

FUTURE CONTINGENTS

Abstract

This paper addresses the problem of future contingents that Aristotle raises in *De Interpretatione*. Which is roughly that, if future tense sentences have a truth value, then events come by necessity. For example, if “There will be a sea battle tomorrow” is true, then it must be the case that the sea battle will happen tomorrow. Aristotle argues against determinism and says that such propositions should have no determined truth value. In response to this problem, Van Fraassen and Thomason argue for an account of supervaluations, assigning a third value to sentences whose name has no referent. Belnap and Perloff argue that these propositions do not need to be assigned a truth value, rather one waits till the sentence is satisfied. I argue that the results of the later view are problematic because some future tense propositions are too vague.

Introduction

“It will rain tomorrow” Harry says, “It will not rain tomorrow”, I wholeheartedly respond.

Harry and I are both making assertions about the future, at first glance these assertions don't seem to be problematic. In fact, they seem to be like any other belief one may utter; they're merely just propositions about the future. But, Aristotle raises a problem about such propositions in *De Interpretatione*, namely: if future tense propositions have a truth value, then this means that future events do not come by chance. If Harry and I make conflicting assertions about the future, one of our propositions has to be true. This is because there is a fact of the matter about whether or not it will rain tomorrow, such that, it either will rain tomorrow or it will not. So there are two questions that arise from this problem: 1. do future tense propositions have a truth value and 2. If (1), does this imply logical determinism? For this paper, I will be focussing on the first question.

As noted, Aristotle argues that propositions with names that refer to the future do not have truth values, because this means that future events do not occur contingently but instead are necessary. Some contemporary logicians, such as Bas Van Fraassen and Richard H. Thomason, argue

that future tense propositions do have a truth value at the moment of utterance. These accounts assign such propositions a third value “N” for neither true nor false. This account preserves classical valuations and allows for truth-value gaps (propositions that are neither true nor false). Michael Perloff and Nuel Belnap argue that such third values are not needed, propositions such as “It will rain tomorrow” do not introduce truth-value gaps that need to be remedied by a third value. Perloff and Belnap argue that these propositions do not have a truth-value at the moment of utterance, one just has to wait till the proposition is satisfied.

I argue that Perloff and Belnap’s view is not a satisfactory replacement for a supervaluation account. Future tense referents are too vague to assign the propositions a truth value upon ‘satisfaction’. For example, if one utters the proposition “It will rain”, the future context of this proposition is too vague to determine when it is satisfied. So either it’s the case that this account is too fine grained, in that it can’t satisfy future tense propositions because they are too vague and coarse grained. Or their view can’t address future tense propositions unless the scope of the context is narrow, e.g. day, date, time. In which case, the supervaluations account is more attractive because it addresses all future tense propositions.

In order to argue for this claim, I start by presenting Aristotle’s problem of future contingents, why he thinks it’s a problem, and how he thinks it is solved. In the second section, I will explain Bas Van Fraassen and Thomason’s accounts of supervaluations. I will show the process of assigning a third value to future tense propositions. In the next section, I will explain Perloff and Belnap’s account of temporal semantics, by showing that their propositions are true at a later moment. In the last section, I will explain why Perloff and Belnap’s view is problematic, and so one should assess the proposition upon utterance.

Aristotle: Problem of Future Contingents

Aristotle argues that future propositions do not have a truth value at the moment of utterance, because if this is the case then future events are not contingent (do not come by chance).

Aristotle does make some controversial points about necessity, but in this paper I'm not concerned about the accuracy of his term 'necessity', or what it means with respect to metaphysics or otherwise. Whether or not his claims about necessity and logical determinism are right go beyond the scope of this paper. I am merely concerned about the question: Why Aristotle thinks future tense propositions do not have a truth value, and not about: Is this an accurate account of future tense propositions?

Harry and I are having another conversation, Harry says "There will be a sea battle tomorrow", and once again, I wholeheartedly respond "There will not be a sea battle tomorrow". Aristotle argues that, if Harry and I maintain that a certain event will or will not take place, one of us is speaking the truth about the event. It must be the case that either one of the conflicting claims will result, e.g. it must be the case that there will be a sea battle tomorrow or that there will not.

But if one assigns future tense propositions a truth value, then it results in logical determinism.

