . To begin with, Kahle neglects other principles Einstein took to be basic in developing the special theory of relativity (or STR), including a kind of verificationism which banished the aether hypothesis and the idea that there are no privileged reference or inertial frames. Moreover, Einstein's verificationism was a *philosophical* assumption. As the noted physicist J.S. Bell pointed out, "since it is experimentally impossible to say which of two uniformly moving systems is *really* at rest, Einstein declares the notion 'really resting' and 'really moving' as meaningless … [whereas] Lorentz … preferred the view that there is indeed a state of *real* rest, defined by the 'aether', even though the laws of physics conspire to prevent us identifying it experimentally. The facts of physics do not oblige us to accept one philosophy rather than the other."[5] Indeed, Hao Wang told me that, in conversation, Gödel expressed great interest in the Lorentz vs. Einstein interpretation of the formalism of STR. Unsurprising, given that in Gö95 (245- 46; brackets added), he made much the same comment we've just seen Bell make: "[I]n perfect conformity with Kant, the observational results by themselves [on which STR rests] really do not force us to abandon Newtonian time and space as objective realities, but only the observational results together with certain principles, e.g. the principle that two states of affairs which cannot be distinguished by observation are also objectively equal."

Naturally, it wasn't Einstein's competence as a "logician" that inspired him to take those principles as basic, as "axioms", when formulating STR, but rather his physical

[5] J.S. Bell, 1989,"How to Teach Special Relativity," in Bell, *Speakable and Unspeakable in Quantum Mechanics*, Cambridge, Cambridge University Press, 67 – 80; 77.

(and philosophical) intuition. Moreover, in constructing the general theory of relativity (or GTR), his physical (and philosophical) intuition had modified. More generally, of course, logical competence concerns derivation from axioms, not the adoption of the axioms themselves; and even "derivation" from physical axioms is not a purely logical affair. Einstein's former student, Hans Reichenbach, the well-known logical positivist, wrote a book entitled, *Axiomatization of the Theory of Relativity*[6]. Einstein, himself, of course, was not operating with such an axiomatization from which he was merely deriving "theorems." Indeed, Gödel noted "the lack of interest of physicists in the axiomatic method ..."[7]

Similarly, Gödel's construction of the Gödel universes involved a great deal more than logical competence. Despite the obvious fact that Gödel's construction depended on an advanced knowledge of physics, there is the fact that, as Feferman said, "in this work, Gödel brought to bear mathematical techniques and physical intuitions that one who was familiar only with his papers in logic would not have expected. The mathematics, however, harks back to his brief contribution to differential geometry in the 1930's, as well as his studies of analysis with Hahn in Menger's colloquium."[8] In sum, it wasn't primarily Gödel's prowess as a logician that enabled him to construct the Gödel universes, but rather his surprising abilities as a physicist and pure mathematician.

These reservations, however, are relatively minor concerns. More serious is the question of what Gödel believed about the reality of time, i.e. the question of Gödel's temporal idealism. With respect to this question, Kahle states in the opening of his essay that,

"Palle Yourgrau, for example, argues [You05] that Gödel concluded that there is no time even in our world. In fact, only much more cautious conclusions can be found in Gödel's writings." (brackets added)

This is a peculiar way of putting things. I'm far from alone in making this suggestion. And Kahle is not alone in rejecting it. John Byron Manchak, for example, also suggests that although Gödel's reasoning "is sometimes interpreted to be an argument that time in our universe is ideal … this reading seems to be a bit strong."[9] In any case, Kahle does provide textual evidence that at least in Gö49b[10], Gödel was indeed rather cautious in his formulations, and that is a fact worth bringing out. To be sure, Kahle acknowledges that Gödel says early in Gö49b that from special relativity (to quote Gödel) "it seems that one obtains an unequivocal proof for the view of those philosophers, who, like Parmenides, Kant and the modern idealists, deny the objectivity of change and consider change as an illusion", but he adds (to my mind, without any basis) the words "(only apparent)" before "an unequivocal proof", thus changing Gödel's claim. What Gödel is saying here, surely, is that *on the basis of special relativity alone*, one obtains an *unequivocal proof* (not an "only apparent" unequivocal proof) that change (hence time) is an illusion. Gödel

[6] 1969, transl. Maria Reichenbach, University of California Press.
[7] Wang96, 307.
[8] Feferman, op. cit., 14.
[9] Manchak, 2016, "On Gödel and the Ideality of Time", *Philosophy of Science*, 1050 – 1058; 1053.
[10] Kurt Gödel, 1949, "A remark about the relationship between relativity theory and idealistic philosophy," in P.A. Schilpp, ed., *Albert Einstein: Philosopher-Scientist*, Harper & Row, 555 – 562.

goes on to add, however, in Gö49b, that of course, one needs also to examine the general theory of relativity before reaching a final conclusion about the objective existence of time. No doubt, that explains Gödel's use of the words, "it seems."

