

Stamatios Gerogiorgakis (Editor)  
Time and Tense  
Unifying the Old and the New

Philosophia  
Basic Philosophical Concepts  
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(Editor)

# Time and Tense

Unifying the Old and the New

Introduction  
by  
Bas C. van Fraassen

Philosophia

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## Introduction

Bas C. van Fraassen

Time was my first philosophical passion, and so it is a special pleasure as well as an honor for me to add some remarks to these far-ranging historical and philosophical essays on the philosophy of time.

The range is indeed so impressively broad that I must inevitably fall short of covering it. I will limit my remarks to just three topics: time and determinism, which links Aristotle's sea battle with the later study of modality; the *now* and tensed language, which links Aristotle with McTaggart; and the reality of time, which links Aristotle with Newton, Leibniz, and Kant. This limitation has the unfortunate consequence that some of my favorite essays in this collection will go unmentioned here.

### 1 Time and Determinism

We may begin, as this book does, with Miloš Arsenjević's exploration of three main approaches to the problem traditionally known as Aristotle's Sea Battle. Provoking arguments which have endured for two millennia, Aristotle wrote:

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 [...]

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 ...<sup>1</sup>

As Arsenijević argues convincingly, Aristotle maintained the Principle of Excluded Middle, that sentences of form ‘p or not-p’ are always true, but denied the (Strong) Principle of Bivalence, that for any sentence it is the case, always, that either it or its negation is true, and the other false. Addition of the Weak principle that if a sentence has a truth value, it is either true or false, introduces what I shall call the first approach, to admit the possibility of *truth-value gaps*: a sentence and its negation may each be neither true nor false.

Of the other two approaches, that of Łukasiewicz agrees with the above up to the last point, but adds that when a sentence is neither true nor false then it still does have a truth value, namely the third value  $\frac{1}{2}$ .

The third approach, which takes the word “necessary” in Aristotle’s text very seriously, introduces the logic of modality, interpreting Aristotle to mean only that, although it is necessary that there either will or will not be a sea battle, it is not necessary that there will be one, nor that there will not be one. (Below I will turn to how Arsenijević’s account links this to the topic of the *now* and the tenses).

Striking in the first account is the insistence, which I find personally convincing, that the most supportable reading of Aristotle introduces truth-value gaps, to furnish a semantics which maintains the unqualified validity of Excluded Middle while denying (Strong) Bivalence. As Arsenijević appreciates, this has thoroughly non-traditional consequences for the philosophy of logic and of language, quite different from the already substantive consequences that follow on the introduction of a third truth value, or of modality.

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<sup>1</sup> Aristotle 1938, 3, 19a 29-36.



The semantic value of a sentence, when such gaps are introduced and Excluded Middle is maintained, will not be a function of the semantic values of its components. Consider the examples

- (a) “There will be a sea battle or there will not be a sea battle”
- (b) “There will be a sea battle or there will be a sea battle”

These are both disjunctions whose disjuncts are neither true nor false. Yet the first is true and the second is not true (since it is equivalent to its first disjunct).

Łukasiewicz’ introduction of the third truth value re-introduces functionality: the value of a disjunction is a function, that he specifies, of the values of the disjuncts. But this is also just what will raise intuitive problems for Łukasiewicz’s view when we try to match it with ordinary discourse. For at first blush, at least, examples (a) and (b) seem to require different evaluations.

There is a clearly non-classical departure that the first approach requires in standard principles of semantics. In Arsenijević’s tense-modal account he notes that it requires an adjustment to Tarski’s disquotational scheme. That is the famous scheme which Davidson called ‘Convention T’, always illustrated initially with Tarski’s own example

- (\*) “Snow is white” is true if and only if snow is white

When a language has truth-value gaps, Tarski’s scheme needs to be adjusted if, with Aristotle, we want to maintain the universal validity of Excluded Middle while denying (Strong) Bivalence. For consider the following sort of argument, that was initially introduced by William

and Martha Kneale with reference to Aristotle's Sea Battle<sup>2</sup>:

- 1 A, or not-A
- 2 A if and only if it is true that A
- 3 It is true that A, or not-A
- 4 Not-A if and only if it is true that not-A
- 5 It is true that A, or it is true that not-A

Here 1 is justified by Excluded Middle, while 2 and 4 are justified by Tarski's scheme. But 3 follows from 1 and 2, while 5 follows from 3 and 4, in both cases by the replacement of equivalents in a disjunction. Yet 5. is clearly an expression of the Strong Principle of Bivalence.

