

# The Semantics and Pragmatics of Argumentation

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# 1 Overview

Arguments have been the object of philosophical interest for a long time. Logicians have studied the formal properties of arguments at least since Aristotle. The study of the structure of arguments by epistemologists (e.g., Pollock (1987); Pollock (1991b), Pollock (1991a); Pollock (2010)) has given rise to *formal argumentation theory*, that has developed into a branch of computer science in its own right (e.g., Dung (1995)). Comparatively less attention has been paid to arguments and argumentations *qua* distinctive linguistic constructions with a distinctive semantics and pragmatics. This chapter is about the semantics and pragmatics of argumentation.

We use language for exchanging information, for raising questions, for issuing orders, for making suppositions, etc. We also use language to make *arguments*, as when we argue on behalf of a certain conclusion and when we share our reasonings. Indeed, giving arguments is one among philosophers' favorite speech acts; and it is quite remarkably widespread outside the philosophy classroom. Although philosophers and linguists have quite widely discussed speech acts such as assertions (cfr. Stalnaker (1987), Stalnaker (1978)), interrogation (Groenendijk and Stokhof (1985), Groenendijk and Stokhof (1982a), Groenendijk and Stokhof (1982b)), and issuing orders (Portner (2004), Portner (2007), Portner (2004), Charlow (2014)), making and giving arguments has received comparably little attention by speech act theorists and semanticists alike.<sup>1</sup>

Among the questions that interest theorists with respect to speech acts of assertion, questioning, and issuing orders, there are: *What kind of speech acts are these? How do they affect the common ground?* Along similar lines, with respect to the speech act of making an argument, the core questions I want to investigate are: *What kind of speech act is to make an argument? How does such a speech act affect the common ground?*

Speech acts do tend to be conventionally associated with certain linguistic features. For example, assertions are associated with the declarative mood of sentences; suppositions with the subjective mood, orders with imperatival mood, questions with interrogative features, etc. Like other speech acts, making arguments is conventionally associated with certain grammatical constructions, of the

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<sup>1</sup>Neither Austin (1975) nor Searle (1969), Searle (1968), Searle and Vanderveken (1985) discuss giving arguments as a sort of speech act. A notable exception is Van Eemeren and Grootendorst (2004), whose approach to the topic of arguments and argumentations is very different from the one developed here.

form:

P1, . . . , Pn therefore C;  
Suppose P1, Pn. then C.

In order to study the speech act of arguing, I will therefore look at the semantics and pragmatics of words such as “therefore,” “thus,” and “hence,” — *argument connectives* as Beaver (2001, 209) calls them — which are used in natural languages to signal the presence of arguments and to express relations between premises and conclusions. How should we understand these relations? How does the semantics of these words compare to their counterparts in formal languages? How should we model the dynamics of contexts that is triggered by use of argument connectives?

Although these questions have not been widely discussed (if at all), recent developments in linguistics provide ample new resources for answering these questions. Constructions of the form “P1, . . . , Pn therefore C.” or “Suppose P1, Pn. then C” are sets of sentences, or *discourses*. It is therefore natural to study these constructions by looking at semantic approaches that take discourses rather than sentences to be the main unit of semantic analysis. Because of this, dynamic approaches to the semantics of argument will be at the centre of my discussion.

The first section sets up some desiderata for a semantics of arguments. The second section explores thinking of argument connectives as expressing discourse coherence relations and will critically consider the best candidate coherence relations for that purpose — such as RESULT (e.g. Asher (1993); Asher and Lascarides (2003); Le Draoulec and Bras (2007); Bras et al. (2009); Bras et al. (2001), Jasinskaja and Karagjosova (2015)) and possible variations on RESULT. The third section examines dynamic analyses of argument connectives as tests (Beaver (2001), Brasoveanu (2007); Pavese (2017); Pavese (ript)), with an eye to highlight the scope, advantages, and difficulties of these sorts of analyses. A main hypothesis about the nature of the speech act of arguing is defended throughout the chapter, according to which the main goal of the speech act of arguing is not that of restricting the context set but rather that of highlighting support relations of various kinds between the context set and the premises, on one hand, and the conclusion. Moreover, the hypothesis is advanced that, although the relevant support relations that are highlighted by argument connectives *include* entailment, such support relations do not necessarily need to be entailment relations.<sup>2</sup> The chapter

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<sup>2</sup>These two claims — that arguing is not necessarily a matter of restricting the context set and that

will conclude by singling out many open questions in the semantics and pragmatics of argumentation and argument connectives that deserve further investigation.

## 2 Preliminaries

Consider **Argument Schema**, with the horizontal line taking a list of premisses and a conclusion into an argument:

### Argument Schema

$$\frac{\phi_1, \dots, \phi_n}{\psi}$$

As Rumfitt (2015, 53) points out, it is tempting to think of the horizontal line as having the same meaning as “therefore,” “hence,” and “so” in English, so that **Argument Schema** is translated as:

- (1) a.  $\Phi$ ; therefore,  $\psi$ .  
 b.  $\Phi$ ; hence,  $\psi$ .  
 c.  $\Phi$ ; so,  $\psi$ .

where  $\Phi$  is the ordered set of premisses  $\phi_1, \dots, \phi_n$  and  $\psi$  is the conclusion.

