

The Semantics and Pragmatics of Argumentation

Carlotta Pavese

Forthcoming in *Linguistics meets philosophy*,
edited by Daniel Altshuler,
Cambridge University Press

March 11, 2019

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. While philosophers and linguists have quite widely discussed speech acts such as assertions (e.g., Stalnaker (1987), Stalnaker (1978)), interrogation (e.g., Groenendijk and Stokhof (1985), Groenendijk and Stokhof (1982a), Groenendijk and Stokhof (1982b)), and issuing orders (e.g., Portner (2004), Portner (2007), Portner (2004), Charlow (2014)), the speech act of arguing or giving an argument has not been studied as intensively by speech act theorists and semanticists.¹

And yet, just like we use language for exchanging information, for raising questions, for issuing orders, for making suppositions, etc., we also use language to give arguments, as when we argue on behalf of a certain conclusion, when we

¹Neither Austin (1975) nor Searle (1969), Searle (1968), Searle and Vanderveken (1985) discuss giving an argument as a sort of speech act. There are some exceptions. 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. Another interesting study of arguments for philosophical purposes is Mercier and Sperber (2011), who use arguments and argumentation theory for a theory of reasoning. Parsons (1996) has cast some important insight on the notion of an argument.

share our reasonings, or when we sketch logical proofs on the board. Indeed, giving arguments is one among philosophers' favorite speech acts; and it is quite remarkably widespread outside the philosophy classroom.

This chapter is about the semantics and pragmatics of argumentation. Speech acts do tend to be conventionally associated with certain linguistic features. For example, assertions are associated with declarative mood; suppositions with subjective mood; commands with imperatival mood; questions with interrogative mood, etc. Like other speech acts, arguing is conventionally associated with certain grammatical constructions, such as:

P1, . . . , Pn. Therefore, C;

Suppose P1, . . . , Pn. Then, C.

In paradigmatic cases, these constructions involves argument connectives 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. These constructions take sets of sentences into 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. Recent developments in linguistics provide ample new resources for a semantics and pragmatics of argumentation: dynamic approaches to the semantics of arguments will be at the centre of my discussion. In particular, I will discuss the resources that discourse coherence approaches as well as dynamic approaches to the study of language have to understand the semantics and dynamics of arguments.

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 (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)). The third section examines dynamic analyses of argument connectives (Beaver (2001), Brasoveanu (2007); Pavese (2017); Pavese (ript)), with an eye to highlight the scope and the advantages of these sorts of analyses.

Some outstanding questions pertaining the semantics and pragmatics of argumentations that will be discussed in this chapter are: What relations do argument connectives express (if any) between the premises and the conclusion? In virtue of what mechanisms do they get to express those 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? Can a unified semantics of argument connectives be given across different uses? What does the speech act of giving an argument amount to? In particular, how does it affect the context set? The theories of arguments discussed below will be assessed in the light of how satisfactorily they answer these questions.

2 Preliminaries

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

Argument Schema

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

Now, compare **Argument Schema** to the following arguments in English:

- (1) a. There is no on-going epidemic crisis. Therefore, there is no need for vaccines.
- b. It is raining. Therefore, the streets are wet.
- c. I am smelling gas in the kitchen. Therefore, there is a gas leak.
- d. This substance turns litmus paper red. Therefore, this substance is an acid.

These arguments have all the form “ Φ , Therefore ψ ” where Φ is the ordered set of premisses ϕ_1, \dots, ϕ_n and ψ is the conclusion. It is tempting to think of ‘therefore’ and other argument connectives such as ‘hence’ and ‘so’ as having the same meaning as the horizontal line.² If so, any of (1-a)-(1-d) would be an English rendition of **Argument Schema**.

However, **Argument Schema** is not perfectly translated by the construction “ Φ , Therefore ψ ”; and the horizontal line is not perfectly translated by ‘therefore’ and ‘hence’. First of all, the horizontal line does not require premisses. The following argument with no premisses is well-formed:

²Cf. Rumfitt (2015, 53) points out.

Theorem

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

By contrast, ‘therefore’ and ‘hence’ etc. do require explicit premises:³

- (2) a. ??Therefore/hence, we should leave (looking at one’s partner uncomfortable face).
- b. ??Therefore/hence, streets are wet (looking the rain pouring outside).
- c. ??Therefore/hence, either it is raining or it is not raining.

A plausible explanation for this contrast is that ‘therefore’ and ‘hence’ 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). Argument connectives require not just an antecedent but its *explicit* occurrence. If so, a semantic entry for argument connectives ought to capture their anaphoric behavior.

That is the first difference between argument connective between ‘therefore’ and the horizontal line. Here is a second difference (cf. Pavese (2017, 94-5)). In **Argument Schema**, the premises can be supposed, rather than asserted. By contrast, ‘therefore’ (and ‘hence’ and ‘so’) is not always allowed in the context of supposition:

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

³As Pauline Jacobson has pointed out to me, ‘so’ can be used without premises, as in “So, you have arrived!”.

- c. If it is raining, therefore/so/hence the streets are wet.
- d.??If Mary is English, therefore/so/hence she is brave.
- e.??Suppose Mark is an Englishman. Therefore/so/hence, he is brave.

Under supposition, connectives like ‘then’ is much preferred to ‘therefore’:

- (4) a. Suppose Φ ; then, ψ .
- b. Suppose it is raining. Then, the streets are wet.
- c. If it is raining, then the streets are wet.
- d. If Mary is English, then she is brave.
- e. Suppose Mark is an Englishman. Then, he is brave.

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

Proof of Theorem. ... \square

Just like ‘ \square ’, ‘therefore’ would require 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’, would be sensitive to the differences between *categorical arguments* — arguments with categorical premises — and *suppositional arguments* — arguments that have suppositions as premises.

However, the data is more complex and should be assessed with caution. In particular, it is noteworthy that ‘therefore’ *is* licensed in the context of supposition, if the mood is subjunctive:

- (5) a. If it were raining, streets would, therefore, be wet.
b. Suppose it were raining; the streets would, therefore, be wet.
c. If Mary were English, she would, therefore, be brave.
d. Suppose Mark were Englishman. He would, therefore, be brave.

What this tells us is that the distribution of ‘therefore’ and ‘hence’ is not quite the same as that of ‘then’, which is permitted within the scope of a supposition whether or not the mood is indicative.

