Future contradictions*

Jc Beall

entailments.net

University of Connecticut & University of Otago

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A common and much-explored thought is Łukasiewicz's idea that the future is 'indeterminate' – a future which is 'gappy' with respect to some claims – and that such indeterminacy bleeds back into the present in the form of gappy 'future contingent' claims. What is uncommon, and to my knowledge unexplored, is the dual idea of an overdeterminate future – a future which is 'glutty' with respect to some claims. While the direct dual, with future gluts bleeding back into the present, is worth noting, my central aim is simply to sketch and briefly explore an alternative glutty-future view, one that is conservative – indeed, entirely classical – with respect to the present.

The structure of the paper runs as follows. §1 briefly sketches the target gap picture of an indeterminate future yielding gappy claims at the present. §2 presents the direct dual idea – a glut picture of an overdeterminate future yielding glutty claims at present. §3 sketches the central idea, a more interesting glut picture in which the future contains contradictory states but the present remains entirely classical. §4 contains a general defense of the idea, leaving it open as to whether the gappy-future view enjoys substantive virtues over the proposed glutty-future view of §3.

1 Gappy present in virtue of gappy future

Famously, Łukasiewicz saw *indeterminacy* of future contingents:[1]

> I maintain that there are propositions which are neither true nor false but indeterminate. All sentences about future facts which are not yet decided belong to this category. Such sentences are neither true at the present moment, for they have no real correlate, nor are they false, for their denials too have no real correlate. [9, p. 126]

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[1]My interest here is not Łukasiewicz exegesis, but only in a simple though interesting idea emerging from (one reading of) Łukasiewicz's view(s). (Indeed, Łukasiewicz's own approach to a future operator was 'extensional', unlike those discussed here.)

One way to take this involves a 'gappy' future, gappy at least with respect to some sentence or other. If, in turn, the future is gappy or underdetermined with respect to some claim A and, in particular, its LEM instance $A \vee \neg A$, then applying the *it will be that* operator F to A and, in particular, to $A \vee \neg A$ results in a gappy or underdetermined claim about the future: $F(A \vee \neg A)$ itself is simply gappy at present; for its constituent parts have *not yet been decided*; the sentence has 'no real correlates'. So, the present itself is gappy in light of a gappy future: our F claims wind up gappy now as a result of a gappy future.

1.1 Formal picture

For ease of discussion, it is useful to have a (familiar) formal picture in mind. One way of formally modelling the informal picture involves a frame $\langle T, t_0, \preceq \rangle$, where T may be thought of as a set of times, with t_0 the present time of the model, and $\preceq$ a linear ordering of such times in terms of which the future operator F is defined.[2] In turn, we may use functions $v : S \times T \longrightarrow \{1, .5, 0\}$ from sentences and times into semantic values, with the middle value representing 'gappy' status. The clauses for our simple (propositional) language are the familiar Łukasiewicz (viz., $Ł_3$) clauses relativized to points:

- $v_x(p) \in \{1, .5, 0\}$ for any $x \in T$ and any *atomic p*.

- $v_x(\neg A) = 1 - v_x(A)$ for all sentences A.

- $v_x(A \wedge B) = \min\{v_x(A), v_x(B)\}$.

- $v_x(A \vee B) = \max\{v_x(A), v_x(B)\}$.

For present purposes, we shall ignore conditionals here. By ignoring conditionals, we may simplify the discussion by focusing on a more familiar name of the conditional-free fragment of $Ł_3$, namely, *K3* or *Strong Kleene* [5, 8, 17].

With K3 in place, the clause for the future operator F is the familiar one where FA is true (generally, designated) at x just if there's some future point at which A is true (designated), and is otherwise – and more generally – the highest value that A achieves at some future point:

$$v_x(FA) = \max\{v_y(A) : \text{ for all } y \in T \text{ such that } x \prec y\}.$$

Finally, logical consequence may be defined in various standard ways. For present purposes, it is useful to first sharpen the picture by treating the present point t_0 in a special fashion. In particular, we may stipulate that a valuation v is 'admissible' only if it treats t_0 as classical with respect to the F-free language: $v_{t_0}(A) \in \{1, 0\}$ for all F-free A.[3] In this way, it is abundantly clear that any non-classicality – any gappiness – at t_0 is coming from the future, so to speak:

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[2]When, as in some of the discussion below, a strict ordering is assumed, I use '$x \prec y$' for the standardly defined strict order: $x \preceq y$ and $x \neq y$.