However, **Argument Schema** is not perfectly translated by the constructions (1-a)-(1-c) and the horizontal line is not perfectly translated by “therefore,” “hence,” and “so.” First of all, the horizontal line does not require premisses. The following argument with a tautology as a conclusion and with no premisses is well-formed:

### Tautology

$$\overline{\psi \vee \neg \psi}$$

By contrast, “therefore,” “hence,” and “so” , etc. do require explicit premisses:

- (2) a. ??Therefore/hence/so, we should leave (looking at one’s partner uncomfortable face).

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the support relation highlighted by argument connectives is not necessarily nor always entailment — are defended in more detail in Pavese (ript).

b. ??Therefore/hence/so, streets are wet (looking the rain pouring outside).

c. ??Therefore/hence/so, either it is raining or it is not raining.

A plausible explanation for this contrast is that “therefore,” “hence,” and “so” differ from the horizontal line in that they contain an anaphoric element—a point made independently by both Brasoveanu (2007, 296) and Neta (2013, 399-406). In this sense, argument connectives require not just an antecedent but the *explicit* occurrence of an antecedent.

That is the first reason to think that the syntax and semantics of the horizontal line comes apart from the semantics of “therefore.” Here is a second reason (cfr. Pavese (2017, 94-5)). In **Argument Schema**, the premises can be supposed, rather than asserted. By contrast, “therefore” is not allowed in the context of supposition:

- (3) a. It is raining. Therefore, the streets are wet.  
b. ??Suppose it is raining; therefore, the streets are wet.

Under supposition, words like “then”, “so” are preferred to “therefore:”

- (4) Suppose  $\Phi$ ; then,  $\psi$ .

For this reason, Pavese (2017) speculates that the slight infelicity of (3-b) may indicate that “therefore” is more similar to the square “ $\square$ ” that ends proofs than to the horizontal line in **Argument Schema**:

*Proof of Theorem . . .*  $\square$

Just like “ $\square$ ”, “therefore” requires its premises having been discharged and not being conditionally dependent on other premises. Hence, a semantics for at least *some* argument connectives, such as “therefore”, must be sensitive to the differences between categorical arguments, such as (3-a), and suppositional arguments, such as (3-b).

Moreover, “therefore”, and perhaps more clearly “then”, “hence,” and “so” can also appear in non-deductive arguments, both inductive arguments such as (52-a)-(52-b) and abductive arguments such as (52-c):

- (5) a. Almost every F is G, and x is F. Therefore, x is G. [INDUCTIVE ARGUMENT]  
b. Every F previously observed was G, and x is F. Therefore, x is G. [INDUCTIVE ARGUMENT]

- c. The victim has been killed with a screwdriver. Hence, it has been the carpenter. [ABDUCTIVE ARGUMENT]

In inductive and abductive arguments, the conclusion does not deductively follow from the premises. Rather, the truth of the conclusion is made more likely by the truth of the premises. Does that mean that argument connectives have different meanings in different kinds of arguments? Or is there a unified meaning for argument connectives across types of arguments? A semantics for arguments must be able to vindicate the distinction between inductive, abductive, and deductive arguments while providing a unified semantics for argument connectives that can appear in different types of arguments.

Finally, arguments in English differ from formal arguments in that they do not need to have a declarative conclusion. As people working on the semantics of imperatives have observed (cfr. Charlow (2014) and Starr (ming)), imperatives can appear as conclusions of arguments:

- (6) If May arrives late tonight, you should go to the store. As a matter of fact, Mary is arriving late. Therefore, go to the store! (*'therefore'-imperative sentence*)

Interestingly, arguments can also have *interrogative* conclusions:

- (7) The doctor and the lawyer were the two main (and only) suspects. But then the detective has found a stethoscope near the location of the murderer. Therefore, who is the chief suspect now?" (*'therefore'-question sentence*)

Any semantic analysis of arguments and argumentation in English and natural languages must capture these features of arguments in ordinary languages. Consequently, in the following, I will be looking for a theory that answers these *desiderata*.

### **3 Argument Connectives within Discourse Coherence Theory**

Giving an argument is a speech act that stretches through a discourse —i.e., from its premises to its conclusion. It is therefore natural to start an analysis of arguments by looking at the resources provided by *discourse coherence analysis*, a sort of approach to the study of language and communication that aims at interpreting

discourses by uncovering coherence relations between their segments. Because the most developed such theory of discourse relations is *Segmented Discourse Representation Theory* (Asher (1993), Asher and Lascarides (2003)), I will focus on this view and assess the resources that it provides to analyze arguments and the semantics of argument-words.

In SDRT, a discourse is represented by an SDRS (Segmented Discourse Representation Structure). It is a recursive structure consisting of labelled elementary DRSs (i.e., Discourse Representation Structures, as described by DRT) representing a single clause and labelled sub-SDRSs linked together by Discourse Relations. The most notable discourse relations studied by discourse coherence theorists are NARRATION, ELABORATION, BACKGROUND, CONTINUATION, RESULT, CONTRAST, EXPLANATION.

Within this framework, it is natural to take argument words such as “therefore,” “then,” and ‘thus’ to be *discourse connectors* in SDRT and express a particular kind of coherence or discourse relation. The crucial question is *what kind* of coherence relation argument connectives plausibly express and by means of what mechanisms they do express those coherence relations. Although discourse coherence theory provides us with important insight on the semantics of arguments and argument connectives, I will claim that the resources provided by this approach ought to be integrated in order to understand the mechanisms by which argument connectives express the discourse relations that they do.

