

**A Grammar in Two Dimensions: The Temporal Mechanics  
of *Arrival* and the Semantics/Pragmatics Divide**

“For this alone is lacking even to god,  
To make undone things that have once been done.”  
- Aristotle, quoting Agathon, *Nicomachean Ethics* (1139b10)

## **I Introduction**

In the sequel to *The Hitchhiker’s Guide to the Galaxy*, Douglas Adams explains how, rather than ontological paradoxes, one of the most serious problems with time-travel is “simply one of grammar” — imagine, for example, the difficulty of properly describing “something that was about to happen to you in the past before you avoided it by time-jumping forward two days” (Adams 1980/2000, 226). Referring to the fictional *Time Traveler’s Handbook of 1001 Tense Formations* for guidance, Adams observes that “Most readers get as far as the Future Semiconditionally Modified Subinverted Plagal Past Subjunctive Intentional before giving up.”

Ted Chiang’s novella “Story of Your Life” (1998/2002) cleverly capitalizes on the grammatical obstacles of time-travel to hint at the story’s complicated temporality. In this paper, I scrutinize Chiang’s story, and its 2016 film adaption *Arrival* (directed by Denis Villeneuve), to run the analysis in the opposite direction: rather than using language to make sense of time-travel, I explore how time-travel can make sense of an important debate within the philosophy of language.

Consider the relationship between an utterance and the context in which that utterance is made: in brief, *contextualists* hold that context can affect the utterance’s propositional content while *semantic minimalists* deny this. Put differently, contextualists argue that pragmatic

elements of a speech-act's performance can affect the semantic content of the speech-act itself;<sup>1</sup> minimalists, in contrast, typically draw a sharp distinction between semantic content and its pragmatic interpretation (or application).<sup>2</sup> In what follows, I concretize this debate by considering a classic trope of time-travel stories — *temporal editing* or “the changing of past events” — to explore how the contextualist and minimalist models operate.

To do so, we can analogically align the contents and context of a timeline with the contents and context of a speech-act. A minimalist picture, which sees an utterance's semantic content as wholly distinct from its context, is akin to a view that allows for temporal events to detach from their timeline and potentially change (thereby editing the resulting temporal sequence, even though the timeline remains itself). A contextualist model, which views semantic content as intertwined with the contingent situation of its utterance, rejects this possibility because the meaning of the utterance depends, in part, on the context as a whole — similarly, because any change in event composition necessitates an overall change in the historical context, a contextualist analog for time-travel stories could not countenance the temporal sequence changing while the timeline remains “the same timeline.”

In this extended analogy between the contents of timelines and the contents of speech-acts, films such as *Predestination* or *Tenet* that deny the possibility of temporal editing demonstrate the inextricability of event-laden historical moments in a manner similar to the contextualist viewpoint. Against this, movies that rely upon the possibility of temporal editing, such as *Back to the Future* or *The Butterfly Effect*, exemplify the position of semantic minimalism.

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<sup>1</sup> Examples include Bezuidenhout (2002), Carston (2008), and Recanati (2002, 2010).

<sup>2</sup> For examples, see Bach (2001), Borg (2004, 2007), and Cappelen and Lepore (2005).

By focusing particularly on *Arrival* (which firmly denies the possibility of temporal editing), I modestly defend the strength of the contextualist position.

I begin in Section II by outlining the debate between the minimalists and contextualists before using *Arrival* to explore, in Section III, a key problem for the latter: the Sapir-Whorf hypothesis. By considering further how *Arrival* exemplifies a certain type of time-travel story, I develop the analogy between timelines and speech-acts in Section IV to then argue for the coherence of the contextualist picture in Section V. I conclude in Section VI.

## II The Semantics/Pragmatics Divide

Since its derivation in the mid-20th century, the semantics/pragmatics divide is sometimes oversimplified to capture the difference between what a sentence *says* (semantics) and what the speaker *means by saying it* (pragmatics). For example, Gricean implicature focuses precisely on when these elements of a speech-act come apart and so recognizes an important difference between a speaker *saying* something and *implicating* (or meaning) something else.<sup>3</sup> This follows the observations by Grice's contemporary J.L. Austin that speech-acts, such as calling, describing, asserting, and the like, are each significantly different in their contributions to a conversation and that cataloging a full taxonomy of speech-acts is particularly difficult since "the difference between one named speech-act and another often resides principally in a difference between the speech-situations envisaged for their respective performances" (1961/1970, 151).