Finally, arguments in English differ from standard renditions of arguments in proof theory in that they do not need to have a declarative conclusion. Imperatives can appear as conclusions of arguments as several philosophers have observed (e.g., Parsons (2011), Parsons (2013), Charlow (2014), and Starr (ming)):

- (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. Here is one example (I will provide more in the following):

- (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 murder. Therefore, who is the chief suspect now? (*‘therefore’-question sentence*)

Finally, argument connectives in English differ from the horizontal line in that they can also appear in non-deductive arguments, both in inductive arguments

such as (8-a)-(8-b) and in abductive arguments such as (8-c):

- (8) 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. Therefore, 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.

In conclusion, there are at least four dimensions along which argument connectives differ from the horizontal line. First, they differ in that they have an *anaphoric component*; secondly, they differ in that they allow embedding under supposition and sub-arguments only depending on the mood of the linguistic context. In this sense, they are *mood-sensitive*. Thirdly, they differ in that they allow for *non-declarative conclusions*. Finally, argument connectives can occur in non-deductive arguments. Any semantic analysis of arguments in English and natural

languages must capture these features of arguments that tell them apart from their schematic rendition in proof theory.

3 Argument Connectives within Discourse Coherence Theory

Making 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* — an 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 a theory of discourse relations is *Segmented Discourse Representation Theory* (Asher (1993), Asher and Lascarides (2003)), I will focus on this particular coherence theory in assessing the resources that this general approach provides to analyze arguments and the semantics of argument connectives.

In SDRT, a discourse is represented by an SDRS (i.e., *Segmented Discourse Representation Structure*). It is a recursive structure consisting of labelled elementary DRSs (i.e., *Discourse Representation Structures*) 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 connectives such as

‘therefore’, ‘then’, and ‘thus’ to be among the *discourse connectors* in SDRT. *Discourse connectors* express different kinds of coherence relations. The crucial question behind a coherence discourse theoretic approach to the meaning of argument connectives is, then, *what kind* of coherence relation they express. Although the literature has focused much more on temporal discourse connectives than on argument connectives, the general tendency in this literature is to assimilate the meaning of ‘therefore’ to the meaning of ‘then’ in its temporal uses and to its French counterpart ‘alors’ (cf. Bras et al. (2001), Bras et al. (2009)). According to the analysis prevailing in this literature, ‘therefore’ would then introduce the relation of RESULT (cfr. Hobbs (1985), Asher (1993), Asher and Lascarides (2003), Kehler and Kehler (2002)).

What relation is RESULT? As Bras et al. (2001) puts it, a RESULT relation between constituents α and β represents the narrator’s intention to signify that β is a result of α . It has the semantic effect of implying a causal link between the main eventualities of the constituents it relates. If the relation of 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 RESULT (Asher (1993), Asher and Lascarides (2003)):

(9) John pushed Max. He fell.

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

(10) Max fell. John pushed him.

In (9), the event of second constituent (= “He fell”) results from the event of the first constituent (= “John pushed Max”) and is naturally construed as *explaining* the event of the first constituent, as the order of the discourse in (10) makes explicit.

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

- α hadn’t occurred then β wouldn’t have;
- events of type α normally yield events of type β .

What are the prospects for analyzing ‘therefore’ and, more generally, argument connectives as expressing RESULT? There are indeed uses of ‘therefore’ that fit well with this general semantics. To illustrate, when telling the story of how Max fell, it would be quite natural to develop (9) by adding a ‘therefore’ between the first and the second constituent, as follows:

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

More generally, we often use ‘therefore’ to express *causal relations* between events. Here are some more examples:

- (12) 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’ is plausibly causal in this way. For example, in the following arguments, the truth of the premises does not cause the truth of the conclusion:

- (13) 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 having arrived; for Mary’s arriving is part of the event that consists in all the girls having arrived. Nor is somebody’s arriving caused by Mary’s having arrived; rather, it is constituted by Mary’s arriving. *Being part of* and *being constituted by* are not plausibly causal relations. More generally, argument connectives can feature between premises and conclusions that do not stand in causal or counterfactual relations, as in:

- (14) 2 is even. Therefore either 2 is even or 3 is.

By using sentences such as (13-a), (13-b), and (14), a speaker is not intending to signify that β is a causal result of α . These uses of argument connectives cannot plausibly be analyzed in terms of RESULT.

In order to analyze uses of ‘therefore’ such as that in (14), Bras et al. (2009, 166) proposes to appeal to INFERENTIAL RESULT — i.e., 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 a constituent’s way of de-

scribing an event α . Then, Bras et al. (2009, 166) defines INFERENTIAL RESULT as follows:

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

As anticipated in §2, not every use of argument connectives can be obviously analyzed in terms of INFERENTIAL RESULT. For example, it is not obvious that when we use ‘therefore’ or ‘so’ and ‘thus’ in inductive or abductive arguments, they express anything like INFERENTIAL RESULT. Hence, INFERENTIAL RESULT is not general enough to capture all uses of argument connectives. But if so, 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 presumably have quite little in common. Hence, this general approach would fail to capture what is common to all the different uses of argument connectives.

We might make progress in finding a general discourse relation expressed by argument connectives in all of their uses by taking a different route. Suppose we understand RESULT in terms of a restricted notion of entailment relation and INFERENTIAL RESULT in terms of a generalization thereof. For example, we might understand RESULT in terms of nomological entailment — entailment given the laws of nature — or default entailment, as in Asher and Morreau (1990) and Morreau (1992). Moreover, we take argument connectives in their inferential uses to express different forms of entailment — i.e., classical or relevantist entailment.

On this view, every use of an argument connective expresses some form of entailment. We might thereby reach unification across uses of argument connectives while preserving their differences.

Independently of the consideration of argument connectives, Altshuler (2016, Chapter 3:70-71) has proposed that we understand RESULT in terms of *enthymematic nomological entailment*.⁴ ϕ is said to enthymematically entail the proposition ψ if there is a nonempty set of propositions Φ such that $\Phi \cup \phi$ logically entails ψ . For example, consider the following discourse:

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

John's having pushed Max does not entail that Max fell. However, Altshuler (2016, Chapter 3:70-71) proposes that John's having pushed Max might entail that Max fell if an appropriate set of background propositions is also taken into account. When we interpret (15), we might assume that in normal circumstances, if one is pushed sufficiently strongly, then one will fell and that Josh must have pushed Max sufficiently strongly. As Altshuler (2016, 70-71) observes, these background propositions may come from a wide variety of sources, from shared knowledge or from the discourse itself. In the case of RESULT, Altshuler proposes that we might understand the relation between two constituents as a form of entailment: *nomological entailment*. This discourse relation between a constituent σ_1 and a constituent σ_2 holds just in case σ_1 entails, together with the relevant laws L, σ_2 as well as the other relevant background propositions. If we extend this

⁴See also Kehler and Kehler (2002, section 3.1).

proposal to the meaning of ‘therefore’ we can analyze historical uses of (48-b), (48-c) and (48-d) in terms of this sort of nomological entailment. And we might analyze uses of argument connectives as in (14), for example, as expressing a *more abstract entailment relation* — that of classical, relevantist, or default entailment (cf. e.g., Meyer and van der Hoek (1993), Weydert (1995), Veltman (1996a)).