[3]Since, except for F, we're considering only 'truth-functional' operators, it suffices to stipulate that, for any (admissible) valuation, $v(p) \in \{1, 0\}$ for all *atomics p*.

the future may contain points at which F-free claims are gappy (and no points at which they're true), and this gappiness bleeds back into our present F-ful claims. Defining *logical consequence* as truth preservation over all *present* points of all models (i.e., any admissible valuation on which all premises are true at t_0 is one at which the conclusion is too) yields classical logic for the F-free fragment of the language, but otherwise gives a 'gappy' (or 'paracomplete') temporal logic for the future operator F.

1.2 Evaluation

My concern is not to evaluate this view. The literature is rich with both philosophical and logical discussions of Łukasiewicz-inspired gap or indeterminacy views [6, 11, 18]. My concern, rather, is to briefly explore a related glutty idea (see §3). But first I put the simple dual (glutty) view on the table, if only to take it off for the target (and more conservative) option.

2 Glutty present in virtue of glutty future

Regardless of one's views of gluts, the dual view of the above picture is an obvious one to consider. The target view in question would go thus:

- There are propositions that are both true and false and, so, overdeterminate. All sentences about future facts *which are overly decided* belong to this category. Such sentences are true at the present moment, for *they have at least one real correlate*, and also false, for *their denials too have at least one real correlate.*

Here, the picture involves a 'glutty' future, glutty at least with respect to some sentence or other. If, in turn, the future is glutty or overdetermined with respect to some claim A and, in particular, its dual-LEM instance $A \wedge \neg A$, then applying F to A and, in particular, to $A \wedge \neg A$ results in a glutty or overdetermined claim about the future: $F(A \wedge \neg A)$ itself is simply glutty at present; for its constituent parts have *been overly decided*; the sentence has 'too many real correlates'. So, the present itself is glutty in light of a glutty future: our F claims wind up being glutty as a result of future contradictions.

2.1 Formal picture

The formal picture is the dual of the 'gappy' one above, requiring only one change: instead of equating *truth at a point* and *having value* 1 *at the (given) point*, we now let truth at a point be modeled by *having either value* 1 *or value* 0.5 *at the (given) point*. In other words, we now 'designate' the value 0.5 in addition to value 1. Where v is a valuation $v : S \times T \longrightarrow \{1, .5, 0\}$ as above, we say that A is *true at time* x if and only if $v_x(A) \in \{1, .5\}$, and that A is *false at* x iff $v_x(A) \in \{.5, 0\}$. If $v_x(A) = .5$, we say that A is true and false at x, that is, that A is a glut – or is glutty – at x.

The definition of validity or consequence remains the same as above: $A_1, \ldots, A_n \vdash B$ iff every valuation (every one of the given functions) that makes all of the premises A_i true at t_0 (i.e., the present point) makes B true at t_0 too. Though the definition of validity is the same, the difference in our set of designated values makes a difference. Most importantly, unlike the Łukasiewicz or K3 logic, the basic F-free logic is paraconsistent: $A \wedge \neg A \nvdash B$. Additionally, the F-free logic is non-paracomplete: we now have, unlike the K3 logic, that $B \vdash A \vee \neg A$. The F-free logic in question has a familiar name, namely 'LP', which we shall use here (for the F-free dual of K3).[4]

We can, as in §1.1, stipulate that the present point t_0 is classical with respect to F-free claims, and so again restrict our definition of consequence only to those valuations v such that $v_{t_0}(A) \in \{1, 0\}$ for all F-free A. The chief difference with respect to the F operator is that we now have glutty F-claims. (Triviality is avoided because the logic is paraconsistent; present gluts fail to imply all sentences). Unlike the gap picture above, there are never – at no time – any gaps in this picture. Instead of a gappy future, we can now have a glutty future. For example, think of a simple model in which, for any x such that $t_0 \prec x$, the sentence A is glutty at x, in which case $A \wedge \neg A$ is also a glut at x. In the dual gappy picture, $\mathsf{F}(A \wedge \neg A)$ would be a gap at t_0. In this glutty picture, $\mathsf{F}(A \wedge \neg A)$ is a glut at t_0, as are $\mathsf{F}(A \vee \neg A)$ and $\mathsf{F}A$ and $\mathsf{F}\neg A$, with such gluttiness in the present resulting from gluttiness in the future. But since such F-claims are glutty, they're true, and their negations are likewise true: specifically, $\neg \mathsf{F}A$ is also true at t_0, and similarly $\neg \mathsf{F}(A \vee \neg A)$ true at t_0, and so on. (Formally, each such claim has value 0.5 at t_0.) Whereas the gap picture has future gaps that yield present gaps, the glut picture has future gluts that yield present gluts.

