Future Contingent Propositions and the Law of Excluded Middle in Aristotle and Some Philosophers

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Introduction

In his work, *De Interpretatione*,[1] Aristotle discusses the nature of propositions. Propositions are sentences that have a truth-value, that is, they are regarded as being either true or false. While some sentences do not have a truth-value, such as questions, commands, and exclamations, those sentences commonly called declarative sentences, also known as claims, statements, or propositions, do have a truth-value; they are either true or false.

To Aristotle, the truth or falsity of a proposition is a function of whether the proposition corresponds to reality. Thus, Aristotle's theory of truth may rightfully be called a "correspondence theory of truth." A proposition is said to be true if and only if the proposition corresponds to an actual state of affairs.

> This is clear, in the first place, if we define what the true and the false are. To say of what is that it is not, or of what is not that it is, is false, while to say of what is that it is, and of what is not that it is not, is true; so that he who says of anything that it is, or that it is not, will say either what is true or what is false . . .[2]

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[1] All translations are from J. L. Ackrill, ed. *A New Aristotle Reader,* (Princeton: Princeton University Press, 1987) unless otherwise stated. All references in Aristotle are to *De Interpretatione* unless otherwise stated.

[2] *Metaphysics* 4.7.1011^{b}26-29. The translation is W. D. Ross in *The Basic Works of Aristotle,* Richard McKeon, ed. (New York: Random House, 1941).

Other philosophers holding a correspondence theory of truth would be Plato (*Sophist*, 240d; 263b); Augustine (*Soliloquia* I, 28); Thomas Aquinas (*Truth*, Question 1, Article 1); René Descartes (*Meditations on First Philosophy: Third Meditation*; *Objections and Replies: Fifth Set of Objections* (see John Cottingham, Robert Stoothoff, Dugald Murdoch, trans. *The Philosophical Writings of Descartes*, Vol. II (Cambridge: Cambridge University Press, 1984): 26, 196)); John Locke (*An Essay Concerning Human Understanding* II, XXXII, §2-§5); Immanuel Kant (*Critique of Pure Reason*, I, Second Part, First Div., Bk. II, Chap. II, §3, 3 (see, Norman Kemp Smith's trans. (New York: St. Martin's Press, 1965: 220)); Bertrand Russell ("On the Nature of Truth," *Proceedings of the Aristotelian Society* (1906-1907), 28-49 as cited in *The Encyclopedia of Philosophy*, Paul Edwards, ed., (New York: Macmillan Publishing, Co., Inc. & The Free Press, 1967), s.v. "Correspondence Theory of Truth," p. 232); and the early Ludwig Wittgenstein (*Tractatus Logico-Philosophicus* 2.0211-2.0212, 2.21, 3.01).

Those philosophers who hold the correspondence theory of truth differ as to exactly where the "correspondence" obtains. Positions include that it obtains between the proposition and external reality (naïve realism), between the proposition and the internal reality of the form of the thing in the intellect (moderate realism), or between the idea of reality in the mind and the thing in reality outside the mind (representationalism).

Other theories of truth include coherence theory, pragmatic theory, and performative theory. Clearly, debates about the nature of the truth of certain proposition will vary according to how one defines 'truth.' For the most part, my examination of the issue of the truth-value of future contingencies will presuppose a correspondence

In logic, the notion that any proposition is either true or false is known as the Law of Bivalence. To state it another way, one could say that for every proposition, either it is true or its negation is true. In this form, the law is known as the Law of Excluded Middle.[3] It is symbolized as (p ∨ ~p) which reads 'Either p or not-p.'[4] It means that either p is true (that p is the case, where p is a statement) or ~p is true (that ~p is the case).

Some may claim that this law is too stringent because it seemingly denies the reality of any sort of *tertium quid* between logical options. Surely, there is a middle ground or third alternative in certain circumstances, *viz*., where there are more than two options in a particular matter. When this is the case, one may argue, to insist on resolving the matter into one of only two options is to commit the informal logical fallacy known as the fallacy of False Dilemma.[5] However, the fallacy of False Dilemma is when one posits 'p ∨ q' (as an exclusive disjunction) where there are other options besides p and q. The Law of Excluded Middle is not really committing the fallacy of False Dilemma, because the variable ~p seeks to represent that which falls outside the scope of p (which would include any middle ground). So, for example, the proposition 'It is either raining or sunny.' is not an example of the Law of Excluded Middle. This proposition could be the informal fallacy of False Dilemma, since it could be the case that it is neither raining nor sunny (e.g., if it is snowing). Rather, the proposition 'It is either raining or not

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theory.

[3] Thus, strictly speaking, the Law of Excluded Middle and the Law of Bivalence are not equivalent, since the Law of Bivalence does not make use of the negation operator '~.' The Law of Bivalence would say of a proposition that it is either true or false, whereas the Law of Excluded Middle would say that the expression (p v ~p) is necessarily true. (cf. Antony Flew, *A Dictionary of Philosophy,* 2nd. ed. New York: St. Martin's Press, 1984, s.v. "Bivalence, principle (*or* law) of."). In this paper, though I may comment on how an issue is worded differently as either an excluded middle or as bivalence, I will not attempt to distinguish how the issue would be rendered along the lines of the Law of Bivalence versus how it would be rendered along the lines of the Law of Excluded Middle unless the distinction is relevant for my purposes.

[4] Contrary to the common way the disjunction is used in logic, here this disjunction must be taken as an exclusive disjunction, which means "either p or ~p, *but not both*," rather than as an inclusive disjunction, which means "either p or q, *or both*." Some texts would symbolize the exclusive disjunction as (p ∧ ~p).

[5] The False Dilemma is an informal rather than a formal fallacy because the argument schema does not formally violate any law of logic. It is the actual content to which the proposition refers, that makes the proposition informally fallacious since the proposition fails to appropriately capture that content.

raining.' would be an example of the Law of Excluded Middle and not the informal fallacy of False Dilemma. Here there is no fallacy since either it is raining or it is not raining (because it is sunny, snowing, the world has come to an end, or anything else that lies outside the scope of 'It is raining.'). One of these two options has to be the case. Anything that falls outside the scope of 'raining' (no matter what it is) is by definition within the scope of 'not-raining.'

However, the Law of Excluded Middle is not without its critics among the philosophers. Since Aristotle's time there has been much discussion as to the soundness and scope of the law. Much of this discussion centers on the implications the law seems to have for propositions that are future tensed, sometimes referred to as 'future contingencies.' For if it is the case that the proposition 'There will be a sea battle tomorrow.' (to use Aristotle's image) is either true or false right now, then it seems that either the sea battle tomorrow necessarily must happen (if the proposition is true) or necessarily must not happen (if the proposition is false).[6]

In this paper I will attempt two things. First, I will try to lay out what I believe is Aristotle's way of framing and approaching the problem of the truth-value of future contingencies, i.e., future tensed propositions (an exegetical project). Second, I will try to lay out and comment upon two modern approaches to the problem of the truth-value of future tensed propositions (a philosophical project).