It's also important, here, to recall the fact that Gödel tended in much of this writing (formal and informal) to be extremely, perhaps, at times, excessively cautious. Witness, the fact, for example, that though his incompleteness theorem, is known for its profound results concerning the relationship between proof and truth, when he published his theorem in 1931, he avoided mention of the controversial notion of (mathematical) truth. As Feferman remarks in "Kurt Gödel: Conviction and Caution"[11], "… the concept of truth in arithmetic was for Gödel a definite objective notion and … he had arrived at the undefinability of that notion in arithmetic by 1931. On the other hand, he did not state this as a result … and he took pains to eliminate the concept of truth from the main results of 1931." Gödel himself, in correspondence with Hao Wang, said that, "the heuristic principle of my construction of undecidable number theoretical propositions in the formal systems of mathematics is the highly transfinite concept of 'objective mathematical truth', as *opposed* to that of 'demonstrability,' with which it was generally confused before my own and Tarski's work. … [F]ormalists consider formal demonstrability to be an *analysis* of the concept of mathematical truth, and therefore were of course not in a position to *distinguish* the two."[12]

Much the same can be said about the failure of many physicists and philosophers—including, it seems, Kahle—to distinguish the intuitive concept of time from the formal/relativistic concept,[13] which is as essential to a proper understanding of the significance of Gödel's cosmology as the distinction between truth and proof is to a proper understanding of Gödel's incompleteness theorem. (I go into this in great detail in You99[14] and You05[15].) Gödel's extreme caution to the side, then, most serious commentators on Gödel's essay have drawn the parallel conclusion about Gödel's temporal idealism, which contrasts the "formal"/relativistic conception of time with the intuitive. Gödel's temporal idealism is directed only at the latter, and about that, commentators are widely agreed. The noted philosopher of science Karl Popper, for example, recalls a discussion he had with Einstein about Gö49b. "When I visited Einstein," Popper wrote, "Schilpp's Einstein volume … had just been published; this volume contained the now famous contribution of Gödel's which employed, against the reality of time and change, arguments from Einstein's two relativity theories. … The Reality of time and change," Popper writes, "seemed to me the crux of realism. [Einstein] clearly disagreed with Gödel's idealism. … Einstein did not want to give up realism … though I think he was ready to admit, as I was, that we might be forced one day to give it

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[11] In Feferman, 1998, *In the Light of Logic*, New York, New York, Oxford University Press, 150 – 164, 159.
[12] Feferman, op. cit., 159 – 160.
[13] Indeed, arguably, even Einstein failed to make that distinction. He remarked, as Gödel did, that in STR, there is no such thing an a nonrelative, global notion of simultaneity, but insisted, nevertheless (contra Gödel), that the notion of passage or evolution **[?]** is not thereby eliminated.
[14] Palle Yourgrau, 1999, *Gödel Meets Einstein: Time Travel in the Gödel Universe*, Chicago, Open Court.
[15] Palle Yourgrau, 2005, *A World Without Time: The Forgotten Legacy of Gödel and Einstein*, New York, New York, Basic Books.

up if very powerful arguments (of Gödel's type, say) were to be brought against it."[16] If Kahle is to be believed, both Einstein and Popper were in error about Gödel's beliefs about time.

As we've seen, Gö49b is not the only place where Gödel indicated his thoughts about the reality of time. In conversations he had with that Hao Wang, for example, he said: "As we present time to ourselves it simply does not agree with fact. To call time subjective is just a euphemism for this failure." Again: "Time is no specific character of being. In relativity theory the temporal relation is like far and near in space. I do not believe in the objectivity of time. The concept of *Now* never occurs in science itself, and science is supposed to be concerned with the objective."[17] Wang himself comments that "on the whole, Gödel seems to favor the fundamental perspective of seeing objective reality, both the physical and the conceptual, as eternal, timeless, and fixed." (op. cit., 322) (I'll have more to same about Gödel's conceptual realism further on.)