2.2 Evaluation

Formally, the pictures above are duals, and so, at least on formal grounds, there is little to decide one framework over the other. My interest is not in deciding among these duals, but rather to advance a more conservative glut picture, one that affords a consistent present while looking squarely into a glutty future.

3 Classical present and (only) future gluts

Consider a different – now much-revised – version of Łukasiewicz's guiding idea, one that suggests a different glut picture from that above.

- All propositions are always, at all times, true or false; and no proposition is true and false at present. There are, however, propositions that, in the future, are both true and false. Such sentences have, in the future, more

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[4]LP was first discovered by Asenjo [2] but later independently discovered and widely applied by Priest [13]. An F-free framework for the current glut view that delivers the above features but contains a more useful conditional than LP is standardly called 'RM$_3$' [1, 12], but, again, the present discussion is intended to be neutral with respect to choice of a conditional.

than 'one real correlate', but the present 'decides' only a single, consistent correlate.

The picture here is one in which, contrary to the gap picture, the future is never gappy, but is at times overdetermined – at least with respect to some sentences. But the inconsistent future gets consistentized (as it were) at the present. Unlike the alternative in §2, the current picture has a fully consistent present – even with respect to $\mathsf{F}A$-type claims where A is one of the future gluts. Here, the F operator may be thought of as a record of the future, recording the truth, if any, that sentences enjoy in the future. And that's its job: to record what the future holds. But because the future holds too much for the present to take, the present, somehow or another, filters out such future contradictions into the consistent present that we experience – or so the view goes.

It seems to me that the picture of an overdetermined future is no less coherent than an underdetermined future. We have contradictions before us, but, thanks to the way reality works, the contradictory future gets 'consistentized' when we get there. Things look perfectly consistent at present because they are perfectly consistent. (If travel to the future were to occur, things might look there very unlike anything seen before. Maybe. But this is an empirical matter at least in need of very advanced technology.) Some elaboration and defense of the idea is given in §4. For now, I briefly turn to a formal picture.

3.1   A formal picture

A formal picture of the current idea requires only a simple tweaking of the picture in §2.1. In particular, we leave everything the same – including the requirement that t_0 be classical with respect to the F-free fragment – except now define F in a way that delivers the appropriate present-time consistency.[5]

$$v_x(\mathsf{F}A) = \begin{cases} 1 & \text{if } v_y(A) \in \{1, .5\} \text{ for some } y \succ x; \\ 0 & \text{otherwise.} \end{cases}$$

Unlike the alternative glut picture, this delivers explosive behavior from the future operator: $\mathsf{F}A \wedge \neg\mathsf{F}A \vdash B$. Our claims about the future are never – at no time – true if inconsistent. The future itself is inconsistent at times, and we can truly – and consistently – record as much using the future operator so defined: $\mathsf{F}(A \wedge \neg A)$, like $\mathsf{F}A \wedge \mathsf{F}\neg A$, can be – and, on intended models, is – true at present if A is a glut in the future. But this is fine, as $\mathsf{F}A \wedge \mathsf{F}\neg A \nvdash B$.

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[5]There are, of course, other options that jump out. I pick the simplest approach. A different conception of time might motivate a 'subvaluational' approach to F. Interestingly, Łukasiewicz's pioneering student Stanisław Jaśkowski, the father of modern paraconsistent logic, was the first to advance a subvaluational logic [7]. (I do not know whether he had 'future contradictions' in mind.)

4 Questions and objections

While I do not have arguments *for* future contradictions, I see no serious objections to the idea. In what follows, I briefly respond to a few questions and objections, focusing entirely on what I take to be the more interesting of the sketched glut views – namely, the consistent-F view of §3.