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[6] Note here I have rendered the issue along the lines of the Law of Bivalence, not along the lines of the Law of Excluded Middle. Stated as an excluded middle, the sea battle dilemma would say "Either it is the case that there will be a sea battle tomorrow, or it is not the case that there will be a sea battle tomorrow." *Prima facie*, one might think that the statement 'It is not the case that there will be a sea battle tomorrow.' and the statement 'It is false that there will be a sea battle tomorrow.' (the second half of the bivalence) are the same statement. Those who proffer a multi-valued logic would argue that they are not.

Part 1: Future Continent Propositions and the Law of Excluded Middle in Aristotle

Introduction

In his treatise *De Interpretatione*, Aristotle discusses of the nature of the truth and falsity of propositions. Aristotle regards 'true' and 'false' as having to do with the ways in which propositions state the combination and separation of subjects and predicates. Thus, while simple terms such as 'man' or 'white' are not properly said to be either true or false, propositions speaking of the relationship of their combination, e.g., 'Every man is white' or of their separation, e.g., 'No man is white' do have a truth-value.

During his discussion, it seems that Aristotle wants to maintain that every proposition has a truth-value. Since the Law of Non-Contradiction disallows both p and ~p at the same time and in the same sense, then for any given proposition, either it will be true or its negation will be true, but not both.

> Of contradictory statements about a universal taken universally it is necessary for one or the other to be true, or false; similarly if they are about particulars, e.g. 'Socrates is white' and 'Socrates is not white'.[7]

The Problem

The dilemma for Aristotle is how to maintain that every statement has a truth-value and at the same time allow for future contingencies to be really contingent. If it is the case that every proposition is either true or false, then this seems to entail fatalism. For if it is the case that a

[7] 7.17^{b}27-30. I do not take Aristotle here to be saying that, of the two universals, affirmative and negative, one must be true and the other false. This would be saying, of the two propositions All S is P and No S is P (to use the standard categorical terms), that one would have to be true and the other false. This is clearly not the case as Aristotle soon goes on to show. In this quote, he refers to "contradictions" but these two universals are contraries, not contradictions. If they were contradictions, not only could they not both be true at the same time, but they could not both be false at the same time either. Being contraries, they cannot both be true at the same time but can both be false at the same time. Rather, I take Aristotle to be referring to two contrasting pairs of propositions (two universals and two particulars), *viz*., either it is true that All S is P or it is false that All S is P and either it is true that Some S is P or it is false that Some S is P.

proposition about the future is necessarily either true or false, then that to which the proposition refers is necessarily what the proposition says it is. Thus, if the proposition 'There will be a sea battle tomorrow.' is true, then it cannot be the case tomorrow that the sea battle does not occur. Therefore, nothing in the future can really be contingent, since there was nothing to prevent anyone from stating a proposition about the future, and whether the proposition is true or false, the future is not able to not be what the proposition says it will be.

> For if every affirmation or negation is true or false it is necessary for everything to be the case or not be the case. For if one person says that something will be and another denies this same thing, it is clearly necessary for one of them to be saying what is true—if every affirmation is true or false. … It follows, that nothing either is or is happening, or will be or will not be, by chance or as chance has it, but everything of necessity and not as chance has it (since either he who says or he who denies is saying what is true).[8]

Of course, if one holds to the notion that the future is determined, and thus cannot be other that it will be due to an immutable relationship to antecedent causes, then there is no problem to address. Aristotle apparently does not hold to such a notion, and thus is confronted with the task of how to maintain a meaningful sense in which the future is contingent without compromising the nature of the truth-value of certain propositions. All this is to say that Aristotle here is not embarking on an analysis of the metaphysics of free will verses fatalism, nor the nature of contingency *qua* contingency, but rather seems already committed to the contingency of the future and wants to render coherent the issue of the relationship of the truth-values of propositions to such a contingent future.

Aristotle's Two-Part Approach

First Part of Aristotle's Approach

How does Aristotle deal with the problem? His answer seems two-fold. First, he seems to argue that there is a difference between saying that the truth-value of a proposition is necessarily so, and saying that that about which the proposition speaks is necessarily so.

[8] $9.18^{a}34$-39; $9.18^{b}4$-9

> What is, necessarily is, when it is; and what is not, necessarily is not, when it is not. But not everything that is, necessarily is; and not everything that is not, necessarily is not. *For to say that everything that is, is of necessity, when it is, is not the same as saying unconditionally that it is of necessity.*[9]

That is, it is one thing to say of proposition *p* that its truth-value could not be other than what it is; it is another thing to say that that about which proposition *p* speaks (i.e., that to which proposition *p* corresponds) could not be other than what is. If X is the case, then a proposition affirming X is necessarily true, even if X did not come about by necessity.[10] Therefore there is a difference between saying that an event is necessary and saying that the truth-value of a proposition about that event is necessary.[11]

Given this, Aristotle could argue that there is nothing problematic about admitting the necessity of the truth-value of propositions of future contingencies. The necessity of the truth-value of propositions of future contingencies does not render the future contingencies no longer contingent (i.e., necessary). The necessity of the truth-value is caused by the event, not the other way around. "For it is not because of the affirming or denying that it will be or will not be the case."[12]

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[9] $9.19^{a}23$-26 (emphasis added)

[10] The distinction here is described by some as the difference between logical necessity and actual necessity. For example, my existence is not logically necessary. This means that the negation of the proposition 'I exist' is not a contradiction (though it does not correspond to what is the case when I say it). Indeed, the negation of the proposition 'I exist' (when I say it) was true before 1956, which could never be said of a contradiction. But since I actually do exist, then a proposition affirming my existence is actually necessary. However, this is not to say that my existence is a necessary existence. I am a contingent being, which is to say that my non-existence is possible. It should be noted here that a peculiar feature of such a statements has to do with it utilizing an indexical sign, which is to say that the proposition 'I exist' has a different referent according to who says it. It nevertheless illustrates the point of the difference between actual and logical necessity.

[11] I disagree with A. N. Prior's description of these matters. (See, A. N. Prior, "Three-Valued Logic and Future Contingents" *Philosophical Quarterly* 3 (1953): 324 and my discussion below.) He suggests that Aristotle's point is a logical one. Prior says that Aristotle's point is to say ($p \supset p$). I agree that Aristotle's point includes this notion, and that such a proposition is logically necessary. Indeed, I take Prior overall to be defending the same point I am making here, *viz*., that Aristotle is not claiming that the notion 'what is, necessarily is, when it is' is metaphysically necessary, *viz*., as that which is impossible to not exist. But, as I argue, I would not describe Aristotle's point to be merely a logical one, since Aristotle does not use a hypothetical, as if to merely say "If something is, then it is" but a stronger, "When something is, it necessarily is." I call the latter "actually" necessary.

[12] $9.18^{b}40$

But there seems to be a problem here. If the truth-value of a proposition is caused by the state of affairs, then if the future tensed proposition has a truth-value, there must exist somewhere that future state of affairs that renders the future tensed proposition either true or false. But this surely will not do. The future does not exist.[13] Therefore, if the truth-value of a given proposition is what it is "according to how the actual things are"[14] then the future tensed proposition cannot have a truth-value.