Let us summarize the section so far. Discourse coherence theory provides us with the resources to approach the question that we are investigating from the correct methodological standpoint: because arguments are discourses, this approach analyzes argument connectives as discourse connectors and thus as expressing discourse relations. From our discussion, it emerges that argument connectives appear in a variety of different constructions (narrative, causal, inferential). Hence, it is not at all trivial what coherence relation is expressed by argument connectives, across their different uses in different kinds of constructions. However, the proposal of analyzing argument connectives in all of their uses as expressing some or other notion of entailment seems promising.

Even so, the analysis of argument connectives available to coherence theorists is not the most ideally explanatory. A discourse theoretical approach to the meaning of argument connectives leaves open several questions about the semantics and pragmatics of arguments. In particular: What is the status of the discourse coherence relations that is expressed by arguments *vis a vis* the context set? In other words, how does expressing this relation affect the context set and what does making an argument contribute (if anything) to the communicative exchange? (Compare: When thinking about assertion, we might ask: how does assertion affect

the context set? What content does an assertion of a sentence contribute to the communicative exchange? (Stalnaker (1987), Stalnaker (1978)).)

In the following section, I propose that we might make progress in answering these questions about the semantics and the pragmatics of arguments by *integrating* the resources and insights of discourse theoretical approaches to the semantics of arguments with a dynamic approach to the meaning of argument connectives.

4 Towards a Dynamic Treatment of Argument Connectives

4.1 Conventional Implicature or presupposition?

In *Logic and Conversation*, Grice (1975, 44-45) observed that in an argument such as (16-a) or in a sentence such as (16-b), ‘therefore’ contributes the content that the premise entails the conclusion — in other words, it contributes *Target Content*:

- (16) a. Jill is English. Therefore, she is brave. (*‘therefore’-argument*)
- b. Jill is English and she is, therefore, brave. (*‘therefore’-sentence*)
- c. Jill is English and she is brave.
- d. Her being brave follows from her being English. (*Target Content*)

However, Grice (1975, 44-45) pointed out that in an argument such as (16-a) or in a sentence such as (16-b), *Target Content* is communicated without being asserted:

If I say (smugly), “He is an Englishman; he is, therefore, brave,” I have certainly committed myself, by virtue of the meaning of my words, to its being the case that his being brave is a consequence of (follows from) his being an Englishman. But while I have said that he is an Englishman and said that he is brave . . . I do not want to say that my utterance of this sentence would be, strictly speaking, false should the consequence in question fail to hold. So some implicatures are conventional . . .

Grice’s point is that while by saying (16-b), one commits to *Target Content*’s being true, whether *Target Content* is true does not contribute to what is said by (16-b). Grice took this to indicate that *Target Content* is only conventionally implicated by ‘therefore’, for he further thought that (16-b) would not be false, if *Target Content* were false. It is customary for linguists and philosophers to follow Grice here. For example, Potts (2007, 2) tells us that the content associated with ‘therefore’ is a relatively uncontroversial example of a conventional implicature (see also Davis (1958, section 2)).

Whether the conventional implicature analysis of ‘therefore’ is best at capturing the behavior of ‘therefore’ is, however, controversial. Several considerations suggest that the explanatory category of *presuppositions*, rather than that of conventional implicatures, might actually better capture the status of the sort of content that is conveyed by argument connectives.

The first kind of evidence for this claim is that ‘therefore’ satisfies the usual tests for presupposition triggers (Pavese (2017)). The first test is *projectability*.

Presuppositions project out of embeddings. For example, the proposition expressed by (17-b) is presupposed by (17-a) because it is still conveyed by the negation of (18-a), by the question (18-b), by the conditional (18-c), when embedded under possibility modals (18-d), as well as under evidential modal and probability adverbs ((18-e)):

- (17) a. It is the knave that stole the tarts.
 b. Somebody stole the tarts. (*Target Content*)
- (18) a. It is not the knave that stole the tarts. (*Negation*)
 b. Is the knave that stole the tarts? (*Question*)
 c. If it is the the knave that stole the tarts, he will be punished. (*Antecedent of a conditional*)
 d. Maybe/It is possible that it's the knave that stole the tarts. (*Possibility Modals*)
 e. Presumably/probably it's the knave that stole the tarts. (*Evidential modal, probability adverb*)⁵

Like standard presupposition triggers, *Target Content* projects out of embeddings — i.e., out of negation ((19-a)), out of questions ((19-b)), in the antecedents of conditionals ((19-c)), out of possibility modals ((19-d)) and out of evidential modal and probability adverbs ((19-e)), as can be seen from the fact that all of the following sentences still convey that Mary's braveness follows from her being English:

⁵Cfr. Langendoen and Savin 1971; Karttunen 1973; Karttunen 1974; Beaver 2001.

- (19) a. It is not the case that Mary is English and, therefore, brave. (*Negation*)
- b. Is Maria English and, therefore, brave? (*Question*)
- c. If Mary is English and, therefore, brave, she will act as such. (*Antecedent of a conditional*)
- d. It might be that Maria is English and, therefore, brave. (*Possibility Modals*)
- e. Presumably Mary is English and therefore brave. (*Evidential modal, probability adverb*)

Some speakers hear a non-projective reading for *Negation* ((19-a)). On this projective reading, we are not simply denying that Mary is English. We are denying that her braveness follows from her being English. However, the claim that ‘therefore’ works as a presupposition trigger in (19-a) is compatible with (19-a) also having a non-projective reading. For example, consider (20):

- (20) The tarts were not stolen by the knave: there is no knave.