4.1 *Semantic-free gluts?!*

OBJECTION. It is one thing to acknowledge that familiar paradoxical sentences, such as liars, which are so utterly twisted upon themselves (so to speak), are gluts [4, 16]. This might not be theoretically attractive to many, but it is coherent in such limited, odd cases. Going beyond that, however, loses coherence. How can there be *gluts* at any time – future or otherwise – involving run-of-the-mill sentences about sea battles or the like?! That $A \wedge \neg A$ is true at any time for any such run-of-the-mill sentence A is nonsense.

REPLY. I am sympathetic with this objection, but the charge of nonsense needs to be filled out before treated as a genuine objection. Wherein, exactly, is the alleged nonsense? Answering this in a non-question-begging way – particularly if a similar gap-future view were deemed sensical – is difficult. Moreover, the challenge of making general sense of 'overdetermined states' has familiar answers from standard ways of modeling 'inconsistent facts' or the like [3, 15, 20]. Such answers might not be problem-free, and may not answer concerns that may be peculiar to the glutty-future idea; however, any charge of nonsense would have to explain where these standard answers fail.[6]

4.2 *'Consistentizing' happens how?*

QUESTION. How do overdeterminacies get consistentized to resolve into a classical state?

ANSWER. The mechanism involved is not known, though there is no obvious reason to think it unknowable. Perhaps the mechanism is not terribly different from quantum phenomena: the future is in a sort of superposed state (as in QM), and the job of the present is to 'collapse the wave packet', as it were. Perhaps, instead, it is something much simpler or much more complicated than quantum phenomena.

4.3 *Gappy future as more intuitive?*

QUESTION. Isn't the gappy-future idea more intuitive – getting at a fairly common thought that the future is 'unsettled'?

ANSWER. Measuring levels of 'intuitiveness' is tricky at best. That aside, it's important to note that the over-determinacy idea can naturally accommodate

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[6]Also requiring explanation would be recent empirical linguistic data [19].

the idea of an 'unsettled future'.[7] In particular, the future is unsettled not in the sense that the future is gappy; rather, the future is unsettled in the sense that the future has yet to be 'consistentized' – resolved from a glutty future into a classical present. This does not seem to be less intuitive than the gappy picture with respect to capturing an important sense in which the future is thought to be 'unsettled'. (See also §4.5.)

4.4 *What of* it will always be that...?

OBJECTION. It is common to define an *it will always be that* operator H via one's future operator F, namely, $\mathsf{H}A$ is defined to be $\neg\mathsf{F}\neg A$. But while this works out in both the DL$_3$ and L$_3$ (or, simply, K3 and LP) frameworks, it doesn't work in the proposed consistent-present-glutty-future approach (see §3.1): $\neg\mathsf{F}\neg A$ does not behave along the expected $\mathsf{H}A$ fashion. In particular, consider a model in which A is glutty at all future times (takes 0.5 at all future times), in which case $\neg A$ is glutty at all such future times. By the target consistent-present account (see §3.1), we have that $\mathsf{F}\neg A$ is just true at present (takes value 1 at the present point), and so $\neg\mathsf{F}\neg A$ is untrue (takes 0 at the present point). But, then, even though A is at least true (designated) at all future points, the sentence $\neg\mathsf{F}\neg A$ itself is nonetheless untrue. So, the standard definition of the *it will always be that* or *henceforth* operator H seems to fail on the proposed approach.

REPLY. Rather than see this as a problem with the proposal, the objection points to an apparent virtue. In particular, the motivation for simply defining *it will always be that* in terms of *negation* plus *it will be that* is at least prima facie dubious in a glutty-future but consistent-present (or, generally, consistent-F-behavior) setting. Suppose, for example, that at all future points A is true. Is it thereby false that there's a future point at which $\neg A$ is true? From a glutty-future perspective, the answer is *no* – at least if, as on the proposal, the present is entirely consistent. (If the present were itself inconsistent, then the answer might be both *yes* and *no*, but I shall continue to focus on the consistent-present idea.) If this is right, then the standard equation of *it will always be that* with *it is not that it will be that it is not that* (i.e., equating H with $\neg\mathsf{F}\neg$) requires argument in a glutty-future (and consistent-present) context; a natural view, in such a context, has them coming apart – as they do on the current proposal.