Indeed, some may argue that, given Aristotle's definition of truth that found in the *Metaphysics* Γ, it is possible to resolve the dilemma of the status of future contingencies in just this way (i.e., that the future tensed propositions have no truth-value). One could argue that according to this definition of truth, a proposition about a future contingency has no truth-value because there is no 'is' in the proposition, but only a 'will be.' That is, what it means for a proposition to be true or false involves the notion of present time. The true proposition corresponds to what *is* the case. But to say 'There *is* a sea battle tomorrow.' is absurd. For tomorrow is not an 'is' but rather is a 'will be.' Only a proposition with an 'is' can have a truth-value. Thus, the proposition 'There will be a sea battle tomorrow.' cannot properly be said to be either true or false since for a proposition to be either true or false it must speak of what is or is not the case, not of what will be or will not be the case. In order for a proposition to have a truth-value (or more accurately, in order for it *to be* a proposition at all)[15] it must either affirm or deny what *is* the case, and at the same time either correspond or not correspond to what is the case.[16]

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[13] Admittedly, this is a philosophically loaded statement. Some may want to argue that in some sense the future exists. But if that is the case then any discussion about the logical status of future tensed propositions which one hoped would free one from the commitment that the future is determined, is moot. For if the future exists, then the law of identity, $(p \supset p)$, would necessitate that the future is (or will be) what it is (or will be).

[14] $9.19^{a}33$

[15] "Yet every sentence is not a proposition; only such are propositions as have in them either truth or falsity." $4.17^{a}2$, Ross.

[16] There is another way to render the tense issue with respect to future propositions. One could argue that a proposition about the future is present tense in that it is claiming presently what is true (or false) about the future. Thus, to say "There will be a sea battle tomorrow." would be saying that presently it is true (or false) that a sea battle will occur in the future. Taking this interpretation could retain the original problem for the dilemma of fatalism

But one may claim that this line of reasoning is too stringent, and indeed may not be truly Aristotelian.[17] For propositions can be made about the past that properly could be said to be either true or false. It does not seem the least bit problematic to say that 'There was a sea battle yesterday.' is necessarily true or false. But since statements about the past do not contain an 'is' but rather a 'was,' then according to the above reasoning one would be committed to the notion that statements about the past have no truth-value. But to maintain that propositions about the past and the present have truth-values, while propositions about the future do not, would commit one to a strange asymmetrical arrangement of the logical status of past, present, and future tensed propositions.[18]

In this regard, one may argue from what he says in *De Interpretatione* that Aristotle does not hold that only present (or past) tensed propositions have truth-value, and therefore one can dismiss this interpretation of the passage from his *Metaphysics* Γ as being unnecessarily narrow. Aristotle seems to state in several places throughout *De Interpretatione* that tenses other than the present are allowed in propositions properly so called, and, being propositions, have truth-values. Note these examples:

> It has significance, but there is no truth or falsity about it, unless 'is' or 'is not' is added, *either in the present tense or in some other tense*.
>
> For even the definition of man is not yet a statement-making sentence [i.e., it does not have a truth-value] —unless 'is' or 'will be' or 'was' or something of this sort is added.
>
> The simple statement is a significant spoken sound about whether something does or does not hold (in one of the divisions of time).

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unless one opts for some notion of either the timelessness of truth-values or of the knower. The latter seems to have been the way certain Medieval Christians understood this matter as it impinged on the issue of God's knowledge of the future. See, for example, Augustine, *Confessions* XIII, 16; Boethius, *The Consolation of Philosophy*, Bk. V, §VI; Aquinas, *Truth*, Question Two, Article XII.

[17] Richard Taylor argues (Richard Taylor, "The Problem of Future Contingencies" *The Philosophical Review* 66 (1957): 16) that the reason Aristotle denies that future contingents have a truth-value is not because of this application of his correspondence theory of truth, but rather because of his commitment to a real contingency of certain future events. See footnote 22 below.

[18] One could render the notion of the past the same as I suggested of the future in footnote 16 above, *mutatis mutandis*.

> Now it is possible to state of what does hold that it does not hold, of what does not hold that it does hold, of what does hold that it does hold, and of what does not hold that it does not hold. Similarly for times outside the present.[19]

But even these statements may not be definitive. For in other places, Aristotle seems to deny that future tensed propositions have truth value. Consider this claim:

> Clearly, therefore, not everything is or happens of necessity: some things happen as chance has it, and of the affirmation and the negation neither is true. … Clearly, then, it is not necessary that of every affirmation and opposite negation one should be true and the other false. For what holds for things that are does not hold for things that are not but may possibly be or not be; with these it is as we have said.[20]

Is this a contradiction in Aristotle? Does he at one point maintain that every proposition has a truth-value, and yet deny that a future-tensed proposition has a truth-value? This may be one of those places where the distinction between the Law of Excluded Middle and the Law of Bivalence is relevant. If, on the one hand, Aristotle denies that every proposition has a truth-value (a rejection of the Law of Bivalence) does this necessarily deny the Law of Excluded Middle? If not, then could Aristotle affirm the Law of Excluded Middle and deny the Law of Bivalence without contradiction? Again, how one regards this will differ depending on other considerations, including the relevance of multi-valued logic.

Be that as it may, one may not be able to take these statements as proof that Aristotle regarded the notion of tense as totally irrelevant to the question of the truth-value of propositions. What may be labeled as an asymmetry in the arrangement of the truth-value of past, present, and future tensed propositions seems to be what Aristotle suggests in the opening paragraph of chapter nine. Consider:

> With regard to what is and what has been it is necessary for the affirmation or the negation to be true or false. . . . But with particulars that are going to be it is different.[21]

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[19] $1.16^{a}18$, Ross, emphasis added; $5.17^{a}11$, emphasis added; $5.17^{a}24$, emphasis added; $6.17^{a}27$-30, emphasis added;

[20] $9.19^{a}18$-19; $9.19^{b}1$-5

[21] $9.18^{a}28$-33

Indeed, the bulk of chapter nine is a *reductio ad absurdum* argument that can be cast in the form of a Modus Tollens for the notion that the logical status of future tensed propositions is different than the logical status of past and present tensed propositions. His argument seems to be:

> 1) If future tensed propositions have the same logical status as past and present tensed propositions (*viz*., that either the affirmation or negation is necessarily true or false), then fatalism follows.[22]
>
> 2) Fatalism is untenable./∴Future tensed propositions do not have the same logical status as past and present tensed propositions (which is to say that future tensed propositions do not have necessary truth-value).