Clearly, the definite article in ‘the knave’ must have a non-projective reading in “The tarts were not stolen by the knave,” for else (20) would have to be infelicitous. Presumably, whatever explains the non-projective reading in (20) can explain the non-projective reading in (19-a) (cf. Abrusán (2016)). The standard explanations for non-projective readings under negation are available here: maybe we are dealing with two different kinds of negation (metalinguistic negation *versus* negation *simpliciter*. cf. Horn (1972), Horn (1985)); or we might be dealing

with an example of local accommodation (cf. Heim (1983)).

Hence, *Target Content* is projectable to the extent to which presuppositions are usually taken to be projectable. Moreover, *Target content* satisfies the second standard set of tests for spotting presupposition triggers — i.e., the *not-at-issuedness* tests. Presuppositions cannot be directly challenged — i.e., for example, by using (21-c) in response to (21-a), one cannot directly challenge the content that somebody stole the tarts — i.e., (21-b):

- (21) a. It is the knave who stole the tarts.
- b. Somebody stole the tarts.
- c. *That is not true/That is false!⁶

‘Therefore’ and other argument connectives also satisfy this non-at-issuedness test. *Target Content* also cannot be directly challenged — i.e., (22) and (23) — in striking contrast to when it is instead made explicit — i.e., (24)-(25):

- (22) Jill is English and, therefore, she is brave.
 *That is false/That is not true.
- (23) Jill is English. Therefore, she is brave.
 *That is false/That is not true.
- (24) Jill is English and from that it follows that she is brave.
 That is false/that is not true.

⁶Cfr. Tonhauser et al. 2013.

- (25) Jill is English. It follows from that that she is brave.
That is false/that is not true.
- (26) Jill is English and, therefore, she is brave. Hey, wait a minute!
Not all English people are brave!
- (27) Jill is English. Therefore, she is brave. Hey, wait a minute!
Not all English people are brave!

While the *Target Content* cannot be directly challenged, it can be *indirectly* challenged, as evidenced by (26) and (27). Hence, argument connectives also satisfy von Stechow 2004's test for presuppositions, according to which presuppositions allow to be challenged by the locution "wait a minute!".

The final standard set of tests for presuppositions is *cancelability*. Presuppositions are not cancelable when unembedded (e.g., (28-a)). Moreover, commitment to presuppositions cannot be retracted, on pain of Moorean paradoxicality (e.g., (28-b)):

- (28) a. ??It is the knave who stole the tarts, but nobody stole the tarts.
- b. ??It is the knave who stole the tarts, but I do not believe/-know that anybody stole the tarts.

In addition to this standard cancelability test, other tests for the retraction of presuppositions have been proposed in the recent literature. As Pearson (2010)

notes, strong presuppositions' triggers cannot felicitously follow a report where the speaker retracts commitment to their presuppositions. For example, in (29-a) and (29-b), one cannot felicitously withdraw commitment to the proposition presupposed by the sentences "Jill stopped now" and "Mary knows that Jill smoked" — i.e., the proposition that Jill smoked:

- (29) a. ??Well, I do not know if Jill ever smoked. But she stopped now.
b. ??Well, I do not know if Jill ever smoked. But Mary knows that Jill smoked.

Finally, strong triggers' presuppositions cannot even be suspended, as observed by Abrusán (2016):

- (30) a. I have no idea whether John read the proposal. But if Bill read it too, let's ask them to confer and simply give us a yes/no response.
(Abusch 2010)
b. I have no idea whether Jane ever rented Manhattan, but perhaps she is renting it again.
c. I have no idea whether my husband is cheating on me. But if I discover that he is, I am going to kill him.

Now, 'therefore' satisfies all of these tests for cancelability. *Target Content* also cannot be canceled when unembedded, on pain of Moorean paradoxicality:

- (31) a. ??Jill is English. Therefore, she is brave. But her braveness does not follow from her being English.

- b. ??Jill is English. Therefore, she is brave. But I do not believe/know that her being brave follows from her being English.

Moreover, ‘therefore’ satisfies both Pearson (2010)’s and Abrusán (2016)’s tests, as evidenced by the infelicity of (32-a), (32-b), and (32-c):

- (32) a. ??Well, I do not know if her braveness follow from her being English. But Mary is English. And therefore, she is brave.
- b. ??Well, I do not know if her being from the North follow from her being progressive. But Mary is from progressive. And therefore, she is from the North.
- c. I have no idea whether all English people are brave. But if Mary is English and therefore brave, she will act as such.

Does the fact that *Target Content* satisfy all these tests for presuppositions (*non-at-issuedness, projectability, cancelability*) tell against the conventional implicature analysis? The boundaries between conventional implicatures and presupposition triggers are notoriously hard to draw. And many supposed examples of conventional implicatures also satisfy many of the aforementioned tests. However, there are three additional considerations that suggest that the presuppositional analysis is more explanatory of the behavior of argument connectives.

On one hand, Potts (2015, 31) distinguishes presuppositions and conventional implicatures on the basis of their pattern of projectability — the idea being that conventional implicatures project even more massively than presuppositions. For example, additive articles such as ‘too’ and ‘also’ project out of standard plugs

such as attitude reports (cf. Karttunen (1973)). By contrast, as many have pointed out to me, the presupposition associated with ‘therefore’ constructions can be plugged by belief reports. For example, consider:

(33) George believes that Mary is English and therefore brave. (*Belief operator*)

(33) is most commonly used to ascribe to George the belief in the entailment from Mary’s being English to her being brave. On this reading, *Target Content* does not project.

The second consideration in favor of the presuppositional analysis is that ‘therefore’ satisfies a test recently proposed by Mandelkern (2016) for telling apart presuppositions from conventional implicatures. Mandelkern (2016) takes the following property to be necessary of presuppositions (as opposed to conventional implicatures):

Lack of preservation in entailment-canceling environment A sentence s presupposes p only if s does not warrant an inference to p when s is in an entailment-canceling environment and when p is locally entailed, as in sentences like:

1. If p , then s .
2. Not p or s .

This property is satisfied by sentences featuring ‘therefore’. For example, the following conditionals (34-a) and (34-b) do not entail *Target Content*:

- (34) a. If being brave follows from being English, Mary is English and, therefore, brave.
- b. If liking the Steelers follows from being from Pittsburgh, then Mary likes the Steelers and, therefore, she is from Pittsburgh.

This suggests that we are dealing with a real presupposition rather than a conventional implicature.