Exactly how a target *it will always be that* operator is to be defined turns on debate about what logical features it is to exhibit – a matter I leave open here. For present purposes, I note that there's no obvious bar against defining a primitive operator directly:

$$v_x(\mathbb{H}A) = \begin{cases} 1 & \text{if } v_y(A) \in \{1, .5\} \text{ for all } y \succeq x; \\ 0 & \text{otherwise.} \end{cases}$$

So defined, $\mathbb{H}A$ is true at present just if A is true at all future points – just if,

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[7]Of course, there is no bar from moving to a glutty *and* gappy framework, but I am focusing on glut-only and gap-only views here.

so to speak, A is henceforth true.[8] All of this is compatible with the guiding thought that the future is glutty while the present – and, generally, our talk about the future – is consistent.

4.5 *What's in the future for us?*

OBJECTION. What we want from an *it will be that* operator is more than a mere record of what's true in the future; we want a record of what's in the future *for us*, so to speak; we want the operator to record what the present shall decide with respect to A and $\neg A$. But this can't be accommodated in the current proposal without deviating from the classical-present picture. If the operator, say F, is to truly record a glutty-A future, then $\mathsf{F}(A \wedge \neg A)$ needs to be true at present. But if the present is classical, then $A \wedge \neg A$ cannot be selected for the present, and so $\mathsf{F}(A \wedge \neg A)$ cannot be true at present if F is to record what the present shall select. So, the proposed glutty-future cannot have an *it will be that* operator that does all that such an operator needs to do.

REPLY. It is correct that F, defined as per the target view, comes up short of what the objection demands. There is no obvious reason not to add an additional operator $\mathbb{F}$ that accommodates the demand. Unlike F, one desideratum of $\mathbb{F}$ is $\mathbb{F}(A \wedge \neg A) \vdash B$, and generally $\mathbb{F}A, \mathbb{F}\neg A \vdash B$. As the objection indicates, $\mathbb{F}$, unlike F, is to record what, from the contradictory future, the present will select. And since the present is fully classical, $\mathbb{F}A$ and $\mathbb{F}\neg A$ ought never both be true. What further desiderata are imposed is less clear. For example, since the present – since classical – needs to select one of A and $\neg A$, we should have $\vdash \mathbb{F}(A \vee \neg A)$. What, though, of $\vdash \mathbb{F}A \vee \mathbb{F}\neg A$? Here, one might think – as gestured above in the discussion concerning apparent 'unsettledness' of the future – that, despite the absence of gaps, the future is 'unsettled' in the sense that what the present has decided is unsettled. This sort of thought would motivate a logic in which $\mathbb{F}A \vee \mathbb{F}\neg A$ need not be true. But if we're to avoid gaps, $\mathbb{F}A \vee \mathbb{F}\neg A$ fails only if both $\mathbb{F}A$ and $\mathbb{F}\neg A$ are false (versus 'gappy' or the like).

One simple route towards achieving the given desiderata for $\mathbb{F}$ is to define $\mathbb{F}A$ as follows – in effect, thinking of $\mathbb{F}A$ as true only if the present has already 'consistentized' an otherwise inconsistent future with respect to A:

$$v_x(\mathbb{F}A) = \begin{cases} 1 & \text{if } v_y(A) = 1 \text{ for all } y \succeq x; \\ 0 & \text{otherwise.} \end{cases}$$

There are undoubtedly different approaches that one might take, some being more natural than others depending on background (usually metaphysical) motivation; however, this approach delivers at least the two salient desiderata, assuming, as I am, that we define logical consequence as above (viz., via the present points of models).

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[8]If one rejects that 'henceforth' or the target 'it will always be that' quantifies over the point of evaluation (over the *now* point, as it were), then one can adjust the condition above and use a strict ordering (i.e., $y \succeq x$ but $y \neq x$). I leave this open.

- $\nvdash \mathbb{F}A \vee \mathbb{F}\neg A$. Consider a model in which $v_{t_0}(\mathbb{F}A) = v_{t_0}(\mathbb{F}\neg A) = 0$ by having $v_y(A) = .5$ for some $y \succ t_0$.