Part Two of Aristotle's Approach

But how is Aristotle able to resolve the dilemma? He does not want to say that the Law of Excluded Middle is not necessary. Yet how is he able to simultaneously hold that the Law of Excluded Middle is necessary and yet the future is not determined? The second part of his solution is found in $9.19^{a}29$-$19^{b}4$ where he argues that the individual propositions of the excluded middle, when these individual propositions are future tensed, do not have a necessary truth-value, but only the expression of the excluded middle as a whole is necessary.[23] That is to say, one cannot properly divide the excluded middle when the excluded middle speaks of that which is future. The necessity of the truth-value of the Law of Excluded Middle does not entail the necessity of the truth-value of either of the terms. Thus, $\Box(p \vee \sim p)$ does not entail $(\Box p \vee \Box \sim p)$.[24] The first proposition claims that is it necessary that: (a) if p is true then ~p is false; (b) if p is false then ~p is true; and (c) both p and ~p cannot be true together.[25] The second

[22] Specifically, fatalism for Aristotle in this context is the denial of the causal relevance of deliberation and action on the status of future events. Thus, to maintain the necessity of future states is to deny that "both deliberation and action are causative with regard to the future, and that, to speak more generally, in those things which are continuously actual there is a potentiality in either direction." ($9.19^{a}8$-9, Ross)

[23] As alluded to above, this in effect preserves the Law of Excluded Middle while denying the Law of Bivalence.

[24] In fact, this entailment does not follow even for propositions that are not future tensed.

[25] Point (c) is necessitated by taking the Law of Excluded Middle as an exclusive disjunction (as I have argued earlier), since an inclusive disjunction would allow both terms to be true. Likewise for the second

proposition claims that it is the case that either it is necessary that p or it is necessary that ~p (but not both).

As far as the truth-value is concerned, one sees that the proposition 'There will be a sea battle tomorrow.' means necessarily: (a') if there will be a sea battle tomorrow then it is not the case that there will not be a sea battle tomorrow; (b') if there will not be a sea battle tomorrow then it is not the case that there will be a sea battle tomorrow; and (c') it is not the case that both there will be a sea battle tomorrow and there will not be a sea battle tomorrow.

It is all three of these conditions taken together that is necessary. But from this, one cannot say that either term is necessary. Both could be contingent. Whichever way the truth-value of either term is rendered, it is rendered so by virtue of what actually happens even if what actually happens does not happen by necessity.

> … everything necessarily is or is not, and will be or will not be; but one cannot divide and say that one or the other is necessary. I mean, for example: it is necessary for there to be or not to be a sea battle tomorrow; but it is not necessary for a sea battle to take place tomorrow, nor for one not to take place—though it is necessary for one to take place or not to take place.[26]

Conclusion

I understand Aristotle to be committed to several points. First, the future is really contingent. Second, if propositions about the future have a definite truth-value, then the future would not be contingent, therefore, propositions about the future do not have a truth-value (and thus, the Law of Bivalence is not a necessary proposition). Third, a true proposition about a present state of affairs is necessarily true. Fourth, the necessity of true propositions does not mean that the present state of affairs came about by necessity. Fifth, the Law of Excluded middle is logically necessary. Sixth, the necessity of the Law of Excluded Middle obtains only with the disjunction as a whole, not with the individual disjuncts (at least as far as future tensed propositions go).

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proposition.

[26] 9.19^{a}27-33

Part 2: Future Contingent Propositions and the Law of Excluded Middle in Some Philosophers

Introduction

In this section, I want to introduce three other approaches to the issue of future tensed propositions and the Law of Excluded Middle. None of the approaches I examined is fatalistic, since fatalism is not really an "approach" to the problem as much as it is a surrender to it. The approaches examined include one that seeks to rework the logical schema in order to work with future contingent propositions, one that seeks to recast the original question about the sea battle in light of Process philosophy and Quantificational Logic such that no problem really exists, and one that seeks to re-describe the logic in light of certain metaphysical commitments of Philosophical Realism.

The Approach of A. N. Prior: Poly-valent Logic[27]

Some have suggested that the issue can be managed, if not resolved, logically if one introduces a multi-valued logic, the most common of which would be a three-valued logic.[28] Whereas in traditional (i.e., Aristotelian) logic there are only two truth-values, *viz*., 'true' and 'false,' in a three-value logic there are three values, sometimes rendered 'true,' 'false,' and 'middle' (or neutral or some other designation). In most cases the three-valued logic would function exactly the same as the traditional two-valued logic. But some propositions would have a truth-value of neither true nor false. These propositions would be middle. For our purposes, the middle value would be applicable for future tensed propositions. A. N. Prior says that the

[27] A. N. Prior (d. 1970) was Professor of Philosophy at Oxford University.

[28] In addition to the article by A. N. Prior, referenced in footnote 11 above, other sources that discuss multi-valued logics include, Ronald J. Butler, "Aristotle's Sea Fight and Three-Valued Logic," *Philosophical Review* 64 (1955): 264-274; John Barkley Rosser and Atwell R. Turquette, "Many-Valued Logics," in *Contemporary Philosophical Logic* eds. Irving M. Copi and James A. Gould (New York: St. Martin's Press, 1978): 320-326; and Hillary Putnam, "Three-Valued Logic" in Copi and Gould, pp. 327-334.

three-valued logic does precisely this. "In sum, three-valued logic does seem to bring new precision to our handling of statements with tenses (as opposed to the fundamentally tenseless propositions of the common systems) …"[29]

Prior seeks to utilize the three-valued logic introduced by Jan Łukasiewicz [30] and developed by other logicians. What the three-valued logic does is provide a schema that would factor in certain modal properties, and consequently be able to address future contingents.[31] The first diagram illustrates the nature of the negation operator '~' and shows the relationships between true, false and ½ .

p	~p
T	F
½	½
F	T

Negation Operator

Factoring in the third category we can see how the truth tables for the various logical operations would look.

p	q	p ⊃ q
T	T	T
½	T	T
F	T	T
T	½	½
½	½	T
F	½	T
T	F	F
½	F	½
F	F	T

Material Implication

p	q	p ∨ q
T	T	T
½	T	T
F	T	T
T	½	T
½	½	½
F	½	½
T	F	T
½	F	½
F	F	F

Disjunction

p	q	p • q
T	T	T
½	T	½
F	T	F
T	½	½
½	½	½
F	½	F
T	F	F
½	F	F
F	F	F

Conjunction

p	q	p ≡ q
T	T	T
½	T	½
F	T	F
T	½	½
½	½	T
F	½	½
T	F	F
½	F	½
F	F	T

Biconditional

[29] Prior, p. 325.

[30] Relevant works by Łukasiewicz cited by Prior include *Elements of Mathematical Logic* (London, 1963) and *Aristotle's Syllogistic* (Oxford, 1951).

[31] Prior utilizes Polish notation in symbolizing the logic. True is indicated by '1,' false by '0,' and the third category by '½.' The logical operators would include: Np = ~p; Mp = It is possible that p; NMp = It is not possible that p; Cpq = p ⊃ q; Apq = p ∨ q; Kpq = p • q; Epq = p ≡ q. For the sake of convenience, except with those notions that are unique to his system (*viz*., ½) I will employ the more standard notation.

After an explanation of the various truth tables and other logical relationships, Prior concludes what the truth-values mean. That which is true (Prior's '1') is definitely true and would apply to such things as analytic statements (what Prior calls "timeless relations"), past states, present states, and determined future states. The true is necessarily true.[32] That which is false (Prior's '0') is definitely false for analogous reasons and is impossible. The third category (Prior's '½') captures the notion of contingency and properly refers to undetermined future states.