Although this literature has focused much more on temporal discourse connectives than on argument connectives “therefore” and “thus,” the general tendency in this literature is to assimilate the meaning of “therefore” to the meaning of “then” and its French counterpart “alors” (cfr. Bras et al. (2001), Bras et al. (2009)). Accordingly, “therefore” would introduce the relation of RESULT (cfr. Hobbs (1985), Asher (1993), Asher and Lascarides (2003), Kehler and Kehler (2002)). What is the relation of RESULT? As Bras et al. (2001) puts it, a RESULT relation between constituents  $\alpha$  and  $\beta$  represents the narrator’s intention to signify that  $\beta$  is a result of  $\alpha$ . It has the semantic effect of implying a causal link between the main eventualities of the constituents it relates. Hence, if RESULT holds between two constituents, then the former causes the latter:

$$\text{RESULT } (\alpha;\beta) \rightarrow \text{CAUSES } (\alpha, \beta).$$

For example, the following discourse is naturally analyzed as expressing this relation of RESULT (cfr. Asher (1993), Asher and Lascarides (2003)):

- (8) John pushed Max. He fell.

In general, RESULT is thought to be the inverse of the discourse relation of EXPLANATION:

(9) He fell. John pushed Max.

In (9), the second constituent (= “He fell”) is naturally construed as *explaining* the event of the first constituent (“John pushed Max”).

RESULT is standardly analyzed as having a causal semantics for which these authors appeal to Lewis (2013)’s theory of counterfactuals. Accordingly, RESULT ( $\alpha$ ;  $\beta$ ) only if

- $\alpha$  hadn’t occurred then  $\beta$  wouldn’t have;
- events of type  $\alpha$  normally yield events of type  $\beta$ .

The second clause conforms to a semantics for *generic conditionals* or *common-sense entailment* modeled by Asher and Morreau (1990) and Morreau (1992).

What are the prospects for analyzing “therefore” and, more generally, argument connectives as expressing RESULT? There are indeed uses of “therefore” that fit well this general semantics. To illustrate, when telling the story of how Max fell, it would be quite natural to develop (8) by adding a “therefore” between the first constituent and the second constituent, as follows:

(10) John pushed Max. Therefore, Max fell.

More generally, we often use “therefore” to express a causal relation between events. Here are more examples:

- (11)
- a. John was desperate for his finances. Therefore, he killed himself.
  - b. Mary qualified for the exam. Therefore, she enrolled.
  - c. Max passed his A-levels. Therefore he could go to the university. (cfr. Bras et al. (2001), Bras et al. (2009, 158)).

However, not every use of “therefore” are plausibly causal in this way. For example, in the following arguments the truth of the premises does not cause the truth of the conclusion:

- (12)
- a. All the girls have arrived. Therefore also Mary has arrived.
  - b. Mary has arrived. Therefore somebody has arrived.



Mary’s arriving is not plausibly *caused* by all the girls being arrived for Mary’s arriving is part of the event of all the girls having arrived. Nor is somebody arriving caused by Mary having arrived for it is constituted by Mary’s arriving. *Being part of* and *being constituted by* are not plausibly causal relations.

More generally, argument connectives can stand between premises and conclusions that do not stand in causal or counterfactual relations, such as necessary truths:

(13) 2 is even. Therefore either 2 is even or 3 is.

By using sentences such as (12-a), (12-b), and (13), a speaker is not intending to signify that  $\beta$  is a causal result of  $\alpha$ . Hence, these uses of argument connectives cannot plausibly be analyzed in terms of a causal RESULT.

There seems to be two main options available to a RESULT-based semantics of argument connectives. The first is to provide a general characterization of RESULT in non-causal terms and characterizes the temporal/causal uses of “therefore” as a specific case of a more general, non-causal, relation. The second is to analyze the meaning of argument connectives in terms of some variation of causal RESULT.

The first option, if viable, would have the advantage of achieving a desirable uniform analysis of the meaning of temporal and argument uses of “therefore”. Independently of a consideration of argument connectives, cfr. Altshuler (2016, Chapter 3) has proposed that we understand RESULT in deductive terms: the relation between the two constituents would be of deductive consequence.

The problem with this proposal, as applied to the present quandary, is that it makes harder to discriminate between temporal and argument uses of “therefore”.

The second option is to introduce a more specific relation of RESULT that is not causal. Discussing cases such as (12-a)-(12-b), (Bras et al., 2009, 166) posit INFERENTIAL RESULT, a relation holding between two events or propositions just in case the latter is a logical consequence of the former. (Bras et al., 2009, 166) uses  $K$  to indicate the constituent’s way of describing event/proposition  $\alpha$ . Then (Bras et al., 2009, 166) defines INFERENTIAL RESULT as follows:

INFERENTIAL RESULT ( $\alpha, \beta$ ) iff  $\Box(K \rightarrow K_\beta)$ .

As anticipated in the introduction and we will see in §4, not every use of argument connectives can be obviously analyzed in terms of logical consequence, however. For example, it is not obvious that when we use “therefore” or better “so” and “thus” in inductive or abductive arguments, they express anything like Inferential Result. Hence, the types of RESULT-relations that we would have

to posit to analyze the meaning of “therefore” would have to be augmented in order to capture the use of argument connectives in arguments that are not deductive. Hence, this approach would amount to a proliferation of RESULT-relations. These relations would have quite little in common one with the other. In fact, calling them all RESULT would be little misleading, for it might give the impression that there is something in common between result, which is causal, and logical consequence or probabilistic consequence. Hence, this general approach would fail to capture what is common to the use of argument connectives.