Again, in his (previously) unpublished draft(s) of Gö49b, "Some observations about the relationship between theory of relativity and Kantian philosophy" (Gö95)[18], Gödel is less cautious than he is in Gö49b, stating outright at the beginning of his essay that relativity theory confirms Kant: "It is a remarkable fact, to which, however, very little attention is being paid in current philosophical discussions, that at least in one point relativity theory has furnished a very striking confirmation of Kantian doctrines."[19] He affirms, however, that "I am not an adherent of Kantian philosophy in general," and notes that "unfortunately, whenever this fruitful viewpoint [of Kant's] of a distinction between subjective and objective elements in our knowledge (which is so impressively suggested by Kant's comparison with the Copernican system) … appears in the history of science, there is at once a tendency to exaggerate it into a boundless subjectivism …. Kant's thesis of the knowability of the thing in themselves is an example."[20] The specific Kantian doctrines he has in mind that he believes relate to relativity theory are that "time is neither 'something existing in itself' … nor 'a characteristic ordering inherent in the objects', but only exists in a relative sense …"[21] I discuss in detail this (previously) unpublished essay on Kant—including drafts of it that have not been reproduced in Gödel's *Collected Works*, to which I had access—in Chapter 5 of my previous, more strictly academic book, *Gödel Meets Einstein: Time Travel in the Gödel Universe* [You99].[22] Unfortunately, Kahle seems unaware of that book, hence unaware of my extended discussion there of Gödel on Kant.

As indicated above, it was in his attempt to find in relativity theory a confirmation of Kant on time that Gödel arrived at his discovery of the Gödel universes, in which,

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[16] Karl Popper, 1976, *Unended Quest: An Intellectual Biography*, La Salle, Illinois, Open Court, 129 – 130.
[17] Wang96, 320.
[18] 1995, in S. Feferman et al., eds, *Kurt Gödel: Collected Works, vol. III*, New York, New York, Oxford University Press, 230 – 259.
[19] Op. cit., 230.
[20] Op. cit., 230; 257 – 258.
[21] Op. cit. 230.
[22] 1999, Chicago and La Salle, Illinois, Open Court.

provably, the physical conditions necessary for the existence of time (in anything like the ordinary sense) are lacking. But can the possibility that the actual world is such a universe be ruled about by physical considerations? Perhaps, but only by adducing contingent features of our world. Gödel, however, finds it philosophically unsatisfactory that only contingent features of the actual universe concerning the global distribution of matter and motion rule out the possibility that the actual world is a Gödel universe. The existence of time, he believes, must be an essential feature of the fundamental laws of nature. In Gödel's words, "if someone asserts that this absolute time is lapsing, he accepts as a consequence that, whether or not an objective lapse of time exists (i.e. whether or not time in the ordinary sense of the word exists), depends on the particular way in which matter and its motion are arranged in the world. This is not a straightforward contradiction; nevertheless, a philosophical view leading to such consequences can hardly be considered satisfactory." Kahle seems believe that by these words Gödel laid down a challenge to see if one can find a way to rule out the possibility of a Gödel universe based, rather, on basic physical principles.

I say Kahle "seems to believe", since I find his final sentence unclear:

"To find such principles is the philosophical challenge that Gödel has left us."

It's unclear if Kahle is suggesting that Gödel was challenging us to find such principles, or only that, given Gödel's results, we, on our own, should challenge ourselves to find such principles. From what Kahle also says, however, the former appears to be the case:

The task, which Gödel discerns here, consists exactly in finding further physical principles, from which the non-existence of his universe would already follow, without the necessity to use contingent properties of our universe.

Certainly, Gödel final words in Gö49b as we have just given them, do not suggest that Gödel was laying down challenge or "discerning a task" that needs to be fulfilled. On the contrary, Gödel states outright what he sees as a consequence for someone who still wishes to maintain that objective time exists in our world. After all, it was Einstein, in his reply to Gö49b in the Schilpp volume, who ended his comments by saying that "[i]t will be interesting to weight whether these [i.e. Gödel's cosmological solutions] are not to be excluded on physical grounds." (Brackets added)

And it was Stephen Hawking, not Gödel, who proposed a conjecture that would rule out their physical possibility, which he dubbed (no doubt, with tongue in cheek), the Chronology Protection Conjecture. Kahle discusses Hawking's conjecture, but I found his discussion confusing:

"A trivial solution would be to put the existence of an objective course of time as a principle at the beginning. Such a petitio principii, of course, cannot satisfy. Nevertheless exactly this was tried by Stephen Hawking with his Cronology Protection Conjecture" [Haw92], but just only as a conjecture and not as an axiom. Thus one must credit Hawking that this conjecture is still to be proved by other principles."