We can see from his truth tables that the Law of Excluded Middle cannot be a law in this system. In other words, (p ∨ ~p) is not necessarily true. We can see this when we compare the disjunction using the standard two-valued logic with disjunction using the three-valued logic.

p	p	∨	~p
T		T	
F		T	

Two-Valued Disjunction

p	p	∨	~p
T		T	
½		½	
F		T	

Three-Valued Disjunction

In order for a proposition (in this instance (p ∨ ~p)) to be a "law" in a system, it must be a tautology, which is to say, it must be true in every instance. We see that this is the case regarding the standard two-valued disjunction, because all of the truth-values under the logical operator '∨' are true. This is not the case with the three-valued disjunction, however. In that instance where p is ½ the truth-value is ½. Thus, it is not the case that in every instance (p ∨ ~p) is true. This means it cannot be a law in this system. [33]

Perhaps the application to the matter at hand is obvious. When factoring out the logical options regarding future contingent propositions, there is no dilemma of fatalism that one has to

[32] I should remind the reader that being "necessarily true" is not a metaphysical notion (see footnote 11), but is what we have seen earlier in Aristotle that "what is, necessarily is, when it is." (9.19ª23). This is what I have referred to as being "actually" necessary. Likewise for that which is false: "what is not, necessarily is not, when it is not."

[33] In fact, in utilizing the three-valued logic, the only law that survives of the three fundamental laws of logic is the Law of Identity (p ⊃ p). Only this one has all true values in each instance of p being true, ½, or false. Even the sacred Law of Non-Contradiction fails, since if p = ½ then ~(p • ~p) has a value of ½, and hence is not always true. Prior does, however, go on to employ the modal operator M (in place of the currently standard '◊') for 'possible' in such a way as to collapse all modal propositions into a two-valued rendering. Thus, outside statements about the future, the standard laws of logic do survive.

manage. Since it is not the case that 'There will be a sea battle tomorrow.' and 'There will not be a sea battle tomorrow.' constitute a tautology, then one is not faced with the problem of admitting that if the proposition is true then the sea battle will necessarily happen or if it is false then it is impossible to happen. All one has to do is understand that the third category (the possible) may apply. Just because a proposition is not true does not mean that it is false (and likewise, just because a proposition is not false does not mean that it is therefore true). With this, the seeming dilemma is eliminated. One does not have to chose between whether a future tensed proposition is true or false (and thus commit oneself in principle to a logically "determined" future).

Comments on the Approach of A. N. Prior: Poly-valent Logic

Though Aristotle did not hold to a three-valued logic, his discussion of the problem of future tensed propositions seems to lead to a resolution that is tantamount to the three-valued logic. As argued earlier, Aristotle maintained that propositions that are present or past tensed do have a truth-value and propositions that are future tensed do not have a truth-value.[34] Aristotle's problem (according to the philosophers who argue from a three-valued logic) was his failure to see that the expression '$(p \vee \sim p)$' (the Law of Excluded Middle) does not clearly represent the expression 'It is true that there will be a sea battle tomorrow or it is false that there will be a sea battle tomorrow.' If one had to employ the expression '$(p \vee \sim p)$' to describe the future contingent of the sea battle, one would have to recognize that it would be (awkwardly) saying 'It is true that there will be a sea battle tomorrow or it is not the case that it is true that there will be a sea battle tomorrow.' Putting it more simply, the expression would be 'There will be a sea battle tomorrow or it is not the case that there will be a sea battle tomorrow.' Then one would have to keep in mind (according to the three-valued logic) that the expression 'It is not the case that it is true that there will be a sea battle tomorrow.' does not mean that it is false that there will be a sea battle tomorrow.

[34] Prior agrees with my interpretation of Aristotle when he says "… Aristotle speaks of some propositions about the future as being neither true nor false when they are uttered, on the ground that there is as yet no definite fact with which they can accord or conflict." (Prior, p. 322) He disagrees, however, with Taylor (see footnote 17) as to why Aristotle denies any truth-value to future tensed propositions.

But what are we to make of the system as it deals with the matter? The value seems to be in the extent to which it can ascribe symbols to future contingents and try to work out a logical schema. However, though there may be other applications of three-valued logic, it sometimes appears to be a complicated way of saying what others who deny fatalism might already be saying by their mere assertion that future tensed propositions do not have a truth-value in the first place. There seems little difference (with reference to the logical status of future tensed propositions) between saying that certain propositions are neither true nor false and leaving it at that (two-valued logic not having a name for the status of such propositions) and saying that certain propositions are neither true nor false and giving its status the truth-value name of '½,' 'possible,' 'middle,' or whatever.

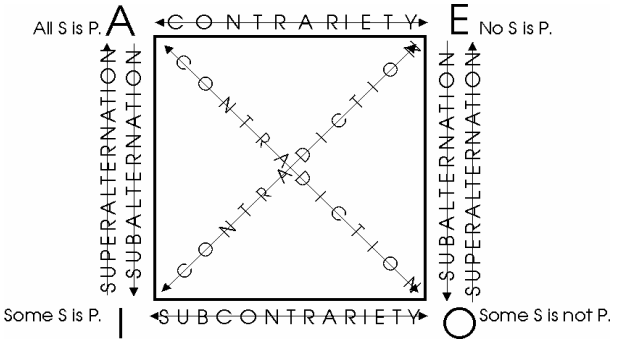
The point, of course, is that by utilizing such a logical schema, Prior is making more than a merely logical point. His schema is predicated upon a notion (not unlike Aristotle and George Shields, though possibly for reasons different than Shields (see below)) that the future is really contingent. In other words, his prior commitment to metaphysical indeterminism seems to be the motivation to adopt a logical schema that is symbolically powerful enough to represent propositions about such a future.

The Approach of George Shields: Process Philosophy and Quantificational Logic[35]

In traditional (Aristotelian) logic, the relationships of categorical propositions fall along patterns. These patterns can be graphed with a diagram known as the Traditional Square of Opposition (or Square of Alterns).[36]

[35] Shields is Professor of Philosophy and Chair of Division of Literature, Languages and Philosophy at Kentucky State University. He hold a A.B. and M.A. from the University of Louisville and a Ph.D. from the University of Chicago. He has also done further study at Oxford University.

[36] The Traditional Square of Opposition shows that two propositions are contradictory if they both cannot be true at the same time nor false at the same time (e.g., **A** 'All men are mortal.' and **O** 'Some men are not mortal.' or **E** 'No men are mortal.' and **I** 'Some men are mortal.'); two propositions are contrary if they both cannot be true at the same time but could both be false at the same time (e.g., **A** 'All men are mortal.' and **E** 'No men are mortal.'); and two propositions are sub-contrary if they both cannot be false at the same time but could both be true at the same time (e.g., **I** 'Some men are mortal.' and **O** 'Some men are not mortal.') Additionally, subimplication shows that the truth of the **A** entails the truth of the **I** (likewise for the **E** and the **O**) and superimplication shows that the falsity of the **I** entails the falsity of the **A** (likewise for the **O** and the **E**).