There is, however, a more serious problem with the current proposal than the proliferating of RESULT-relations. As we have seen at the outset, arguments can have interrogatives and imperatives as conclusions:

- (14) a. The doctor and the lawyer were the two main (and only) suspects. But then the detective has found a stethoscope near the location of the murderer. Therefore, who is the chief suspect now?” (*‘therefore’-question sentence*)
- b. If May arrives late tonight, you should go to the store. As a matter of fact, Mary is arriving late. Therefore, go to the store! (*‘therefore’-imperative sentence*)

Now, the denotation of interrogatives for example do not plausibly stand in a RESULT-relation to the premises. For example, it is not clear what it means for the question *Who is the chief suspect now?* to inferentially result from the premises in (47-a). INFERENTIAL RESULT is a relation between events or propositions that can stand in logical consequence between them. But a question is not obviously a logical consequence of the premises in (47-a). It is a bit of a stretch to think of INFERENTIAL RESULT as applying to cases such as (47-b).

Let me summarize the conclusions of this section. Discourse coherence theory has the resources to approach the question that we are investigating from the correct methodological standpoint: because arguments are discourses, it makes sense to analyze argument words as discourse connectors and thus as expressing discourse relations. However, as pointed out, the most likely candidate among the discourse relations posited by discourse coherence theorists —i.e., RESULT — cannot discriminate between uses of “therefore” and “then,” and “so” in discourses that constitute arguments and uses of those words in discourses that do constitute arguments. Hence, standard RESULT, understood along the lines of Lewis’s theory of counterfactuals, will not do. Understanding RESULT along different lines is open to the discourse theorists (cfr. Altshuler (2016, Chapter 3)).

However, doing so will not help discriminate between uses of “therefore” in arguments and uses of “therefore” in other contexts. In order to discriminate between these uses, one might need to posit a particular relation of result, INFERENTIAL RESULT. However, it is not entirely clear that INFERENTIAL RESULT can account for arguments with imperative and interrogative conclusions, for it is not clear that the semantic content of imperatives and interrogatives can stand in the relation of INFERENTIAL RESULT to the premises. Even if we limit ourselves to arguments with declarative conclusions, it is not obvious that the analysis of discourse connectors available to coherence theorists is the most ideally explanatory. Although the analysis of argument words as expressing INFERENTIAL RESULT might indeed be ultimately extensionally correct if we limit ourselves to arguments with declarative conclusions, in the next section I argue that certain features of argument words cannot be captured simply thinking of them as expressing INFERENTIAL RESULT and that thinking of them as simply expressing a discourse relation, such as INFERENTIAL RESULT misses out on capturing the mechanism by which argument connectives operate. I suggest that it is more explanatory of argument connectives to think of them as *tests*, in the sense of “tests” that we are familiar from dynamic semantics. Thinking of them as tests, I argue, will cast light on the mechanism whereby argument words express in some uses INFERENTIAL RESULT and in others temporal or causal relation. Moreover, it will cast light on the nature of speech acts in which argument connectives figure. As we will see, it also comes with the bonus of providing us with a desirable uniform analysis of arguments with declarative, imperative, and interrogative conclusions.

## 4 “Therefore” as a generalized test

Philosophers of language have been interested in argument connectives such as “therefore” primarily as a primary example of a word associated with a conventional implicatures. For example, Grice (1975, 44-45) has argued that in an argument such as (52-c) or in a sentence such as (16), “therefore” contributes the conventional implicate that the premise entails the conclusion:<sup>3</sup>

We might get some leverage into a semantic analysis of argument connectives by looking at their distribution not only in arguments such as (52-c) but also in sentences such as (16). Pavese (2017) argues that in sentences such as (18),

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<sup>3</sup>Many linguists and philosophers have followed Grice here. For example, ? 2 tells us that “therefore” is a relatively uncontroversial examples of conventional implicatures. (See also ?, section 2).

“therefore” works as a presupposition trigger —i.e., it triggers the presuppositions that the premises entail the conclusion. In these examples, it conveys *Target Content*, (18):

(15) Jill is English. Therefore, she is brave. (*‘therefore’-argument*)

(16) Jill is English and she is, therefore, brave. (*‘therefore’-sentence*)<sup>4</sup>

(17) Jill is English and she is brave.

(18) Her being brave follows from her being English. (*Target Content*)

Evidence for this claim is that “therefore” satisfies the usual tests for presupposition triggers. Presuppositions project out of embeddings. For example, the content in (20) is presupposed by (19) because it is still conveyed by the negation of (19), by the question (21), and the conditional (23):

(19) It is the knave that stole the tarts.

(20) Somebody stole the tarts. (*Target Content*)

(21) It is not the knave that stole the tarts. (*Negation*)

(22) Is the knave that stole the tarts? (*Question*)

(23) If it is the the knave that stole the tarts, he will be punished. (*Antecedent of a conditional*)<sup>5</sup>

Like standard presupposition triggers, the target content projects out of embeddings, such as in the antecedents of conditionals (26), in questions (27) (see also Neta 2013: 394-5), as well as under negation (25):

(24) Jill is English and she is, therefore, brave. (*‘therefore’-sentence*)<sup>6</sup>

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<sup>4</sup>Grice (1975, 44-45)

<sup>5</sup>Cfr. Langendoen and Savin 1971; Karttunen 1973; Karttunen 1974; Beaver 2001.