The final consideration for favoring the presuppositional analysis is that the machinery of local contexts, standardly invoked in studying presuppositions (e.g., Heim (1983); Karttunen (1974), Rothschild (2011), Schlenker (2009), Schlenker (2010)) helps explain the context-sensitivity of constructions embedding ‘therefore’ (Pavese (2017)). For example, consider (35):

- (35) Mario is progressive. Therefore, he is from the North.

This argument could be felicitous in a context where a sociological experiment is conducted with a group of subjects that includes Mario and where all the progressive subjects of the experiment turn out to come from the North. The presuppositional analysis can predict this pattern of context-sensitivity for it is commonly accepted that presuppositions are to be “satisfied” relative to their so-called local contexts. Simplifying a bit, a local context can be thought of as the current set of assumptions in a conversation augmented with the contribution of the linguistic environment closest to the presupposition trigger. For instance, in the case of a conjunction “ α & β ” the local context for its second conjunct is the current set of assumptions c augmented (+) with α . For example, a standard explanation for

why (36) is infelicitous in any context where nobody has been assumed to go to school is that the presupposition triggered by ‘too’ is not satisfied by the local context for second conjunct:

(36) ??Mary went to the bank and Mark went to school too.

Now, in the case of (35), the local context for “He is, therefore, from the North” is the global set of assumptions c augmented with the sentence “Mario is a progressive.” Let us model c as the set of possible worlds compatible with the set of assumptions described in this scenario and let $\langle \text{Mario is a progressive} \rangle$ be the set of possible worlds where Mario is a progressive. Finally, let $c + \text{“Mario is a progressive”}$ be the intersection of the possible worlds in c with those where Mario is a progressive ($c \cap \langle \text{Mario is a progressive} \rangle$). In every possible world in this intersection, it will be true that Mario is from the North. In this sense, the local context for “Mario is, therefore, from the North” entails that Mario is from the North. Hence, the hypothesis that ‘therefore’ is a presupposition trigger, together with the related notion of local context, can naturally explain why (35) can be felicitous and true in the context described even though Mario’s being a progressive by itself does not entail his being from the North.

Or consider another example:

(37) 13 is a number. Therefore odd.

Out of context, this argument is quite bad. However, consider uttering it in the context of an exercise consisting in sorting numbers and letters into two categories

— odd or vowels — where all numbers are odd and all letters are vowels. It makes sense in that context to argue as in (37) and the argument would be sound. Again, just like before, the machinery of local contexts — so central to the study of presuppositions — helps explain this pattern of context-sensitivity. Hence, the presuppositional analysis does better than the conventional implicature analysis in that it correctly predicts that arguments are context-sensitive, as the local context where the relevant presupposition is satisfied may vary.

4.2 A Dynamic Treatment of Argument Connectives

In conclusion, a plethora of considerations suggest that the presuppositional analysis for argument connectives is superior to the conventional implicature analysis. The next question to ask now is: How are we to model the presupposition associated with argument connectives?

On a dynamic treatment of presuppositions, we can think of presuppositions as special kinds of ‘tests’. In dynamic semantics, a test is an expression whose function is to make sure whether the context satisfies certain constraints.⁷

In order to introduce a dynamic treatment of argument connectives, it is therefore helpful to introduce the basics of dynamic semantics. The crucial notion is that 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 σ — which I will indicate by ‘ $c[\sigma]$ ’ — can be defined inductively as follows:

⁷Some theories of local context have been formulated within an explicitly dynamic framework (Heim (1983); Karttunen (1974), Rothschild (2011)); others within an explicitly nondynamic framework (Schlenker (2009), Schlenker (2010)).

- Support**
1. If σ has the form p , $c \models \sigma$ just in case, for all $w \in c$: $w \in \llbracket p \rrbracket$;
 2. If σ has the form $\neg\phi$, $c \models \sigma$ just in case $c \not\models \neg\sigma$;
 3. If σ 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 ψ (\models) just in case ψ is true at every world in c . In the simplest case, a context c augmented with ψ ($= c + \psi$) is just the intersection of c with the set of ψ -worlds — the worlds where ψ is true ($= c \cap \langle \psi \rangle$). Finally, say that ψ is true at c just in case $c \cap \langle \psi \rangle = c$.

Given these preliminaries, the most paradigmatic example of a test is Veltman (1996b, 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 tests, 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 dynamic ‘must’:

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

‘Must’ and ‘therefore’ are similar: whereas ‘must’ imposes that the context support a conclusion, the presupposition associated with ‘therefore’ imposes that the context *augmented with the premisses* entail the conclusion. The analogy with ‘must’ suggests the following natural semantic entry for ‘therefore’:⁸

$$\mathbf{Dynamic\ Therefore-First} \quad c[\phi, \text{therefore-}\psi] = \begin{cases} c & \text{if } c[\phi] \models \psi \\ \emptyset & \text{if } c[\phi] \not\models \psi \end{cases}$$

However, there is an important difference between epistemic modals such as ‘must’ and argument connectives — a difference that might go unnoticed if one simply treats them on a par. ‘must’ is not plausibly a presupposition trigger and ‘must’-sentences do not need to presuppose that the context supports their preja-cent. For example, the following is not infelicitous if it is not known in the context that Mary is in Holland:

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

Pavese (2017)’s suggestion to capture this difference is that ‘therefore’ differs from other tests, in that the checking is done by the presupposition triggered by ‘therefore’, rather than by its core content. ‘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*. Because of ‘therefore’'s projective behavior, it is more helpful to think of ‘therefore’ as having the semantic entry that Beaver (2001, 156-162) assigns to the presuppositional

⁸ Beaver (2001, 209) and Brasoveanu (2007, 295-6) also draw an analogy between necessity modals such as ‘must’ and ‘therefore’.

operator δ :

$$\mathbf{Dynamic\ \delta}\ c[\delta-\phi] = \begin{cases} c & \text{if } c \models \phi \\ \text{undefined} & \text{if } c \not\models \phi \end{cases}$$

Compare **Dynamic Must** and **Dynamic δ** . They only differ in that the former returns the empty set if the context does not support ϕ , whereas the latter returns an undefined value. The difference between these two ‘fail’ values — undefinedness *versus* the empty set — is important. A semantic entry that returns the empty set receives a non-fail value — that of a tautology — under negation. But in order to account for the projection of the presupposition from a sentence containing ‘therefore’ to its negation, the negation of that sentence must also receive a fail value if the the sentence does. Choosing ‘undefined’, rather than the empty set, gives the desired result here — i.e., that the negation of the sentence containing ‘therefore’ will also be undefined.