To what does "exactly this" refer? Clearly to "a trivial solution", which Khale describes as "a *petitio pricipii,* [which] of course, cannot satisfy." A harsh criticism, indeed. Yet

Khale adds that Hawking advanced his conjecture "just only [as] a conjecture and not as an axiom. Thus one must credit Hawking that this conjecture is still to be proved by *other* principles." This added comment absolves Hawking from the harsh criticism Kahle just advanced against him. So, what exactly is Kahle saying? I think the latter, but the passage is clearly poorly written and confusing—since the latter claim contradicts the former. Further confusing is what Kahle said in footnote 10, that, "From this perspective, Yourgrau's harsh criticism of Hawking [You05, pp. 8 and 136) is both incomprehensible and unjustified." For my part, I found that footnote itself "incomprehensible." It wasn't clear to me at first how my harsh criticism of Hawking differed from Kahle's.

I revisited, however, what I said about Hawking in my book, and it finally became clear what Kahle was trying to say in his criticism of me, and that in fact, he was correct. I had mistakenly taken Hawking's Chronology Protection Conjecture as a proposed new axiom, not as a principle to be derived from more fundamental axioms, and thus considered it to be ad hoc, or in Kahle's words, as "a trivial solution [that] would put the existence of an objective course of time as a principle at the beginning …; a *petitio pricipii,* [that] of course, cannot satisfy." Given what Khale himself asserted about the conjecture (albeit, I've argued, in a confusing manner), it should have been obvious to him what my mistake was. It's incomprehensible to me, therefore, why Kahle described what I said as "both incomprehensible and unjustified." Unjustified, yes; but incomprehensible?

There's still more to this story, however. Kahle fails to pose an obvious next question: suppose Hawking's conjecture proves false, in the sense that it proves incapable (in whatever sense one can make of this supposition) of being supported from more basic physical principles. What then? Should one propose a new axiom that would rule out cosmologies like Gödel's? Kahle draws attention to "additions by the author" to footnotes to the German edition of Gödel Gö49b, of which I was previously unaware. He says that in those addition,

> Gödel speculates on the possibility of a "cosmological physics" which, for its part, would revise the known laws at (too) large scales.

If the idea here is that at some point cosmologists may revise the known laws of physics with respect to cosmological scales, then at this point, the problem of the *petitio pricipii* Kahle mentions does raise its head. Would it be an acceptable reason for proposing such revisions, or for adopting new fundamental physical principles, that they would rule out the possibility of the Gödel universes?

This question was in the back of my mind when I wrote those passages in You05. Note, further, that it was surely a priori, philosophical intuitions about the nature of time that led Hawking to make his conjecture in the first place, to look into whether one could deduce from more basic physical principles that the Gödel universes are a physical possibility. The situation, of course, was symmetric with regard to Gödel. He says explicitly that the reason he looked into the question of whether there are possible universes where it would be demonstrable that objective, intuitive time fails to exist is

because of his philosophical intuitions about the nature of time, shared by idealists like Kant, that time is merely ideal.

What if, however, Hawking's Conjecture proves right, or if the discovery or postulation of deeper physical principles rules out the physical possibility of the Gödel universes? Kahle's answer is clear:

"he [Gödel] clearly looks after the possibility of *guaranteeing the existence of time* through deeper physical principles." (brackets and emphasis added)

Kahle here fails to distinguish between necessary and sufficient conditions for the existence of time. The significance Gödel attributed to his discovery of the Gödel universes which was that in them it was provable on physical grounds that time in the intuitive sense fails to exist, i.e. their possibility was a *sufficient* condition for the *nonexistence* time in those worlds, and (via his modal argument), also in the actual world. It doesn't follow that the possibility of the Gödel universes is *necessary* for the *nonexistence* of time. Simply put, according to Gödel, *if the Gödel universes are possible, time **doesn't** exist*. It doesn't follow that *if the Gödel universes aren't possible, time **does** exist*. And yet, as we've just seen from the quotation from Kahle, he seems to be making just this elementary logical mistake when he asserts that Gödel was looking after the possibility of *guaranteeing the existence of time* through deeper physical principles that would rule out the possibility of the Gödel universes. "There's no such thing as time travel, therefore time exists" is hardly a valid inference. By contrast, Gödel's inference, "there is such a thing as time travel, therefore (intuitive) time fails to exist," has considerable force, which explains his concern to establish the premise.