<sup>6</sup>Grice (1975, 44-45)

- (25) Jill is English. Therefore, she is brave. (*'therefore'-argument*)
- (26) Jill is English and she is brave.
- (27) Her being brave follows from her being English. (*Target Content*)

Secondly, the target content satisfies also standard not-at-issuedness tests. Presuppositions cannot be directly challenged —i.e., for example, one cannot directly challenge the content that somebody stole the tarts conveyed by (19):

- (28) \*That is not true/That is false!<sup>7</sup>
- (29) Hey, wait a minute! Nobody stole the tarts.<sup>8</sup>

Pavese (2017) observes that the target content of “therefore”-sentences and “therefore”-arguments also cannot be directly challenged (cfr. (30), (31)), in contrast to whether the target content is made explicit, as in (32)-(33):

- (30) Jill is English and, therefore, she is brave.  
\*That is false/That is not true.
- (31) Jill is English. Therefore, she is brave.  
\*That is false/That is not true.
- (32) Jill is English and from that it follows that she is brave.  
That is false/that is not true.
- (33) Jill is English. It follows from that that she is brave.  
That is false/that is not true.
- (34) Jill is English and, therefore, she is brave. Hey, wait a minute!  
Not all English people are brave!
- (35) Jill is English. Therefore, she is brave. Hey, wait a minute!  
Not all English people are brave!

<sup>7</sup>Cfr. Tonhauser et al. 2013.

<sup>8</sup>Cfr. von Stechow 2004.

As a further corroboration of Pavese (2017)'s claim, notice that "therefore"-sentences and "therefore" arguments satisfy von Fintel's "wait a minute test," as they can be indirectly challenged (cfr. (34), (35)). Moreover, they cannot be canceled when unembedded (cfr. (36-a) and (36-b)), and commitment to the presupposed content cannot be retracted, on pain of Moorean paradoxicality ((36-c), (36-d)):

- (36) a. ??It is the knave who stole the tarts, but nobody stole the tarts.
- b. ??Jill is English. Therefore, she is brave, but her braveness does not follow from her being English.
- c. ??It is the knave who stole the tarts, but I do not believe/-know that anybody stole the tarts.
- d. ??Jill is English. Therefore, she is brave, but I do not believe/know that her being brave follows from her being English.

The presuppositional analysis predicts infelicity in case of presupposition failure, which is exactly what we find: (37) and (38) are both infelicitous in most contexts.

(37) ??Andrea has red hair. Therefore, she is female.

(38) ??13 is a number. Therefore, it is odd.

Moreover, it correctly predicts that "therefore" sentences and arguments are context-sensitive, as the local context where the presupposition is satisfied may vary.

(39) Mark is progressive. Therefore, he is from the North.

On the presuppositional analysis, then, when one makes an argument of the form "p, therefore q", one asserts p and draws the conclusion q from it, by presupposing that q follows from p.

The question to ask now is: Where does such presupposition associated with argument connectives come from? Pavese (2017) suggestion is that "therefore C" works as what in dynamic semantics are known as "tests" — where a test is an expression whose function is to make sure whether the context satisfies certain

constraints. The presupposition associated with “therefore” imposes that the context augmented with the premisses entail the conclusion. For example, consider Veltman (1996, 9)’s dynamic entry for ‘might’:

$$\mathbf{Dynamic\ Might} \quad c[\text{might-}\phi] = \begin{cases} c & \text{if } c[\phi] \neq \emptyset \\ \emptyset & \text{if } c[\phi] = \emptyset \end{cases}$$

Suppose you also endorse:

$$\mathbf{Duality} \quad \text{must-}\phi =_{def} \neg \text{might } \neg\phi.$$

**Dynamic Might** and **Dynamic Must** are said to be a *test*, for the sentences where it occurs “test” whether the context satisfies a certain constraint – that of entailing the sentence which ‘must’ embeds. As Von Stechow and Gillies (2007, 54) point out, from **Dynamic Might** plus **Duality**, we get the following entry for ‘must’:

$$\mathbf{Dynamic\ Must} \quad c[\text{must-}\phi] = \begin{cases} c & \text{if } c \models \phi \\ \emptyset & \text{if } c \not\models \phi \end{cases}$$

Pavese (2017)’s proposal is then like “must”, “therefore” checks for certain support relations on the context; in particular, Pavese (2017) followed the standard assumption that dynamic tests check for entailment relations (more on this later). So the relevant support relation that is being checked for is *entailment*.

Beaver (2001, 209) and (Brasoveanu, 2007, 295-6) also draw an analogy between necessity modals such as “must” and “therefore.” However, as Pavese (2017) observes, there is an important difference between epistemic modals such as “must” and argument connectives, that might go unnoticed if one simply treat them both as tests. Pavese (2017)’s suggestion is that “therefore” differs from other tests, in that the checking is done by a presupposition triggered by therefore, rather than by its core content. For ‘must-sentences do not need to presuppose that the context supports their prejacent. For example, the following is not infelicitous if it is not known in the context that Mary is in Holland:

(40) If Mary must be in Holland, she cannot be in Paris.

As Pavese (2017) argued, the important difference between “must” sentences and “therefore”-constructions is that “therefore”-discourses are infelicitous if the checking is not positive, like in the case of ‘must’-sentences. But in the case of

“therefore”, the infelicity is due to *presupposition failure*. Hence, she concluded that some tests test the context through their core content, such as “must” and “might.” Others through an associated presupposition.