Like Beaver (2001, 156-162)’s δ , we have seen that argument connectives like ‘therefore’ work as presupposition triggers. If we analyze the meaning of ‘therefore’ on the model of δ , the resulting dynamic entry for ‘therefore’ is:

$$\mathbf{Dynamic\ Therefore-Final}\ c[\delta-\phi] = \begin{cases} c & \text{if } c \models \phi \\ \text{undefined} & \text{if } c \not\models \phi \end{cases}$$

Because it returns undefined, rather than the empty set, **Dynamic Therefore-Final** can account for the projection of the presupposition from, for example, a sentence such as “Mary is English and, therefore, brave” to its negation.

The conclusion we should draw from this discussion is that tests come in different flavors. Some tests test the context through their core content: ‘must’ and ‘might’ are the paradigmatic examples of this. Other tests, such as Beaver (2001, 156-162)’s δ or Pavese (2017)’s ‘therefore’, do the checking through an associated presupposition.

4.3 Consequences of a dynamic treatment of argument connectives

In addition to giving a dynamic meaning to argument connectives, we might want to assign soundness conditions to arguments where they occur. For this purpose, I propose **Final**:

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

A few observations about **Final**.

According to it, an argument is sound in a context if the result of updating the context with its premises supports the conclusion and the premises are true in every world of the context. Note that the context might or might not contain the actual world. Hence, truth at a context does not entail truth at the actual world. Call *Proper soundness* the property that an argument has when the premises are

true in the actual world — when the context contains the actual world. An argument might be sound in a context without being properly sound.

Secondly, note that according to **Final**, arguments are not either sound or unsound: they are sound or unsound only provided that the relevant presupposition is satisfied — i.e., in the case of deductive arguments, only provided the arguments are valid. This deviates from the usual understanding of unsoundness as a property that an argument might have even if invalid.

Thirdly, on this analysis, a categorical argument is a matter of first asserting the premises and then drawing a conclusion from the premises, by presupposing that the conclusion follows from the premises. It might therefore seem as if arguments can never be informative. For on this analysis, drawing a conclusion from the premisses has the effect of running a test on the context that results from the original context when augmented with those premisses.

However, this conclusion is not entirely correct: ‘therefore’ is a presupposition trigger and presuppositions *can* be informative. If so, then in some cases drawing a conclusion from the premises can be informative — i.e., it can result in restricting the context set. For example, consider the following argument:

(39) 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 (39) is most likely to be accommodated in this context and this accommodation will result in restricting the context set, by ruling out possibilities where Pittsburgh is located in a state other than Pennsylvania.

Hence, although the presupposition associated with ‘therefore’ generally works as a test checking that the context satisfies certain constraints, just like other kinds of presuppositions, it can sometimes be informative.

One might wonder whether this analysis predicts that sentences such as (40-a) and (40-b), repeated here below, are always infelicitous:

- (40) a. ??Andrea has red hair. Therefore, she is female.
b. ??13 is a number. Therefore, it is odd.

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. However, because of the nature of the local context, no presupposition failure is there. Rather, it is a case of unsoundness. One might argue on these bases that insofar one takes it to be a desideratum that a sentence such as (40-a) count as weird due to presupposition failure, **Final** 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 always ought to be explained in terms of presupposition failure. On the current analysis, in contexts like the one described, (40-b) stands or falls together sentences such as:

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

Sentences such as (41) sound quite independently weird. This analysis predicts this nicely.

This last point brings out another important issue. Arguments such as (41) sound weird to common speakers and so do arguments such as the following:

- (42)
- 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, worth exploring. Notoriously, the weirdness of these patterns of inferences has motivated relevance logic (MacColl (1908); Belnap (1960); Anderson et al. (2017)). This suggests the thought that argument connectives might test for relevantist, rather than classical, support.

Thus far, we have been only discussing arguments with declarative conclusions. But as we have seen in §2, arguments can have non-declarative conclusions too. For example, consider the following arguments, embedding imperative conclusions:

- (43) a. Make flour tortillas and Mom will complain. So don't make flour tortillas. (Starr (ming))
- b. If the weather is good, attack at dawn! The weather will be good. Therefore, attack at dawn! (Parsons (2011))
- c. Attack at dawn unless the weather is fine! The weather is not fine. Therefore, Attack at dawn! (Parsons (2013))

Or consider the following arguments, with an interrogative conclusion:

- (44) 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 Anna had gotten the job offer, she was going to remain in the USA. But she did not get the job. Therefore, what is she going to do?
- c. 2 plus 2 equal 4. And 2 plus 3 equal 5. Therefore, what is 2 plus 4 equal to?

These kinds of arguments suggest that drawing a conclusion from certain premises can be a matter of checking that the context supports the conclusion even if the conclusion is not declarative. In particular, in (44-a)-(44-c), for example, the test checks that the context plus the premises entail a *true* answer to the question "Who is the chief suspect now?".

It might be helpful to draw again a comparison with epistemic modals like

‘must’ and ‘might’. Although not every use of these epistemic modals in the scope of questions is always felicitous (cfr. Dorr and Hawthorne (2013)), many have observed that some uses of these modals are acceptable in questions. For example, Papafragou (2006, 1692) observes that the following exchange is felicitous:

- (45) 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 interrogatives also have a distinctively epistemic interpretation:

- (46) 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. As we have seen, argument connectives can also tolerate imperative conclusions, whereas neither ‘might’ nor ‘must’ can occur in imperatives (although the reason for this infelicity might be syntactic):

- (47) a. ??Might go to the store!
b. ??Must go to the store!⁹

The next question to discuss is whether thinking of argument connectives as tests

⁹This sentence does have an acceptable reading, on which “must” receives a deontic interpretation.

can account for their uses with interrogative and imperatival conclusions. 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, ‘therefore’ in “P; therefore, $\phi!$ ” might be understood as testing that a context supports $\phi!$, where a context c supports an imperative $\phi!$ just in case c entails that the prescription issued by $\phi!$ should be fulfilled. For example, in (6), we might model ‘therefore’ as checking that the context augmented with 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 as equivalent to the context entailing $\Box\phi$. Hence, our definition of support can be extended as follows to encompass cases where the context augmented with the premises supports a non-declarative conclusion:

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

In conclusion, 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 dynamic analysis, better than the previously considered analysis of argument connectives in terms of INFERENCE RESULT, is sufficiently flexible to account also for these different uses of argument connectives.