- $\mathbb{F}A, \mathbb{F}\neg A \vdash B$. This holds vacuously. By definition, $v_x(\mathbb{F}A) \in \{1, 0\}$ for all $x \in T$ and all A. We can't have a model in which $v_{t_0}(\mathbb{F}A) = v_{t_0}(\mathbb{F}\neg A) = 1$, since this would require $v_{t_0}(A) = 1 = v_{t_0}(\neg A)$, which is ruled out by clauses on negation.

So, while F is an operator that records the truth, if any, of sentences at future points – including those sentences that are true *and* false at future points – we can also accommodate an operator $\mathbb{F}$ that records what the future will be 'for us' (so to speak), should such an operator be required.

4.6   *Broader significance?*

QUESTION. Beyond its direct bearing on the logic of time, what – if any – broader significance does the idea of a glutty future bear?

REPLY. The significance of the idea goes beyond the logic of time. I highlight four points below, leaving each for future exploration.

A novel picture of time. There are three main pictures of time: block, branching, and linear. The branching picture has a line that, at the present node, branches (think of a tree turned sideways, with the roots cut off). The block picture is a big block, which represents all of time: the past, which is set, the present – which is the 'last moment of time' (the right edge of the block) – and the future is empty. The linear picture is the familiar timeline: past to the left, present at the present point, and the future stretching to the right of the present point. Now, even though I've put the discussion in terms of linear models of time, the discussion nonetheless opens up a new block picture:[9] instead of the present being 'the last moment', one may think of it as 'the first moment' – with the past entirely empty and the future a block of contradictions (to be filtered by 'the first moment', i.e., the present). This is not the picture I've assumed in the discussion in this paper, but it is certainly one that is opened up by the discussion – once the idea of future gluts is on the table. One interesting virtue of this new picture is that it captures, in a strong and straightforward way, the intuition that the past cannot be altered: on this picture, the past is gone – only the future is wide open, filled with gluttiness to be sorted out via the present. Other virtues of the new picture are for future debate.

Time travel. With the idea of a glutty future on the table, another idea immediately emerges: a glutty past (but, as I will assume, a consistent present). And with the idea of a glutty past comes a natural thought for certain puzzles about time-travel. (I am not suggesting that all puzzles are resolved, but only that new options open up.) In particular, we now see an important ambiguity in the familiar thought that *the past cannot be changed*, specifically, an ambiguity in

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[9]I'm grateful to Achille Varzi for observing this and other ideas emerging from the glutty-future idea. Varzi also, independently, observed the potential value of gluts and time travel (see below).

the notion of *changing the past.* On one hand, we might hold – as many do – that we cannot change the past *by subtraction* – you cannot take away what has already happened. But with the idea of a glutty past, another sense of 'change the past' emerges: addition – changing the past by *adding* to it. (E.g., Grandpa avoided being murdered back on 26 January 1788, but then Grandchild traveled back and *also* murdered him – thereby producing an inconsistent past.) In this way, a glutty-past approach to time travel allows one to maintain the common thought that the past is unalterable-by-subtraction; but one can nonetheless allow alteration by addition. Whether such an approach to time travel trumps more consistent ones is for future debate.

The (actual) trivial time? Another time-related issue that arises is the *trivial time* – the time at which everything is true. (NB: nothing in the proposal requires that there be such a time; but the issue naturally arises out of the discussion.) Paraconsistent theorists have often discussed the possibility of a (the) *trivial world* – a world, however remote, at which everything is true [14]. The idea of a glutty future brings the question home (so to speak): might there be a trivial *time* – an actual time at which everything is true? If the future is glutty, why not also trivial – containing at least one (future) time, however remote, at which everything is true? Serious exploration of such questions may be more than interesting; it may reveal a variety of unseen assumptions in epistemology (e.g., how do we know about the future), metaphysics of actuality and time, and more. But, again, such exploration left for the future.