Here is the definition of support. Let  $\llbracket p \rrbracket$  be the set of possible worlds where  $p$ . The relation of support between a context  $c$  and a sentence  $\sigma$  — which I will indicate by ‘ $c[\sigma]$ ’ — can be defined inductively as follows:

- Support**
1. If  $\sigma$  has the form  $p$ ,  $c \models \sigma$  just in case, for all  $w \in c$ :  $w \in \llbracket p \rrbracket$ ;
  2. If  $\sigma$  has the form  $\neg\phi$ ,  $c \models \sigma$  just in case  $c \not\models \neg\sigma$ ;
  3. If  $\sigma$  has the form  $\phi \ \& \ \psi$ ,  $c \models \sigma$  just in case  $c \models \phi$  and  $c \models \psi$ ;

A context  $c$  so conceived is said to *support* a sentence  $\psi$  ( $\models$ ) just in case  $\psi$  is true at every world in  $c$ . In the simplest case — but I will complicate this picture soon enough — a context  $c$  augmented with  $\psi$  ( $= c + \psi$ ) is just the intersection of  $c$  with the set of  $\psi$ -worlds — the worlds where  $\psi$  is true ( $= c \cap \langle \psi \rangle$ ). Finally, say that  $\psi$  is true at  $c$  just in case  $c \cap \langle \psi \rangle = c$ .

$$\mathbf{Final} \left\{ \begin{array}{ll} \text{If } c + \Phi^* \in C^+ \text{ and } c + \Phi^* \models \psi, & \\ \left( \begin{array}{ll} \ulcorner \Phi^* \urcorner; \text{ therefore, } \psi^1 \text{ is true/sound in } c & \text{if } c + \Phi + \psi = c; \\ \ulcorner \Phi^* \urcorner; \text{ therefore, } \psi^1 \text{ is false/unsound in } c & \text{if } c + \Phi + \psi \neq c; \end{array} \right. & \\ \text{Else, } \ulcorner \Phi^* \urcorner; \text{ therefore, } \psi^1 \text{ is undefined in } c. & \end{array} \right.$$

A few observations about **Final**. First, note that according to it, not every “therefore”-sentence is either true or false. They are true or false only provided that the relevant presupposition is satisfied. Along the same lines, “therefore” arguments are not either sound or unsound: they are sound or unsound only provided that the relevant presupposition is satisfied — i.e., only provided they are valid. This deviates from the usual understanding of unsoundness as a property that an argument might have even if invalid. On the other hand, this deviation is justified by the interest of providing a uniform semantics of “therefore” across “therefore”-sentences and “therefore”-arguments.

On this analysis, a categorical argument is a matter of first asserting the premises and then drawing a conclusion from the premises. It might therefore seem as if that the latter speech act is never informative. For on this analysis, drawing a conclusion from the premisses is a matter of running a test on the context augmented with the premisses. However, this is not entirely correct: because “therefore” is a presupposition trigger, and because presuppositions can be informative, in some



cases drawing a conclusion from the premises can be informative — i.e., it results in restricting the context set. For example, consider:

(41) John is in Pittsburgh. Therefore, John is in Pennsylvania.

Suppose it is not known in the context that Pittsburgh is in Pennsylvania. The presupposition triggered by (41) is most likely to be accommodated in the context, which will result in restricting the context set, to rule out possibilities where Pittsburgh is located in a state other than Pennsylvania. Hence, although the presupposition generally works as a test, simply checking that the context satisfies certain constraints, just like other kinds of presuppositions, when accommodated, the presupposition triggered by “therefore” can be informative.

One might wonder whether this analysis predicts that sentences such as (37) and (38) are always infelicitous. For example, in contexts in which the negation of one premise is accepted (for example, contexts in which it is common ground that Andrea does not have red hair), we do have that  $c + \Phi \models \psi$  ( $c + \langle \text{Andrea has red hair} \rangle$  supports the conclusion that Andrea is female). In this particular case, the argument “Andrea has red hair. Therefore she is female” presumably still counts as unacceptable, but because of  $c$ , it would correspond to unsoundness or falsity, with no presupposition failure. Insofar, one takes it as desideratum that a sentence such as (37) count as weird due to presupposition failure, the final analysis does not live up to it.

In response, although it is true that in this case the analysis does not predict presupposition failure, it is unclear that the infelicity of the sentence ought to always be explained in terms of presupposition failure. On the current analysis, in contexts like the one described, (38) stands or falls together sentences such as:

(42) Andrea has red hair and does not have red hair. Therefore, she is female.

Sentences such as (42) sound quite independently weird. This analysis, equating the above scenario to giving the argument in (42), predicts this nicely.

This last point brings out another important issue. Arguments such as (42) sound weird to common speakers and so do arguments such as:

- (43)
- a. Paris is in France. Therefore, either it is raining in Ecuador now or it is not.
  - b. Paris is in France. Therefore, if today is Wednesday then today is Wednesday.
  - c. Paris is in France. Therefore, if today is Wednesday, then Paris is in France.

Because they are all classically valid, and also sound, the current semantics cannot predict their infelicity. One might blame it on the pragmatics and allege that their weirdness has to do with their conclusions not being relevant to the premises. An alternative thought is nonetheless intriguing and worth exploring. Notoriously, the weirdness of these patterns of inferences motivates relevance logic (MacColl (1908); Belnap (1960); Anderson et al. (2017)). This motivates the thought that drawing a conclusion from premises through “therefore” might check for relevantist, rather than classical, support. According to this hypothesis, natural language would figure both tests checking for classical support and tests checking for relevantist support.<sup>9</sup>

The speech act of making categorical argument consists of two speech acts: that of asserting the premises and that of drawing a conclusion out of it. The hypothesis that we have been exploring so far is that drawing a conclusion out of the premises is a matter of testing that the premises and the context entail the conclusion. What about suppositional arguments? In suppositional arguments, instead, premises are only supposed and conclusions are drawn from the supposed premises. For example, consider:

- (44) a. Suppose John has won the lottery. Then he will be rich.  
b. Suppose I had won the lottery. Then I would be rich.