This discussion 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 seem to exploit argument connectives to test the relation of support between the context and a question, as well as a relation of support between the context and (the fulfillment of) an imperative. This dynamic analysis has a further interesting consequence. Recall historical and narrative uses of ‘therefore’ discussed in §2:

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

We are now in position to provide a *unified* analysis of these narrative uses and of the inferential uses of ‘therefore’. In all of these cases, some entailment relation is tested: a classical — or perhaps relevantist — relation, in inferential uses; and a more restricted relation of entailment in narrative and historical uses — something more similar to nomological and default entailment (cf. Altshuler (2016)).

So far, I have been assuming that ‘therefore’ tests for deductive entailment between the context augmented with the premises and the conclusion. In fact, 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:

- (49) 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’ in (49) might not be testing for classical, or even relevantist, entailment but rather something more similar to default entailment.

Whether or not this is the right diagnosis for the argument in (49), there remain an open question about how to interpret argument connectives in arguments that are not deductive. Consider:

- (50) 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 (50-a) and (50-b)? There are two main options, as far as I can see. One option is to say that ‘therefore’ (or any other argument connective) just means in these arguments the same that it means in deductive arguments. What accounts for the difference between inductive and de-

ductive arguments is that in the former, a suppressed premise — e.g., *If almost every F is G and x is F, then x is G* — is presupposed and, together with the explicit premises, they classically entail the conclusion. This account obliterates the distinction between inductive, abductive, and deductive arguments: every argument turns out to be deductive. Another option is to take argument connectives to invariably test for whether the conclusion follows from the premises but to allow the relevant kind of entailment to be different for different kinds of arguments: in abductive and inductive argument, argument connectives test that the conclusion *abductively follows* from the premises, whereas in inductive argument they test that the conclusion *inductively follows* from the premises. I leave it to further research to adjudicate between these different possible accounts of the uses of argument connectives in abductive and inductive arguments.

5 Conclusions

The speech act of giving an argument is conventionally associated with certain linguistic constructions — or discourses — that involve argument connectives. Therefore, in order to cast light on the speech act of giving an argument, I proposed we look at the semantics of argument connectives.

Section §1 has looked at some general *desiderata* for a semantic analysis of argument connectives. Section §2 has overviewed the resources available to discourse coherence theories for analyzing argument connectives as a type of discourse connectors which express RESULT or some variation of RESULT. As we

have seen, a purely discourse theoretical approach on its own casts little light on how we should model the speech act of giving an argument. In §3, I tackled directly the questions: in virtue of what mechanisms do argument connectives express discourse relations? How does expressing those discourse relations affect the context set? By looking at tests for at-issuedness, projectability, and cancellability, as well as some recent tests for telling apart presuppositions and conventional implicatures, I argued that argument connectives are presuppositions triggers and their associated presuppositions can be captured by thinking of them as particular kind of tests. On this view, argument connectives have the conversational function of checking that certain support relations hold between the context and the premises, on one hand, and the conclusion of an argument, on the other. The proposal is amenable to being extended to arguments with interrogative and declarative conclusions, to historical and narrative uses of argument connectives, as well as to their uses in inductive and abductive arguments. And it is compatible with arguments being informative for the relevant presuppositions do not need to be part of the common ground and might enter into the common ground only through accommodation.

According to the proposal that emerges from this discussion, the speech act of making an argument consists, at least in part, in presupposing that certain support relations hold. Making an argument is possible only by taking certain support relations for granted. Arguments are, in this sense, constitutively presuppositional: there cannot be an argument that does not take something for granted.

References

- Abrusán, M. (2016). Presupposition cancellation: explaining the 'soft-hard' trigger distinction. *Natural Language Semantics*, 24(2):165–202.
- Altshuler, D. (2016). *Events, States and Times: An essay on narrative discourse in English*. Walter de Gruyter GmbH & Co KG.
- Anderson, A. R., Belnap Jr, N. D., and Dunn, J. M. (2017). *Entailment: The Logic of Relevance and Necessity*, volume 2. Princeton University Press.
- Asher, N. (1993). Reference to abstract objects in English: a philosophical semantics for natural language metaphysics. *Studies in Linguistics and Philosophy*. Kluwer, Dordrecht.
- Asher, N. and Lascarides, A. (2003). *Logics of conversation*. Cambridge University Press.
- Asher, N. and Morreau, M. (1990). Commonsense entailment: A modal theory of nonmonotonic reasoning. In *European Workshop on Logics in Artificial Intelligence*, pages 1–30. Springer.
- Austin, J. L. (1975). *How to do things with words*. Oxford university press.
- Beaver, D. I. (2001). *Presupposition and assertion in dynamic semantics*, volume 29. CSLI publications Stanford.

- Belnap, N. D. (1960). Entailment and relevance. *The Journal of Symbolic Logic*, 25(2):144–146.
- Bras, M., Le Draoulec, A., and Asher, N. (2009). A formal analysis of the French temporal connective *Alors*. *Oslo Studies in Language*, 1(1).
- Bras, M., Le Draoulec, A., and Vieu, L. (2001). French adverbial *puis* between temporal structure and discourse structure. *Semantic and Pragmatic Issues in Discourse and Dialogue: Experimenting with Current Dynamic Theories*, Oxford: Elsevier, pages 109–146.
- Brasoveanu, A. (2007). *Structured Nominal and Modal Reference*. PhD thesis, Rutgers University.
- Charlow, N. (2014). Logic and semantics for imperatives. *Journal of Philosophical Logic*, 43(4):617–664.
- Davis, M. (1958). *Computability and Unsolvability*. McGraw-Hill, New York.
- Dorr, C. and Hawthorne, J. (2013). Embedding epistemic modals. *Mind*, 122(488):867–913.
- Dung, P. M. (1995). On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and n-person games. *Artificial intelligence*, 77(2):321–357.
- Grice, H. P. (1975). Logic and Conversation. In Cole, P. and Morgan, J., editors, *Syntax and Semantics*, volume 3, pages 43–58. Academic Press, New York.