Traditional Square of Opposition

In dealing with asyllogistic arguments,[37] or somewhat more complicated propositions, i.e., propositions that cannot be stated as merely categorical in nature,[38] a different system of logic can be employed using universal and existential quantifiers. The general connections between universally and existentially quantified propositions can be seen in the first diagram that follows. If we quantify the subjects and predicates of the standard propositions, we can see the relationships between them in the second diagram that follows.[39]

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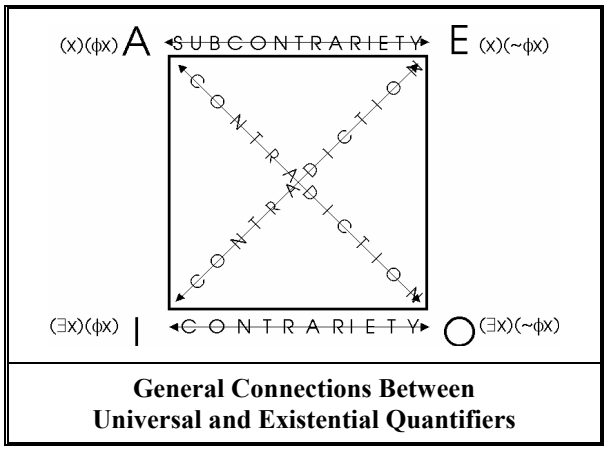
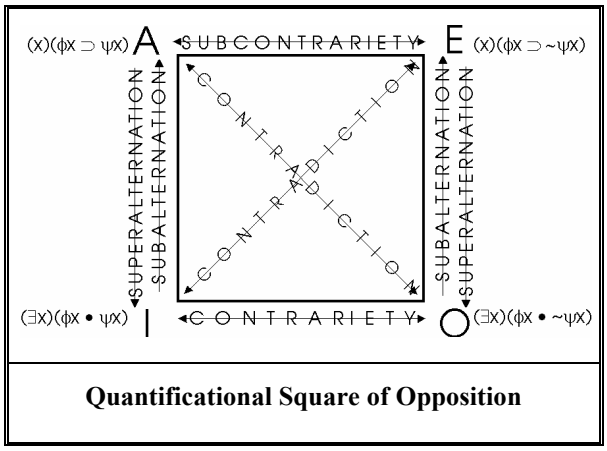
[37] Asyllogistic logic would be arguments that consist of more than two premises and a conclusion. With simple categorical propositions that make up a simple syllogism, a few fundamental rules can demonstrate the argument's validity. But in order to do more complex arguments, those whose premises are either complex or that have more than two premises, quantificational logic can come into play.

[38] An example would be the proposition 'All bankers are either thrifty or patient.' The standard categorical schema cannot capture the complex predicate term.

[39] Notice in the second diagram, the relationships of super- and subalternation, and contrariety and subcontrariety change from the traditional square. Super- and subalternation as traditionally understood (sometimes referred to as super- and subimplication) do not obtain quantificationally, but, in fact, reverse. This is so because any substitution instance such that (ϕx) is false, will make ($\phi x \supset \psi x$) true and ($\phi x \bullet \psi x$) false. In this instance, the truth of the **A** would not entail the truth of the **I** and the falsity of the **I** would not entail the falsity of the **A**, (likewise for the **E** and **O**) contrary to the Traditional (Aristotelian) Square. But, the truth of the **I** entails the truth of the **A** and the falsity of the **A** entails the falsity of the **I** (likewise for the **E** and **O**) which, again, is the reverse of the Traditional Square. In addition, the relationships of contrariety and subcontrariety also reverse since any substitution instance such that (ϕx) is false will make both the **A** and the **E** true (which could not be for contraries) and there are no substitution instances such that the **A** and the **E** are both false (which makes them subcontraries). Finally, any substitution instance such that (ϕx) is false will make both the **I** and the **O** false (which could not be for subcontraries) and there are no substitution instances such that **I** and the **O** are both true (which makes them contraries).



General Connections Between Universal and Existential Quantifiers



Quantificational Square of Opposition

The problem, then, is how is one to understand the Law of Excluded Middle? Is the pair of propositions 'There will be a sea battle tomorrow.' and 'There will not be a sea battle tomorrow.' strict contradictories, contraries, or are there other alternatives?

In his article,[40] George Shields examines and defends an earlier work of Charles Hartshorne against a critic of Hartshorne, Steven M. Cahn, on a process treatment of future tensed propositions.[41] *Prima facie*, Shields' treatment of the issue *vis-à-vis* Hartshorne and Cahn may look like a version of the three-valued logic. Apparently, Cahn's critique of Hartshorne's article renders the issues along these lines.[42] By recasting the argument, however, Shields makes no use of a third logical category. Rather, his treatment of the status of future contingent propositions is along the lines of understanding present states as "necessitating, excluding, and merely permitting" future states.[43]

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[40] George W. Shields, "Fate and Logic: Cahn on Hartshorne Revisited," *The Southern Journal of Philosophy* 26 (1988): 369-378. The work by Cahn cited by Shields is Steven M. Cahn, *Fate, Logic, and Time* (Yale University Press, 1967) re-issued by Ridgeview Publishing, 1986. The work by Hartshorne cited by Shields is Charles Hartshorne, "The Meaning of 'Is Going to Be,'" *Mind* 74 (1965), no pages given.

[41] The terminology here is mine, which is to say, nowhere does Shields call his position 'process.' But to me it does not seem to be an unfair label given the way Shields goes on to render the nature of future tensed propositions, and given the fact that Shields considers his paper to be a defense of Hartshorne.

[42] Critiquing Hartshorne, Cahn examines the relationship between these three claims: 1) X will occur; 2) X will not occur; and 3) X may or may not occur. The logical symbols he uses are thus: 1)X = X will occur; 2) " = X will not occur; and 3) M = X may or may not occur. The logical relationship between these proposition are: 1) If X is true, then " is false and M is false; 2) if " is true, then X is false and M is false; 3) if M is true, then (X is false and " is false). Making use of the category 'M' seems to frame the issue as multi-valued. Apparently, Shields rejects such an understanding of Hartshorne, or at least, goes on to defend Hartshorne while not appealing to any three-valued logic.

[43] The expressions are Hartshorne's. Even at this point, one may expect the use of three logical operators,

In dealing with the problems of propositions about the future, what does it mean to say 'X will occur' or 'X will not occur'? For Shields, the former means that all the conditions for the actualization of X from the utterance about X to the occurrence of X are such that X is going to occur. The latter means that no conditions of the actualization of X from the utterance of X to the occurrence of X are such that X is going to occur.[44]

Connecting the occurrence of X to the antecedent states of X is not insignificant for Shields. He holds that the occurrence of some future events are ontologically indefinite. Now, granted, such an understanding of the future does not necessarily entail process ontology (It certainly does not for Aristotle.), but I suggest that this is indeed his thinking here. In explaining the logical relationship of what would be called 'superimplication' on the Traditional Square of Opposition, Shields says:

> … it is at least logically possible that the future relative to *t* might develop in such a way that conditions come into being which will then require the occurrence of e, but it might also develop in such a way that conditions come into being which will then exclude the occurrence of e, *and this indefiniteness as to which possibility obtains at t is extra-mentally real.*[45] ... The future states themselves are often conceptualized in terms of 'may-be-or-may-be-not' expressions … and it is at least logically possible that this applies not just to our knowledge of the future, but to the future itself or *in re*.[46]

In the following diagram we can see how Shields, with analogous use of the traditional Square of Opposition, illustrates the logical relationships of how he understands propositions that are future tensed.