One reason Kahle may have made this mistake is his failure throughout his essay to distinguish the intuitive from the "formal"/relativistic concept of time, an astonishing failure, since, as pointed out above, Gödel's entire philosophical discussion of time presupposes this distinction, much as his philosophical assessment of his incompleteness theorems brings out the analogous distinction between the intuitive and the formal, between truth and proof. (Indeed, Wang correctly describes Gödel's methodology as "a dialectic of the formal and the intuitive.") Hawking's Chronology Protection Conjecture, even if confirmed, would not, after all, protect intuitive time, but only formal/relativistic "time." As mentioned above, I discuss the analogy between intuitive mathematical truth and intuitive, "Kantian" time at length in both of my books on Gödel and Einstein, yet Kahle, somehow, fails to note it. I describe Gödel's characterization of intuitive time in detail on p. 74 of You99. Gödel calls the concept of intuitive time the ordinary, Kantian, pre-relativistic concept, according to which time objectively lapses, which results in a change in the existing, and presupposes an objective, world-wide present or *Now*. (Recall what Gödel said to Wang: "I do not believe in the objectivity of time. The concept of *Now* never occurs in science itself, and science is supposed to be concerned with the objective.")

One can ask, however, whether the advancement of science provides deeper insight into a concept or rather replaces an *intuitive* concept with increasingly formal *simulacra*. Thus, Carlo Rovelli has described ten distinct notions of time in physics. "[A] single, pure and

sacred notion of 'Time'," he says, "does not exist in physics."[23] He traces a sequence of different stages in the notion of time appropriate to stages in the advancement of science. "[T]he development of theoretical physics," he says, "has modified substantially the 'natural' notion of time. A first modification was introduced by special relativity. After Einstein's analysis of simultaneity, we know the notion of time is observer dependent."[24] The modification of the concept of time becomes increasingly extreme. For example, "[q]uantum fluctuations of physical clocks, and quantum superpositions of different metric structures make the very notion of time fuzzy at the Planck scale."[25] First time becomes relative, later it becomes fuzzy. "We have discussed attributes of time that progressively disappear," he writes, "in going toward more 'fundamental' physical theories."[26] And so on.

In response, it should be said that Gödel doesn't deny that a *formal simulacrum* of time remains in relativity (special and general). Indeed, he speaks often of "what remains of time" in relativity theory. What is left of intuitive time, minus the idea of objective becoming, a change in the existing, however, according to Gödel, "hardly deserves the name of time." "[A]n entity corresponding in all essentials to the intuitive idea of time," Gödel said, "… in relativity theory ... exists only in our imagination."[27]

Even if it turns out, then, that Hawking's Chronology Protection Conjecture was right and the Gödel universes aren't physically possible, it doesn't follow that in the actual world time—*intuitive* time-- lapses and that there is a change of the existing over time. As Steven Savitt puts it in discussing what he calls "Yourgrau's epistemic argument": "we presumably have in our universe (and the Gödelians lack in theirs) a global time function and the global time slices, but these structures, we recall, are only necessary conditions for objectively lapsing time. The other conditions, the successive coming into existence, is precisely what is at issue."[28] Similarly, Manchak comments that, "following the literature … we take the existence of a global time function to be a necessary (but not sufficient) condition for the objective lapse of time."[29]

Gödel's excessive caution may in fact have caused him to overstate the importance of deriving his new cosmological models in order to argue for temporal idealism. It was typical of him to seek, cautiously, the most unassailable arguments for his philosophical views—in the present case, arguing from his new discoveries about relativity theory--and then to be even more cautious about the lack of decisiveness about even those arguments. Consider, for example, what the philosopher of science Lawrence Sklar has written with regard to Gödel's cosmology and the intuitive concept of time: "I don't think Gödel really needed such a cosmology to 'refute' Jeans, since conceptual reflection shows us, I