- Groenendijk, J. and Stokhof, M. (1982a). Semantic analysis of wh-complements. *Linguistics and Philosophy*, 5(2):175–233.
- Groenendijk, J. and Stokhof, M. (1985). On the semantics of questions and the pragmatics of answers. *Semantics: Critical Concepts in Linguistics*, 288.
- Groenendijk, J. A. G. and Stokhof, M. J. (1982b). Semantic analysis of wh-complements. *Linguistics and Philosophy*, 5:175–233.
- Hacquard, V. and Wellwood, A. (2012). Embedding epistemic modals in english: A corpus-based study. *Semantics and Pragmatics*, 5:4–1.
- Heim, I. (1983). On the projection problem for presuppositions. *Formal semantics—the essential readings*, pages 249–260.
- Hobbs, J. (1985). On the coherence and structure of discourse, report no. csli-85-37. center for the study of language and information.
- Horn, L. (1972). On the semantic properties of logical operators in english: Ucla dissertation. *Distributed by IULC*.
- Horn, L. R. (1985). Metalinguistic negation and pragmatic ambiguity. *Language*, pages 121–174.
- Jasinskaja, K. and Karagjosova, E. (2015). Rhetorical relations. *The companion to semantics*. Oxford: Wiley.
- Karttunen, L. (1973). Presuppositions of compound sentences. *Linguistic inquiry*, 4(2):169–193.

- Karttunen, L. (1974). Presupposition and linguistic context. *Theoretical Linguistics*, 1:181–94.
- Kehler, A. and Kehler, A. (2002). *Coherence, reference, and the theory of grammar*. CSLI publications Stanford, CA.
- Langendoen, D. T. and Savin, H. (1971). The projection problem for presuppositions. In Fillmore, C. J. and Langendoen, D. T., editors, *Studies in Linguistic Semantics*, pages 54–60. Irvington.
- Le Draoulec, A. and Bras, M. (2007). Alors as a possible temporal connective in discourse. *Cahiers Chronos*, 17:81–94.
- Lewis, D. (2013). *Counterfactuals*. John Wiley & Sons.
- MacColl, H. (1908). 'if' and 'imply'. *Mind*, 17(67):453–455.
- Mandelkern, M. (2016). Dissatisfaction theory. In *Semantics and Linguistic Theory*, volume 26, pages 391–416.
- Mercier, H. and Sperber, D. (2011). Why do humans reason? arguments for an argumentative theory. *Behavioral and brain sciences*, 34(2):57–74.
- Meyer, J.-J. C. and van der Hoek, W. (1993). A default logic based on epistemic states. In *European Conference on Symbolic and Quantitative Approaches to Reasoning and Uncertainty*, pages 265–273. Springer.
- Morreau, M. (1992). Epistemic semantics for counterfactuals. *Journal of Philosophical Logic*, 21(1):33–62.

- Neta, R. (2013). What is an Inference? *Philosophical Issues*, 23(1):388–407.
- Papafragou, A. (2006). Epistemic modality and truth conditions. *Lingua*, 116(10):1688–1702.
- Parsons, J. (2011). Cognitivism about imperatives. *Analysis*, 72(1):49–54.
- Parsons, J. (2013). Command and consequence. *Philosophical Studies*, 164(1):61–92.
- Parsons, T. (1996). What is an argument? *The Journal of Philosophy*, 93(4):164–185.
- Pavese, C. (2017). On the meaning of ‘therefore’. *Analysis*, 77(1):88–97.
- Pavese, C. (manuscript). Arguments and their semantics.
- Pearson, H. (2010). A modification of the ‘hey, wait a minute’ test. *Snippets*, 22:7–8.
- Pollock, J. L. (1987). Defeasible reasoning. *Cognitive science*, 11(4):481–518.
- Pollock, J. L. (1991a). Self-defeating arguments. *Minds and Machines*, 1(4):367–392.
- Pollock, J. L. (1991b). A theory of defeasible reasoning. *International Journal of Intelligent Systems*, 6(1):33–54.
- Pollock, J. L. (2010). Defeasible reasoning and degrees of justification. *Argument and Computation*, 1(1):7–22.

- Portner, P. (2004). The semantics of imperatives within a theory of clause types. In *Semantics and linguistic theory*, volume 14, pages 235–252.
- Portner, P. (2007). Imperatives and modals. *Natural Language Semantics*, 15(4):351–383.
- Potts, C. (2007). Into the conventional-implicature dimension. *Philosophy compass*, 2(4):665–679.
- Potts, C. (2015). Presupposition and implicature. *The handbook of contemporary semantic theory*, 2:168–202.
- Rothschild, D. (2011). Explaining Presupposition Projection with Dynamic Semantics. *Semantics and Pragmatics*, 4:3–1.
- Rumfitt, I. (2015). *The Boundary Stones of Thought: An Essay in the Philosophy of Logic*. Oxford University Press, USA.
- Schlenker, P. (2009). Local contexts. *Semantics and pragmatics*, 2:3–1.
- Schlenker, P. (2010). Local contexts and local meanings. *Philosophical Studies*, 151(1):115–142.
- Searle, J. R. (1968). Austin on locutionary and illocutionary acts. *The philosophical review*, pages 405–424.
- Searle, J. R. (1969). *Speech acts: An essay in the philosophy of language*, volume 626. Cambridge university press.

- Searle, J. R. and Vanderveken, D. (1985). *Foundations of illocutionary logic*. CUP Archive.
- Stalnaker, R. (1987). *Inquiry*. MIT Press, Cambridge, Mass.
- Stalnaker, R. C. (1978). *Assertion*. Wiley Online Library.
- Starr, W. (forthcoming). A Preference Semantics For Imperatives. *Semantics and Pragmatics*.
- Tonhauser, J., Beaver, D., Roberts, C., and Simons, M. (2013). Toward a taxonomy of projective content. *Language*, 89(1):66–109.
- Van Eemeren, F. H. and Grootendorst, R. (2004). *A systematic theory of argumentation: The pragma-dialectical approach*, volume 14. Cambridge University Press.
- Veltman, F. (1996a). Defaults in update semantics. *Journal of philosophical logic*, 25(3):221–261.
- Veltman, F. (1996b). Defaults in Update Semantics. *Journal of Philosophical Logic*, 25(3):221–261.
- von Fintel, K. (2004). Would you believe it? The king of France is back! (pre-suppositions and truth-value intuitions). In Reimer, M. and Bezuidenhout, A., editors, *Descriptions and Beyond*, pages 315–41. OUP, Oxford.
- Von Fintel, K. and Gillies, A. (2007). An opinionated guide to epistemic modality. *Oxford studies in epistemology*, 2:32–62.

Weydert, E. (1995). Default entailment. In *Annual Conference on Artificial Intelligence*, pages 173–184. Springer.