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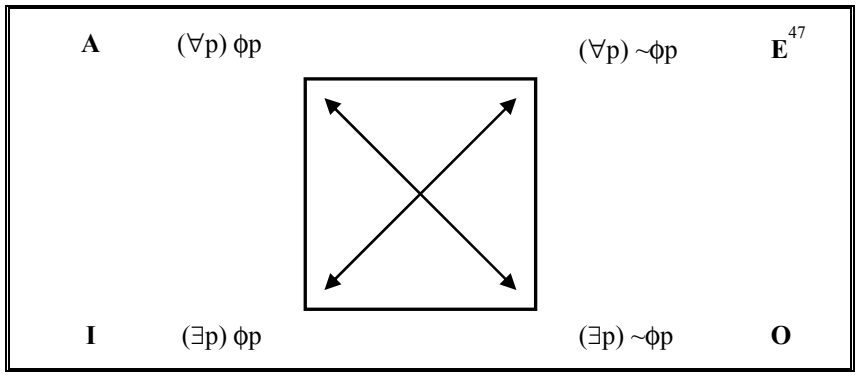
viz., representing possible (◊), impossible (~◊) and necessary (□), as in Modal Logic. As we shall see, rather than that, Shields tries to capture these three categories within a two-valued logic by making use of the quantificational operators. Ultimately, Shields' position is a philosophical rather than merely logical one.

[44] Shields, p. 371.

[45] Shields, p. 373, emphasis added.

[46] Shields, p. 376-376. Both of these comments could remind one of Whitehead's "Principle of Relativity" albeit modified. See Alfred North Whitehead, *Process and Reality* (corrected edition), ed. by David Ray Griffin and Donald W. Sherburne (New York: Macmillan Publishing Co., 1978): 22. I say 'modified' since, in Whitehead, "it belongs to the nature of a 'being' that it is a potential for every 'becoming.'" Shields seems here to allow some "beings" i.e., states, to necessarily entail certain future states and thus not be a potential for every becoming, but only for a certain becoming.



Shields' reading of the propositions is thus:

> (∀p) ϕp: All states at an arbitrarily selected "present" time, t, are such that event *e* is going to occur.[48]
> (∀p) ~ϕp: All possible states at *t* are such that it is not the case that *e* is going to occur.
> (∃p) ϕp: There is at least one possible state at *t* such that *e* is going to occur.
> (∃p) ~ϕp: There is at least one possible state at *t* such that it is not the case that *e* is going to occur.

For Shields, the key application of such a quantification is to deny the fact that the propositions 'There will be a sea battle tomorrow.' and 'There will not be a sea battle tomorrow.' would be schematized as (p • ~p), that is, he denies the claim that these propositions are contradictory. Rather, 'There will be a sea battle tomorrow.' would be an **A** statement and 'There will not be a sea battle.' an **E** statement. Thus, he argues, these propositions would best be schematized as (p ∨ q), where (p ∨ q) is an exclusive disjunction.[49] Thus, if p is true, q has to be false, and if q is true, p has to be false, that is, ((p ⊃ ~q) • (q ⊃ ~p)).[50] He notes for us that "this is a veridical analogue of the truth value relations between **A** and **E** type statements on the

[47] In the article, the **E** proposition is rendered (∀p) ~ϕp) [sic]. I presume that the second closing parenthesis is a typographical error. In addition, for Shields' Existential Quantifier, I have replace his symbol 'E' with the more usual '∃' throughout.

[48] Shields notes a proviso regarding such quantificational statements, that at the occurrence of e, the scope of quantification closes. Thus, though (∀p) is seemingly universal, it ranges only over all those possibilities that are future to *t* up to the occurrence of e, and does not range to possibilities after the occurrence of e.

[49] Shields' term is "strong" disjunction. His symbolization is 'p ∧ q.'

[50] Flew (*Dictionary*, s.v., "Or") symbolizes the exclusive disjunction as ((p ⊃ q) • ~(p • q)). The schema are truth-functionally equivalent, Shields' rendering achievable by replacing Flew's second conjunct with ~(q • p) by Commutation, deriving (~q ∨ ~p) by De Morgan's Theorem, and then deriving (q ⊃ ~p) by Material Implication.

traditional square …"[51] and that such a schema "mirrors the truth value semantics of contrariety, not contradiction."[52] Being contraries, it is possible for both to be false at the same time and thus, the falsity of one does not necessitate the truth of the other. The Law of Excluded Middle is preserved.

Comments on the Approach of George Shields: Process Philosophy and Quantificational Logic

What are we to make of Shields' resolution of the problem of the Law of Excluded Middle and future contingencies? It seems plain enough that if the propositions 'There will be a sea battle tomorrow.' and 'There will not be a sea battle tomorrow.' are contraries, then it follows that, while the truth of one entails the falsity of the other, the falsity of one does not entail truth of the other. There are several responses that I can make.

First, (and perhaps less importantly) I find Shields' quantificational rendering of his propositions problematic. I would normally take a universally quantified p to mean that, whatever is true of p, is true of any given p. The fact that a universally quantified p is talking about the entire class of individual p's can be seen by the rule of Quantifier Exchange.[53] The proposition $(\forall p)\phi p$ is logically equivalent to $\sim(\exists p)\sim\phi p$. But the second proposition implies that we are talking about a particular p. Therefore $(\forall p)$ must be referring to the entire class of p's.[54]

But Shields' argument seems to be saying, not that whatever is true of p is true of any given p, but rather, it is true of all p's taken together. It would be the difference between saying 'Every girl loves some boy.' and 'There is some (particular) boy whom every girl loves.' Symbolically, it would be the difference between $(\forall x)(\exists y)(Lxy)$ and $(\exists y)(\forall x)(Lxy)$. Granted,

[51] Shields, p. 374.

[52] Shields, p. 374.

[53] See Robert Baum, *Logic* (New York: Holt, Rinehart, and Winston, Inc., 1975): 263. Copi does not give this operation a name, but nevertheless acknowledges the logical equivalency of two propositions, one of which is the Quantifier Exchange of the other. See, Irvin M. Copi, *Introduction of Logic*, 7th Edition (New York: Macmillan Publishing Company, 1986): 345.

[54] Indeed, the way Shields defines $(\exists p)\phi p$ as "There is at least one possible state at t" shows that he must be taking $(\forall p)$ to be referring to the entire collection of individual states, not to the class as a whole as if it were one thing.