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[23] 1995, Rovelli, "Analysis of the Distinct Meanings of the Notion of 'Time' in Different Physical Theories", *Il Nuovo Cimento*, Vol. 110 B, N. 1, 81 – 93; 82.
[24] Op. cit., 84.
[25] Op. cit., 86.
[26] Op. cit., 86.
[27] Gö95, 258, footnote 28.
[28] 1994, "The Replacement of Time," *Australasian Journal of Philosophy*, 463 – 474; 468.
[29] Manchak, 2016, 1052.

think, that even if such a cosmological time exists, it is hardly a restoration of an 'absolute time' in anything like the pre-relativistic sense of that notion."[30]

Indeed, one can go even further than this. As we've seen, Gödel concluded that it was philosophically unsatisfactory to maintain that the existence of time in our world depends on the particular distribution of matter and motion, and not on a fundamental law of nature. John Earman disagrees: "Why … is there a lurking contradiction," he says, "or something philosophically unsatisfactory in saying: 'Time in our universe elapses, but if the distribution and motion of matter were different, there would be no consistent time order and so time would not elapse'?"[31] Similarly, Manchak asks "[if] it is philosophically unsatisfying (although not a contradiction) for one to assert that time is objectively lapsing in one's universe when from the perspective of the observer making the assertion there remains the nomological possibility that, after the time of the assertion, matter and its motions might be smoothly (re)arranged in such a way so as to prohibit an objective time lapse."[32] The essential point, however, I believe, doesn't concern the question of the relevance of a *particular* distribution of matter and motion. The determining factor, surely, is that if there is *any* motion at all in the universe, no matter the distribution, there must be *change*, and therefore *time*. In a word: no time, no motion. How, then, can the existence of time depend on a *particular distribution* of motion and matter? Sklar was right to note that "even if such a cosmological time exists, it is hardly a restoration of an 'absolute time' in anything like the pre-relativistic sense of that notion."

As to the question of the relevance of epistemologically remote cosmological facts to questions about the existence and nature of time, what Sklar has written about the question of the so-called direction of time applies as well to our present discussion: "Surely, there is something implausible about a philosophical analysis that makes the existence and knowability of an obviously present feature of the world hinge upon the existence of other features that may, in fact, not exist, and that, even if they do exist, have observational consequences only in the most unusual situations."[33] If this is so, Gödel's reasoning about the nonexistence of intuitive time with respect to special relativity--if it's sound[34]--is already decisive. Moreover, based on formal results he claims to have established concerning expanding Gödel universes and what he calls "weakly observationally indistinguishable" space-times, Manchak argues that "it remains an epistemic possibility, just as Gödel claimed it was, that we inhabit a world that has no objective time lapse."[35] If it is indeed epistemically possible that in our world there is no

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[30] 1984, "Comments on Malament's '"Time Travel" in the Gödel Universe'*, Proceedings of the Philosophy of Science Association*, 106 – 110; 106.

[31] 1995, *Bangs, Crunches, Whimpers and Shrieks: Singularities and Acausalites in Relativistic Spacetimes*, New York, New York, Oxford University Press, 198.

[32] Manchak 2016, 1054.

[33] Quoted in David Malament, 1976, "Review: L. Sklar, *Space, Time, and Space-Time*," *The Journal of Philosophy*, 306 – 323; 322.

[34] One needs to add this caveat, since it remains a debated issue whether the becoming or lapsing of time is consistent with—even, for some, is a direct consequence of—the STR. (For the record, I do not believe there is room for the objective lapse of time in STR, but this is not the place to argue the point.)

[35] Manchak, op. cit., 1053. Manchak reminds us that "even late in his life, Gödel had still not given up on the possibility that we inhabit a Gödel-type model. Indeed, he would remain intensely interested in the collection of all astronomical data relevant to this possibility …" (1052) Just how interested can be gleaned

objective time lapse, then clearly even our direct experience (as of) the lapse of time is not decisive. To borrow Gödel's words, "this is not a straightforward contradiction; nevertheless, a philosophical view leading to such consequences can hardly be considered satisfactory."