He states:

If, moreover, a thing is now white, then it would have been true in the past time to affirm that that thing *would* be white, and thus at all times was it true of whatever has now taken place to affirm that 'it is' or 'will be.' But if at all times was true to affirm that 'it is' or 'will be,' how impossible that it should not be or not about to be so! When a thing cannot not come to be, how impossible that it should not! If, again, its not coming to be is impossible, as we assume, come to be then it certainly must. And in consequence future events, as we said, come about of necessity. Nothing is casual, contingent. For if a thing happened by chance, it would not come about of necessity. (On Interpretation, IX, 10-18)

He is arguing that, because propositions that are true are necessarily true and those that are false are necessarily false, when one assigns a future tense proposition a truth value the event must take place. For example, if one assumes that the sea battle does take place tomorrow, and therefore assign Harry's proposition, "There will be a sea battle tomorrow" as true. If Harry's proposition is true, then it was true of the past that the sea battle would happen. Propositions that are true of the past are necessarily true, and if the proposition is necessarily true in the past, then it must be the case that the event will occur. If it must be the case that the event will occur, then the event is not contingent. This means that events do not come by chance, but come by necessity.

Aristotle argues that this is not true about events in the world. Both coming to be and not coming to be are equally possible events. For example, it is possible that my phone will fall of the desk and break, and it is possible that my phone will not fall of the desk but will remain in tact until I get a new phone. He argues that it is not necessary that either of these events should occur; some events happen by chance. Therefore, it is necessary that *either there will be a sea battle tomorrow or there will not*, but it is *not* necessary that it will take place nor necessary that it will not take place. It is true that the disjunction of the events will occur, but neither proposition has a truth value at the moment of assertion. In sum, Aristotle is arguing that future tense propositions do not have a truth value, because this would mean that future events are not contingent.

Van Fraassen and Thomason: Supervaluations

Now that Aristotle's problem is clearly stated, it time to move into contemporary solutions. Van Fraassen argues that propositions with names that have no referent, e.g. "Pegasus has white wings", do have a truth value at the moment of assertion, namely "N" (neither true nor false). Thomason uses this account and applies it to propositions with names that refer to the future

within a branching time structure. For this paper, I will only explain the method of assigning truth values to propositions whose referent is in the future, the branching time semantics just rids the possibility of determinism. Therefore, the question I will address is, how is a truth-value assigned to future tense propositions?¹

The truth value assignment for sentences is a two step process, both steps involve a classical valuation of the sentence, this function assigns a truth value in an arbitrary manner. Van Fraassen writes:

A classical valuation over a model is a function v that assigns T or F to each statement, subject to:

- a. if A is an atomic statement containing no nonreferring names, then $v(A)$ is determined by the model, in the indicated manner, and
- b. if A is a complex statement, then $v(A)$ is determined by what v assigns to the simpler statements, in the usual manner. (Van Fraassen 7)

For example, the sentence "This apple is red", is true in the model. To be true in the model the names of the sentence must have a referent that is a member of the extension of the predicate within the domain. For example, 'apple' must be defined and its referent $f(\text{apple})$ is a member of the extension (all red things) of its predicate "is red". If it's a sentence with a name that has no referent, the sentence is neither true nor false in this model. Therefore a sentence with a name that has no referent, has at least two classical valuations, one which assigns true to the sentence and one which assigns false to the sentence.

¹ I also want to explain some terms and symbols that occur in this section, that may or may not be familiar. **Model:** is a framework, e.g. true in all models means true no matter what logical framework one is in. **Domain (D):** non-empty set of things. **f:** function. **L:** Language. **(f;D):** model of L. **Name:** Proper noun and common noun. e.g., Pegasus, apple. **Predicate:** refers to a concept, e.g. 'is red'. **Extension:** all the things that are of that sort, e.g., the extension of the predicate 'is red' is all the things that are red. **Logically true:** True in all situations. **CL-true:** iff assigned true by all classical valuations over all models. **SL-true:** assigned true by all supervaluations. (Van Fraassen)

The process of truth value assignment works like this: if the sentence contains a name that is defined within the domain of the model, then the classical valuation will assign it a value of "True" and assign its contradictory a value of "False". This same process happens again, so the sentence is assigned the value of "True" a second time and its opposite is assigned a value of "false" a second time. For sentences with names that have no referent, e.g. "There will be a sea battle tomorrow", the first classical evaluation will assign it a value of "True" and its contradictory a value of "False". As previously stated, because there is no referent, the sentence has two classical valuations true and false. Therefore, this process is repeated, this time the classical valuation assigns the sentence "There will be a sea battle tomorrow" the value of "False" and its contradictory a value of "True". Therefore, the sentence "There will be a sea battle tomorrow" has the value of "True" and the value of "False." The supervaluation function assigns "True" to all the sentences that are assigned "True" by the classical valuations, and assigns "False" to all the sentences that are assigned "False" by the classical valuations. And it goes on to assign "N", to all the sentences that were assigned both "True" and "False" by the classical evaluations, e.g. "There will be a sea battle tomorrow". Therefore, sentences that are CL-true are SL-true. Since the model is now including proposition with names that have no referent, the supervaluation function is needed to determine which sentences have a referent and which do not. The classical valuation assigns these propositions two values, and the supervaluation function 'reads' both of these values and assigns it the value "N." So the supervaluation function is there to distinguish between sentences are assigned "N", those that are assigned "T", and those that are assigned "F."