Shields does not employ the logic of relations here, but that may be the reason why his interpretation is ambiguous. Surely Shields is arguing, not that each individual state is such that *e* is going to occur, but rather, he is arguing that the states as a whole are such that *e* is going to occur.

All in all, perhaps my quarrel with the way Shields symbolizes his premises, or his interpretation of his symbols, does not impact his overall point. I realize that Shields' philosophical points are not predicated on his symbols, but rather, it is the other way around. The issue still comes down to whether one reads 'There will be a sea battle tomorrow.' and 'There will now be a sea battle tomorrow.' as contradictories or contraries.

Second, it is not clear to me exactly how Shields thinks he has solved any problem. It still remains that if it is true now that there will be a sea battle tomorrow, then it cannot be true that there will not be a sea battle tomorrow, and the problem of "fatalism" remains. Despite his logical reworking of the relationship between the two propositions and his subsequent denial that the two propositions constitute an exclusive disjunction, the fact remains that, as contraries, the truth of one entails the falsity of the other; a true **A** entails a false **E**. But are we to suppose that the falsity of the **E** means that the sea battle may still take place? Not really. But if not, then how is it that the truth of the **A** does not necessitate that it cannot be that the sea battle will not occur? It seems that Shields would have us to reason that one should take the falsity of **E** to be, not a denial of the occurrence of the sea battle *simpliciter*, but to the obtaining of "all the states at t such that it is not the case that *e* is going to occur."

But is this what we mean when we discuss the occurrence or non-occurrence of the sea battle? Is it possible to talk about such an event without necessarily including any commitment to all or some of the states antecedent to that event? Apparently, Shields thinks not. He informs us that Hartshorne finds (and I take Shields' appeal to Hartshorne to be a defense of Shields' own position) that any commitment to a "neutral" sense in which x is said to occur without any

reference to its "being causally determined or its being associated with any cause whatsoever"[55] to be unintelligible.

I do not concede, however, that the sense in which I might take the occurrence of x in a neutral way is unintelligible. Hartshorne only maintains this because he takes this neutral sense to be "the notion of an event existing without any antecedent cause."[56] But, just because one might refer to the occurrence of x without making any commitment to the causal relationship between x and any antecedent states, does not mean that one is denying any causal relationship. When it is all said and done, however, no matter how cleverly one might recast the issue so as to eliminate the exclusive disjunction, the issue can still be said as an exclusive disjunction without doing violence to every metaphysic, and reassert the original problem of the future necessarily being what a presently true proposition about that future says it will be.

Third, I take Shields' overall point to be that we can preserve both the indeterminacy of the future and "certain hallowed logical principles."[57] He takes Cahn to be saying that, because we cannot abandon these logical principles, then perhaps a determined future is not too much of a price to pay for keeping these principles intact. Shields wants both, *viz*., an undetermined future and intact logical principles (as does everyone who sees this issue as a problem to be resolved). The issue to me, however, does not require that we unpack metaphysically exactly how or why it is that the future is contingent. Shields has an undercurrent of process metaphysics beneath the ostensive defense of the Law of Excluded Middle. In his own defense of what I call an undercurrent, Shields suggests that, hiding behind other arguments about this issue, is an assumption of fatalism. In fact, Shields accuses Cahn of question begging, as if to say that Cahn (and perhaps others) already holds that the future is not contingent and uses the Law of Excluded Middle to support such a notion. About Cahn's argument, Shields says

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[55] Shields, p. 377.

[56] ibid.

[57] Shields, p. 369.

> … one must assume the position that every event which in fact occurs is fixed *for all time* to occur at some definite time, in order to collapse the alternatives into an exhaustive dichotomy such that the alternatives at some time t are limited to 'x will definitely occur' or 'x will definitely not occur.' If one argues that *on the basis of this exhaustive dichotomy* fatalism follows, this is just to beg the metaphysical question of fatalism, since the very dichotomy already contains fatalism.[58]

I do not agree. To argue that at time t there is a *tertium quid* with respect to the occurrence of x, is not so much to make a logical point, but to make a metaphysical one. I grant that if one is already committed to fatalism, then there is no problem to be solved about how one reconciles the future events and the necessity of the Law of Excluded Middle. But to insist that there is a necessary truth-value of the Law of Excluded Middle (or for that matter, to insist on the necessity of the Law of Bivalence) is not necessarily to commit one to metaphysical fatalism. Even if the truth of the proposition 'There will be a sea battle tomorrow.' entails that it is not possible that there will not be a sea battle tomorrow, this does not mean that the occurrence of the sea battle related to its antecedent states in any determined way.[59] Though I am inclined to think that metaphysical considerations are critical to an approach to the problem, I do not think it is necessary to commit oneself to this particular metaphysic for a resolution. In fact, as I argued earlier, I am not convinced that this particular metaphysic actually does solve the original dilemma, even if Shields is able to reframe the question such that problem dissolves. It comes down to this, as far as I understand Shields: His conclusion can prevail only if it is legitimate to understand a given future contingent event in light of the antecedent states, and that factoring in these states (either universally or existentially) is the proper way to discuss the logic of the issue.

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[58] Shields, pp. 374-375, emphasis in original.

[59] One reason one might think that, unless there is an absolute possibility of x not occurring, then x must have happened determinedly, is because of how one defines what it means for something to happen freely. (For our discussion, we might refer to such happenings as 'contingent.') For example, if one decides to remain in a room from which it is impossible to leave, is one's remaining in the room free? Would it have to be the case that one would have to be able to leave the room in order to say that, having remained in the room, one did so freely? I do not believe so. For a discussion of this, see Peter Van Inwagen, *An Essay on Free Will* (Oxford: Clarendon Press, 1983): 162-164.

Conclusion

The options on how one can understand the nature of truth-value of future tenses propositions seem to be these: First, one might say that all propositions, including future tensed ones, have a truth-value and thus the future cannot be other than what it will be, because fatalism is true. But if it is the case that the future is determined, it surely is not due to the truth-value of future tensed propositions. Even if future tensed propositions have a necessary truth-value, it is not their truth-value that makes the future determined. Rather, if future tensed propositions have a necessary truth-value, they would have this value because of the determined future. Thus, if one is a fatalist there is no logical problem to be solved.

Second, one might say that all propositions, including future tensed ones, have a truth-value and thus the future cannot be other than what it will be, either because (a) the notion of truth-value is timeless and thus can "correspond" to future events even though those events themselves did not come about by necessity or (b) a certain knower (God) of the truth-values is timeless and thus the truth-value of future contingencies are known "now."[60]

Third, one might say that all propositions, including future tensed ones, do have a truth-value, but that truth-value is neither true nor false, but some third value. (Prior)

Fourth, one might say that all propositions, including future tensed ones, have a truth-value, but propositions affirming and denying the future do not have the commonly believed logical relationships to each other. (Shields)

Fifth, one might say that future tensed propositions do not have a truth-value and so the future can be regarded as contingent. (Aristotle)

[60] I did not examine anyone who held this view, but this seems to be the view of certain theists, including Thomas Aquinas. See footnote 16.

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