In both (44-a) and (44-b), conclusions are drawn, but the premises are not discharged: conclusions are only conditionally drawn from the premises.

What is the semantics of such suppositional arguments? Suppositionalists about conditionals propose we understand conditionals along the lines of suppositional arguments. On this view, (44-a) paraphrases the indicative conditional “If John has won the lottery, then he will be rich;” and (44-b) paraphrases “If I had won the lottery, then I would be rich.” Moreover, independently of suppositionalism, several semanticists have proposed to analyze “then” as a test (Starr (2012), Gillies (2004)). Hence, one might expect suppositional arguments to have the semantics of conditionals. Yet, crucially, suppositional arguments differ from indicative conditionals in their pattern of challengeability:

- (45) a. Suppose John has won the lottery. Then he will be rich.  
?? That is false; ?? That is not true.

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<sup>9</sup>For discussion of this hypothesis and a development of a relevantist semantics for “Therefore,” see Pavese (ript).

- b. Suppose I had won the lottery. Then I would be rich. ??That is false; ?? That is not true.
- c. If John has won the lottery. Then he will be rich. That is false; that is not true.
- d. If I had won the lottery, then I would be rich. That is false; that is not true.

In this respect, suppositional arguments side with categorical arguments: although (45-a) does not state explicitly that if John has won then he will be rich, this conditional content is nonetheless conveyed by it. Just like for categorical arguments, we observe presupposition failure when the conditional content is patently false:

- (46) a. ??Suppose Andrea has red hair. Then she is female.  
 b. ??Suppose Andrea had red hair. Then she would be female..

This suggests that just like in the case of categorical arguments, in suppositional arguments, drawing a conclusion from the supposed premises is a matter of testing that the augmented context supports the conclusion. That this condition is satisfied by the context is a presupposition conveyed by the suppositional argument. This suggests the following analysis for suppositional arguments:

$$\mathbf{FinalSuppositional} \left\{ \begin{array}{l} \text{If } c + \Phi^* \models \psi, \\ \left\{ \begin{array}{ll} \lceil \Phi^* \rceil; \text{ then/hence, } \psi^\top \text{ is sound in } c & \text{if } c + \Phi + \psi = c; \\ \lceil \Phi^* \rceil; \text{ then/hence, } \psi^\top \text{ is unsound in } c & \text{if } c + \Phi + \psi \neq c; \end{array} \right. \\ \text{Else, } \lceil \Phi^* \rceil; \text{ then/hence, } \psi^\top \text{ is undefined in } c. \end{array} \right.$$

Thus far, we have been only discussing arguments with declarative conclusions. Hence, the scope of her analysis is unduly limited, for as have seen, arguments can have non-declarative conclusions too. For example, consider:

- (47) a. The doctor and the lawyer were the two main (and only) suspects. But then the detective has found a stethoscope near the location of the murderer. Therefore, who is the chief suspect now?" (*therefore*-question sentence)  
 b. If Mary arrives late tonight, you should go to the store. As a matter of fact, Mary is arriving late. Therefore, go to the store! (*therefore*-imperative sentence)

These kinds of arguments suggest that drawing a conclusion from certain premises can be a matter of checking that the context supports the conclusion in a broader sense than classical or relevantist entailing it: in (47-a), it checks that the context plus the premises entail a *true* answer to the question “Who is the chief suspect now?”.

It might be helpful a comparison with epistemic modals like “must” and “might.” Although not every use of these epistemic modals in questions is always felicitous (cfr. Dorr and Hawthorne (2013)), many have observed that some uses of these modals in questions are acceptable. For example, Papafragou (2006, 1692) observes that the following exchange is felicitous:

- (48) a. If it might rain tomorrow, people should take their umbrella.  
b. But may it rain tomorrow?

Along similar lines, Hacquard and Wellwood (2012, 7) observe that the following also have a distinctively epistemic interpretation:

- (49) a. With the owners and the players on opposite sides philosophically and economically, what might they talk about at the next bargaining session?  
b. Might he be blackballed by all institutions of higher learning?

In this respect, then, “therefore,” “hence”, and “so” resemble standard tests. There is an important difference between “must” and “might”, on one hand, and “therefore”, “hence”, “So”, on the other. Argument connectives can also tolerate imperative conclusions, as in (47-b), where neither “might” nor “must” can occur in imperatives (although the reason for this infelicity might be syntactic):

- (50) a. ??Might go to the store!  
b. ??Must go to the store!<sup>10</sup>

Can thinking of argument connectives as tests account for uses of them with interrogatives and imperatives? Although support of an imperative by the context is not straightforwardly a matter of entailment, it can be defined *in terms of* entailment. For example, “P; therefore,  $\phi$ !” tests that a context supports  $\phi$ , where a context *c* supports an imperative like  $\phi$ ! just in case *c* entails that the prescription

<sup>10</sup>This sentence does have an acceptable reading, on which “must” receives a deontic interpretation.

issued by  $\phi!$  should be fulfilled. For example, in (47-b), “therefore” checks that the context plus the premises entail that the imperative “go to the store!” should be fulfilled. If this condition is equivalent to  $\Box\phi$ , then we might define support of an imperative by a context is equivalent to the context entailing  $\Box\phi$ . Hence, our definition of support ought to be extended to encompass cases where the context augmented with the premises supports non-declarative conclusions:

1. If  $\sigma$  has the form  $\phi!$ ,  $c \models \sigma$  just in case,  $c \models \Box\phi$ ;
2. If  $\sigma$  has the form  $\phi?$ ,  $c \models \sigma$  just in case  $c \models \psi$ , for some complete answer  $\psi$  to  $\phi?$ .