In sum, the supervaluation function preserves the classical valuation of sentences such as "This apple is red", but it also allows for truth value gaps, i.e. sentences that are neither true nor false. Also, it allows for the disjunction of conflicting future tense propositions to be true, e.g. "There will

be a sea battle tomorrow (t) or There will not be a sea battle tomorrow (f)" is true, while still assigning each proposition "N". This argument shows that future propositions do have a truth value. By assigning "N" to future propositions, it allows it to be the case that either event could occur.

Perloff and Belnap: No Supervaluations, Just Patience!

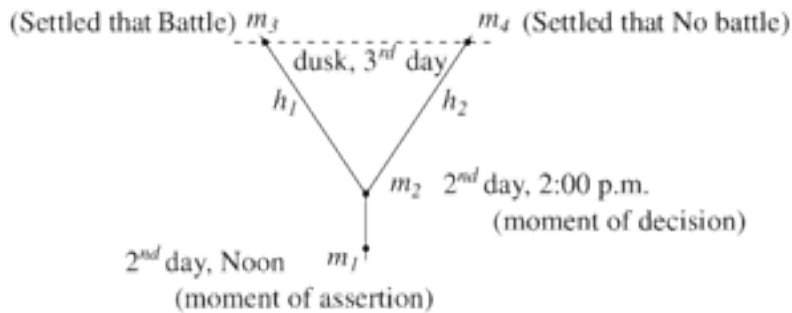
Perloff and Belnap argue that future propositions do not have a truth value at the moment of assertion. Their argument is:

1. At the moment of assertion there is a definite future of possibilities.
2. Since there is a definite future of possibilities, there is not enough available information to evaluate the statement at the moment of assertion.
3. Therefore, a statement is to be evaluated if and only if there is enough available information.
4. There is enough available information when the statement is satisfied.
5. Therefore, a statement is settled true² (evaluated), at the moment the statement is satisfied.

I will not be discussing the first premise, because it deals with branching time semantics. So I am assuming that their structure is correct, such that it rids concerns of logical determinism. Premises 2-5 I will explain by the use of an example, namely that if two people make conflicting claims about the future, Harry says "There will be a sea battle tomorrow" and I say "There will not be a sea battle tomorrow". With respect to the graph (Perloff 7), Harry and I make the assertion on the 2nd day at noon (moment of assertion), and the 2nd day at 2:00 p.m. is when people who may or may not engage in the sea battle decide whether or not they will engage in a sea battle (moment of decision). And at dusk on the third day the propositions are settled, either 'Settled

² **Settled True:** "A should be counted as settled true at some moment just when A is true at that moment, regardless what happens in the future."

that Battle' or 'Settled that No Battle'.



At the moment of assertion there are two possible future histories (in this case), so what does one assign to assertion of “There will be a sea battle tomorrow”, if there are two possible results? Perloff and Belnap state, “The truth–value of future–tensed sentences at a moment depends on what course history takes.” (Perloff 10) In order to evaluate a sentence one needs the moment of utterance and the corresponding history. Therefore, the utterance “There will be a sea battle tomorrow” on the 2nd day is settled at m_3 (dusk on the 3rd day) that it was true, but it is not settled true at the moment of utterance (m_1). Because after the moment of assertion there is a range of possible future histories one cannot assess the truth value of the utterance. It is not until the later moment that the proposition can be settled true or settled false. They argue it is not needed to assess the truth value at the moment of utterance:

Nothing is needed except the patience to wait until a later moment of assessment when the truth or falsity is settled. Nor is there a defect that has to be remedied by saying that history–open sentences have some third truth value, or some other special status. It is, we believe, a mistake to think of history–open sentences as introducing truth–value gaps that sometimes need to be filled by so–called supervaluations. Assignment–open sentences in quantification theory have no truth value, but we do not therefore feel the need to introduce truth–value gaps, supervaluational accounts of truth, or a third truth value to play a role in our calculations. (Perloff 14)

Therefore, in contrast to the previous account, Perloff and Belnap argue that it is not problematic that future tense propositions do not have a truth value. One does not need to assess the proposition at the moment of assertion, this is what leads to truth-value gaps, instead one should assess the proposition at the moment it is settled. By not having a truth value upon utterance it leaves open the possibility of a range of future moment to occur. Therefore, this account and the previous account are in sync with Aristotle's worry about determinism.