A new route towards 'consistent dialetheism'. Beyond directly time-related issues, the advanced glutty-future idea – conjoined with the consistent-present idea – reveals a surprising new version of paraconsistency, a sort of 'consistent dialetheism'. Dialetheists maintain that there are gluts – 'true contradicitions' (i.e., true sentences of the form $A \wedge \neg A$). What the advanced glutty-future idea reveals is a way in which one may agree with the dialetheist while rejecting all contradictions: one agrees that there are, *in the future*, true contradictions; however, there are no contradictions that one – *now* – accepts. Some sorts of 'conservative dialetheism' have been recently advanced [4, 10], but this new sort of time-tied version is a surprising (and more conservative) option.[10]

5   Closing remarks

Future contingents continue to be a source of philosophical and logical exploration. An under-explored idea is one according to which, instead of gaps, there are future contradictions. This may be thought of in at least two ways. One way is the simple dual of common gappy approaches, where future non-classicality bleeds back into the present – future contingents wind up being non-classical. A more interesting approach confines the non-classicality to the future: there are

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[10]My own dialetheic views are very conservative [4], ruling out any inconsistency except for 'spandrels' of semantic predicates – e.g., liars, etc. What is interesting about the main idea in §3 is that such very conservative views can be maintained – at least with respect to the *present* – even if one recognizes a glutty future in which overdeterminacy runs amuck.

future contradictions, but only future contradictions – with the present serving as a classical filter, however the filtering may occur.

My aim has not been to argue for a glutty-future approach over a gappy-future approach, or even for a non-classical approach in general. Such issues are ultimately to be decided on the theoretical virtues of the various approaches. My central aim has been to set the glutty idea on the table alongside the more common gappy idea. My hope is for future debate – however contradictory the future may be.[11]

References

[1] Alan Ross Anderson and Nuel D. Belnap. *Entailment: The Logic of Relevance and Necessity*, volume 1. Princeton University Press, Princeton, 1975.

[2] F. G. Asenjo. A calculus of antinomies. *Notre Dame Journal of Formal Logic*, 16:103–105, 1966.

[3] Jc Beall. On truthmakers for negative truths. *Australasian Journal of Philosophy*, 78:264–268, 2000.

[4] Jc Beall. *Spandrels of Truth*. Oxford University Press, Oxford, 2009.

[5] Jc Beall. *Logic: The Basics*. Routledge, Oxford, 2010.

[6] Craig Cellender, editor. *The Oxford Handbook of Philosophy of Time*. Oxford, Oxford, 2011.

[7] Stanisław Jaśkowski. Propositional calculus for contradictory deductive systems. *Studia Logica*, 24:143–157, 1969. First published under the title 'Rachunek zdań dla systemów dedukcyjnych sprzecznych' in *Studia Societatis Scientiarum Torunensis* in 1948.

[8] S. C. Kleene. *Introduction to Metamathematics*. North-Holland, 1952.

[9] Jan Łukasiewicz. On determinism. In Ł. Borkowski, editor, *Jan Łukasiewicz: Selected Works*, pages 110–128. North Holland, Amsterdam, 1970.

[10] Edwin Mares. Semantic dialetheism. In Graham Priest, Jc Beall, and Brad Armour-Garb, editors, *The Law of Non-Contradiction*, pages 264–275. Oxford University Press, Oxford, 2004.

[11] S. McCall, editor. *Polish Logic: 1920–1939*. Oxford University Press, Oxford, 1967.

[12] Chris Mortensen. Model structures and set algebras for Sugihara matrices. *Notre Dame Journal of Formal Logic*, 23:85–90, 1982.

[13] Graham Priest. The logic of paradox. *Journal of Philosophical Logic*, 8:219–241, 1979.

[14] Graham Priest. Could everything be true? *Australasian Journal of Philosophy*, 78:189–95, 2000.

[15] Graham Priest. *Doubt Truth To Be A Liar*. Oxford University Press, Oxford, 2006.

[16] Graham Priest. *In Contradiction*. Oxford University Press, Oxford, second edition, 2006. First printed by Martinus Nijhoff in 1987.

[17] Graham Priest. *An Introduction to Non-Classical Logic*. Cambridge University Press, Cambridge, second edition, 2008. First edition published in 2001.

[18] Greg Restall. Łukasiewicz, supervaluations, and the future. *Logic and Philosophy of Science*, 3:1–10, 2005.

[19] David Ripley. Inconstancy and inconsistency. In Petr Cintula, Christian Fermüller, Lluis Godo, and Petr Hájek, editors, *Reasoning Under Vagueness: Logical, Philosophical, and Linguistic Perspectives*. College Publications, 2010. Forthcoming.

[20] Bas C. van Fraassen. Facts and tautological entailments. *Journal of Philosophy*, 66:477–487, 1969. Reprinted in [1].