Hence, an analysis of arguments with non-declarative conclusions does not require we depart from **Final** nor that we depart from the central idea of the proposal — i.e., that argument connectives work as tests. In fact, this idea, better than the previously considered analysis of argument connectives in terms of INFERENTIAL RESULT is sufficiently flexible to account also for these cases. It also suggests a more complex taxonomy of tests than is standardly assumed. In addition to tests that check whether the context entails the conclusion, natural languages exploit argument connectives to test the relation of entailment between the context and a complex answer to a question, as well as a relation of entailment between contexts and the fulfillment of an imperative.

## 5 Towards an analysis of inductive and abductive arguments

A further complexity has to do with the variety of argument types, whether inductive, abductive, or deductive and with whether every seemingly deductive argument is truly deductive, as usually deductiveness is understood. So far, I have been assuming that “therefore” tests for deductive entailment between the context and its prejacent. Many intuit that “therefore” is not felicitous in the context of inductive and abductive arguments. Even assuming that this is correct, there are seemingly deductive arguments where it is at least questionable whether “therefore” tests for deductive entailment. For example, consider:

- (51) Mary was attacked on the shore. Whales do not attack people. Therefore, Mary was not attacked by a whale.

In this argument, the conclusion does not deductively follow from the premises, for the second premise, *Whales do not attack people* is a generic sentence, which is not a universal statement. And yet many intuit that the argument is valid. This suggests that “therefore” might not be testing for logical entailment, but for some weaker relation, maybe probabilistic in nature.

Whether or not this is the right diagnosis for the argument in (51), there remain to be an open question how to interpret arguments word in arguments that are not deductive.

- (52)
- a. Almost every F is G, and x is F. Therefore, x is G.  
[Inductive argument]
  - b. Every F previously observed was G, and x is F.  
Therefore, x is G. [Inductive argument]
  - c. The victim has been killed with a screwdriver. Hence,  
it has been the carpenter. [Abductive Argument]

What is the meaning of “therefore” in (52-a) and (52-b)? There are three main options, as far as I can see. I will list them and point out their pros and cons.

One option is to say that “therefore” just mean in these arguments the same it means in deductive arguments. A suppressed premise (if Almost every F is G and x is F, then x is G) is presupposed and together with the explicit premises it entails deductively the conclusion. This account obliterates the distinction between inductive, abductive and deductive arguments: every argument is deductive. The problem with this option as far as I can see is that it obliterates a distinction, that between arguments that are deductive and arguments that are not deductive, that might be important to make. For one thing, the distinction is there for different kinds of reasoning. To the extent to which arguments can express reasoning, we would expect there to be a corresponding distinction between different kinds of arguments.

Another option is to say that “therefore” has the same meaning I have given it in deductive arguments: it tests that the context supports the conclusion. And the testing is felicitous for contexts that only encompass normal worlds, where nothing exceptional happens. On this view, the difference between inductive, abductive and deductive arguments is that while the latter are valid no matter what context one starts with, the former are valid only provided that the initial context has certain features. An inference to the best explanation is valid provided that the worlds are the simpler or more natural ones. But this solution fails to capture

the sense in which inductive and abductive arguments (and their corresponding kinds of reasoning) are ampliative in ways in which deductive arguments are not. For on this analysis, inductive and abductive arguments are valid only when they are *not* ampliative: on this account, reaching the conclusion does not rule out any possible worlds.

A final possibility is that argument words test for whether the conclusion follows from the premises and in abductive and inductive argument they tests that the conclusion abductively follows from the premises and in inductive argument inductively follows from the premises. The result of the checking can still be ampliative in this case because asserting the conclusion is a matter of ruling out all the worlds where the premise is true and the conclusion is false.

I leave it to further research to adjudicate between these different possible accounts of abductive and inductive arguments.

## 6 Conclusions

This essay has studied the speech act of giving an argument by looking at the semantics of the linguistic constructions conventionally associated with it in English. Section §1 has looked at some general desiderata for a semantic analysis of arguments. Section §2 has overviewed the resources for a theory of arguments provided by discourse coherence theory and some shortcomings of analyzing argument connectives as discourse connectors that express RESULT or some variation of RESULT. Section §3 has developed a view of argument connectives as tests. On this view, argument connectives check that certain support relations hold between the context and the premises and the conclusion of an argument. The proposal is amenable to being extended to arguments with interrogative and declarative conclusions. In this sense, it improves on discourse coherence theories of argumentation. Section §4 discusses several options for analyzing inductive and abductive arguments. According to the proposal that emerges from this discussion, the speech act of making an argument consists, at least in part, of checking and showing that certain support relations hold. Deductive arguments test for entailment relations, but inductive and abductive arguments might test for support relations that are not entailment. If so, making an argument is not a matter of restricting the context set but rather showing that certain relations hold between the context and our suppositions, and certain conclusions.

The speech act of arguing is *meta* in this way: it does not add to what we already know but it makes sure we acknowledge what follows from the things that we do know and from the possibilities that we can entertain.

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