Criticism of Perloff and Belnap

My criticism of Perloff and Belnap rests on the utterance at the moment of assertion, and how this utterance determines when it is settled true. Their account bases the settled truth of a proposition on the context of proposition upon utterance. For example, If I say today that "There will be a sea battle tomorrow", the satisfaction of this assertion is based on the context. Namely that, it is 'today' such that the moment of satisfaction will be the next day, i.e., tomorrow. It is also based on the scope of the context of the assertion. By using their example, "There will be a sea battle tomorrow" is uttered at noon on the 2nd day, and the assertion is satisfied at dusk on the third day. So in this case "There will be a sea battle tomorrow", translates to "There will be a sea battle at dusk on the third day." Because the scope of the context is so narrow, the context of the assertion determines when the assertion will be satisfied, e.g. dusk on the third day.

I think positing this narrow scope for their example leads them into trouble. This is more apparent if a non-narrow future tense proposition is used. e.g., "There will be a sea battle." I think this kind of proposition is too vague to determine the moment of satisfaction. "There will be a sea battle" could refer to dusk on the third day, or it could refer to a month from now at noon. The problem is the scope of this context is too coarse grained to specify a moment of satisfaction, i.e.

when it is settled true. And their argument framework is too fine grained, because it relies on a narrow context, with referents such as “tomorrow”, in order to determine the moment of satisfaction. Because some future tense propositions are vague, their method of ‘assessment at a later moment’ doesn’t work in all cases. Being ‘settled true’ is dependent on the histories that pass through the moment of utterance and what happens in these later moments. So if the context does not include a particular moment in time, the proposition can’t be ‘settled.’

Therefore, I think they are left with saying that either: 1. their account only addresses future tense propositions that have a narrow scope, e.g. day, date and time. And in these cases the moment of satisfaction can be determined, and can therefore be settled true or settled false. If this is the case, then I don’t think their account is any more attractive than a supervaluation account. Especially, due to the fact that supervaluations accounts can address all forms of propositions with names that don’t have a referent. Or 2. Sentences like “There will be a sea battle” cannot be settled true or false because they can’t be satisfied. Since, if the opposite happens (There is not a sea battle), it doesn’t prove the contradictory, because the proposition can always refer to some later moment, it could still be the case that the sea battle will happen. Due to the fact that the proposition isn’t referring to a particular time that the sea battle will happen. But, then what would be the case if the sea battle does happen? Is the proposition still ‘unsatisfied?’ This doesn’t seem right. If I uttered “There will be a sea battle” and some time in the future a sea battle happens, I think I am vindicated, the sentence that I uttered is satisfied. Therefore, there arises a complication of when the proposition is ‘satisfied’ and ‘settled true’. The vague proposition is satisfied if it happens, but I don’t think it is settled true because it may not be the moment the proposition is referring to in order for it to be ‘settled true.’

Therefore, due to the complications of moment of satisfaction, and the determination of when the proposition is settled true or false, I think the assessment of the proposition at the moment of utterance is needed. The account of supervaluations preserves classical valuations, allows for truth value gaps, and allows for the disjunction “There will be a sea battle tomorrow or there will not be a sea battle tomorrow” to be true, but the propositions alone are undetermined. This is exactly in line with Aristotle’s concern, that it is necessary that either one will occur, but it is not necessary that one of them will occur.

Conclusion

In this paper I addressed the questions of whether or not future tense propositions have a truth value at the moment of utterance. Aristotle argues that they do not, because it would imply that future events come about by necessity. Van Fraassen and Thomason argue that they do have a truth value at the moment of utterance, namely “N”, for neither true nor false. Belnap and Perloff argue that one does not need to assess the proposition at the moment of assertion, it is settled true when the proposition is satisfied. And I argue that Belnap and Perloff’s view is problematic because future tense assertions are too vague to determine when it is satisfied, i.e. settled true or settled false. Therefore, the account of supervaluations is more satisfactory as an account of truth value assignment, and it is in line with Aristotle’s concerns.

Ackrill, J. K. (trans.). *Categories and De Interpretatione*. Oxford: Clarendon Press, 1963.

Cooke, Harold P., and Hugh Treadnick (trans.). *The Categories; On Interpretation*. Cambridge, Massachusetts: Harvard University Press.

Perloff, Michael, and Nuel Belnap. "Future Contingents and the Battle Tomorrow." *Review of Metaphysics* 64 (2011): 581-602.

Thomason, Richard M. "Indeterminist Time and Truth Value Gaps." *Theoria: A Swedish Journal of Philosophy*. Vol. XXXVI (1970) Part 3: 265-281.

Van Fraassen, Bas C. "Singular Terms, Truth Value Gaps, and Free Logic." *Journal of Philosophy*. Vol. 63 No. 17 (Sept. 15 1966): 481-495.