The only remedy, to allow for what Arsenijević convincingly argued to be Aristotle's own view, is to distinguish then a Strong and Weak reading of Tarski's scheme for truth. On a Strong reading, the two sides of (\*) are equivalent in a strong sense of equivalence which sanctions the replacement of equivalents in the above context. To block the argument we must reject that Strong reading.

Yet there is clearly an equivalence that (\*) means to honor! Under any possible circumstances whatsoever, the sentence A and the sentence that A is true, will have the same truth value! Nevertheless, if we are to block the inference from Excluded Middle to Bivalence, that equivalence should not suffice to warrant mutual substitutability even in a disjunction.

What could the appropriate Weak reading be? The answer about how we are to understand Tarski's seminal insight, when brought to this new context, will depend on how we complete the sketch of a semantics in which Excluded Middle is maintained while truth-value gaps are

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<sup>2</sup> W. and M. Kneale 1962, 46-48.

allowed.<sup>3</sup> Below I will note how a problem in time and tense logic that was introduced by Hans Kamp shines a special illuminating side-light on this issue.

As the third approach to Aristotle's sea battle argument, after truth-value gaps and Łukasiewicz' third truth value, we have its reading as elliptically trading on a distinction concerning necessity. Thus rendered, the argument is a fallacy of equivocation:

*Either there will be a sea battle or there will not be a sea battle*

*If there will be a sea battle then there will necessarily be a sea battle*

*If there will not be a sea battle then there will necessarily not be a sea battle*

*Hence, either there will necessarily be a sea battle or there will necessarily not be a sea battle*

The equivocation is between the forms that the medievals called 'necessity of the consequence' and 'necessity of the consequent'. If we read those premises as having the form 'necessity of the consequence', so that they mean

*Necessarily, if there will be a sea battle then there will be a sea battle*

*Necessarily, if there will not be a sea battle then there will not be a sea battle*

they are true, but the argument is invalid. If instead we read the second and third premise as having the other form, 'necessity of the consequent', then the argument is valid but those premises are false. In addition, that reading becomes completely implausible if we consider the

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<sup>3</sup> For a discussion of the Kneale's argument, and a weak version of the equivalence in a language with truth-value gaps, see my van Fraassen 1966, 493-495.

form in general. On that reading of “Bachelors are necessarily unmarried” we would take every man who never married to have been literally incapable of marriage!

On this approach to the Sea Battle, as pertaining to the modalities, we are encountering the view of time and history that Stamatiou Gerogiorgakis calls *bipartite*:

*What is past is necessary, but much of the future is contingent, is still in the realm of contrary possibilities.*

It is, in current terms, a view of ‘branching time’ – a misnomer of course, ‘branching history’ would be more accurate. For it entails that we have a single past history, but many possible future histories, and that what is necessary now is precisely what is common to all those histories in which our present, our *now*, lies.

That view was as controversial in antiquity as it is now. Especially striking in Gerogiorgakis’ account is how it was attacked by a centuries’ long history of versions of the Reaper Argument. For this argument, in its many versions, attacked the contention that anything in the future is contingent.

Is the following assertion true?

(R) If you will reap then it is not the case that you may not reap.

The answer may not be obvious, but the question can be put differently. Consider the following dialogue:

Peter: “I will reap.”

Paul: “No, maybe you will not reap.”

Does Paul’s “maybe you will not reap” contradict Peter’s “I will reap”? Surely it is very natural to take Paul’s statement as showing his disagreement with Peter, in a minimal but clear fashion. And then, as step two, it is natural to infer that Peter’s statement is logically incom-