In the end, how shall we describe Gödel's view about the existence or reality of intuitive time, bearing in mind Kahle's emphasis on how cautious Gödel was in Gö49b? The answer by now should be clear. Gödel, though a *mathematical, space-time*[36], *and conceptual* realist, was a *temporal* idealist. Kahle, however, refers to Howard Stein's Introduction to Gö49b, where he, in Kahle's words, "explicitly regrets the lack of more material that would shed light on Gödel's philosophical position, especially vis-à-vis Kant", though Kahle does mention that "at least" we have Gödel's Kant paper. I hope, however, to have made it clear, briefly, above, and at length in Chapter 5 of Gö99, that Gödel was a temporal idealist in precisely Kant's sense, though he was not, in general, an adherent of Kant's philosophy. Kahle only confuses the issue when he remarks that "Gödel himself is usually regarded as a realist; see e.g. [You05, p. 171f]." What I say there is only that Gödel is a *conceptual* realist. "I have been a conceptual and mathematical realist," Gödel said, "since about 1925."[37] I emphasize, by contrast, in both You99 and You05, that Gödel was, at the same time, a *temporal* idealist.[38] As he made clear in Gö95, Gödel believed relativity theory confirmed Kant's thesis that time is a mere appearance or illusion. Of course, Kant, unlike Gödel, wasn't in addition a conceptual realist. Plato, by contrast, was, like Gödel, both a temporal idealist and a conceptual realist (if we take the Platonic Idea as the ancestor of the modern notion of a concept). "I am for the Platonic view," said Gödel. "If there is nothing precise to begin with, it is unintelligible to say that we somehow arrive at a precise concept. … It was the anti-Platonic prejudice [with respect to mathematics] which prevented people from getting my results. This fact is a clear proof that the prejudice is a mistake."[39]

In holding with Kant that (intuitive) time is a mere appearance or illusion, Gödel was, of course, denying that time exists, yet, curiously, this has been denied. "What advantage," writes Savitt, "could there be to maintaining, as I insist, that Time does not exist rather than that Time is an illusion … All over Vancouver … people arrive at meetings … buses arrive, all more-or-less on schedule. Could an *illusion* coordinate this intricate

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from the fact Gödel's biographer, John Dawson, was astonished to find in Gödel's *Nachlass* two notebooks containing detailed calculations concerning the angular orientation of galaxies.

[36] We, in turn, must be cautious here. In the context of his writings on relativity, Gödel adopted a realist perspective with regard to space-time. Fundamentally, however, we know that his primary allegiance was to Leibniz, who was an idealist with regard to space and time. Interestingly, however, Gödel's writings on Kant far exceed his discussions of Leibniz. Indeed, "I have never attained anything definite," Gödel said, "on the basis of reading Leibniz. Some theological and philosophical results have just been suggested [by his work]. One example is my ontological proof [of the existence of God]." (Wang96, 87.)

[37] Wang96, 235; 6; brackets added.

[38] A subsection of Chapter 5 in You99 is entitled, "Gödel's Theorem and Gödel's Cosmology: Mathematical Realism versus Temporal Idealism", and Chapter 7 in You05 is entitled, "The Scandal of Big 'T' and Little 't'", where big T is truth, with respect to Gödel's incompleteness theorem, and little t is time, with respect to Gödel's results on relativity.

[39] Wang96, 83; brackets added.

choreography? … [C]locks don't measure Time; *they measure space-time*."[40] Savitt here forgets what has just been emphasized, that while Gödel is a temporal idealist, he is a space-time realist. In saying that (intuitive) time is an illusion, Gödel is not saying, perversely, that the world is haunted by this illusory phenomenon. Clocks can't measure illusions. In maintaining that time is an illusion, Gödel is saying that we have the illusion that time exits. If I say to you that witches are a figment of your imagination, I'm not claiming that imaginary witches are flying around the world. Savitt isn't delivering the news to Gödel that clocks measure space-time, not (intuitive) time.

One final point. The Kurt Gödel Award 2021 question was: "What does it mean for our world view if, according to Gödel, we also assume the non-existence of time? It is not about a confirmation or refutation of Gödel's reasoning; instead for the contest this is assumed to be correct." It's not clear to me how, exactly, Kahle has answered this question. His conclusion seems to be that Gödel left us a task he himself was engaging in, to find fundamental physical principles that would rule out the possibility of the Gödel universes and thus "guarantee" the *existence* of time. Thus, though his essay can stand on its own, Kahle appears to have ignored the requirement that "we also assume the non-existence of time," and that we don't attempt to "confirm or refute Gödel's reasoning."

[40] Savitt, op. cit., 469 – 470.