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<sup>3</sup> Grice (1967/1989, 24–25) admitted that the mechanics of implication are often nebulous and difficult to concretely quantify, hence his project to outline various *maxims* that ordinary language tends to obey.

In general, the truth value of a statement is often treated as a function of a proposition's semantic content as indicated by its syntactic or lexical elements, whereas its applicability (or utility) within various pragmatic circumstances is a more complicated notion contingent on a variety of contextual factors. This distinction, derived from definitions codified by Stojanovic (2014), is laid out in Table 1.

	<u>Semantics</u>	<u>Pragmatics</u>
Lexically encoded in linguistic expressions	✓	
Varies by contextual factors		✓
Affects truth value / relevant to determining truth conditions	✓	

*Table 1: Stojanovic's definition of key criteria for the semantic/pragmatic divide*

Imagine that you ask me if a particular film was considered popular and I respond with the following:

- (1) It made no one vomit.

On an extremely strict reading of (1), I might be accused of uttering a non-sequitur; the popularity of a movie can be described in measurable quantities (box office sales, reviewer scores, award nominations, etc.), not simply on the basis of whether or not it provoked a particular disgust response. However, the lexical elements of (1) combine to indicate only that the subject in question provoked no regurgitation amongst its audience, therefore, the truth value of (1) might be determined simply by whether or not anyone did, in fact, vomit as a result

of seeing the movie. Nevertheless, what I *mean* when I offer (1) as a response to your question is much different:

(2) No, it was not a popular movie.

In this setting, (1) is an example of litotes and is meant to be understood non-literally to mean that, because (1) is the best thing I might be able to say in its defense, the movie was not very good.<sup>4</sup> For one reason or another (perhaps I wish to appear clever, perhaps I want to shelter someone else's feelings about the film, etc.), I choose to implicate (2) via the expression of (1) and I trust that both the context and performance of my speech-act will be sufficient to indicate the desired interpretation.

While contextualists and minimalists might roughly agree on the broad description of this case, they disagree on how (1) and (2) interact. Minimalists will treat (1) as an encapsulated category which comprises the entirety of the speech-act's semantic content and (2) as the pragmatic interpretation of the sentence's meaning, given the relevant contextual factors (such as the speaker's posture, tone, physical gestures, facial expression, and other performative elements), with fundamentally separate content of its own; any analysis of the truth conditions for (1) and the truth conditions for (2) will, on this account, be separate calculations. On the other hand, while all but the most radical contextualists will similarly admit that the semantic content of the speech-act is at least *primarily* found in (1), they will similarly assert that "truth-conditional content is underdetermined by sentence meaning, and that it depends instead on a background of assumptions that can never be made completely explicit" (Bezuidenhout 2002,

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<sup>4</sup> In Gricean terms, this can be seen as a flouting of the maxim of Relation (1967/1989, 35).

115). In general, contextualists see the determination of truth conditions for (1) and (2) as a joint affair and would add a checkmark to the bottom-rightmost box of Table 1.

A more exaggerated example will make this distinction more clear: suppose that Calvin asks Susan what she did the previous night, knowing that Susan had mentioned plans to spend her evening watching a movie. Susan responds with:

(3) I watched a classic!

So, imagine three different possible worlds, each of which contain Susan performing different actions:

World C: Susan watched the entirety of *Casablanca* the previous night.

World S: Susan watched half of *Casablanca* the previous night, then fell asleep on her couch for the rest of the film.

World R: Susan watched the entirety of *The Rocky Horror Picture Show* the previous night.

It seems plausible that in each of these worlds, Susan could truthfully utter (3), despite the fact that the meaning of both ‘watched’ and ‘classic’ will differ in each world.

This is problematic for the minimalist, given the position’s insistence that semantic meaning is fully encapsulated from contextual considerations and different philosophers will solve the issue in different ways. Following the treatment of Kent Bach’s work in Cappelen (2007a),<sup>5</sup> one solution would be to suggest that (3) is simply incomplete and that such a ‘propositional skeleton’ will be enriched in different ways relative to the different worlds, in a manner such as follows:

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<sup>5</sup> See also Bach (1999, 72).

(3C)<sub>M</sub><sup>6</sup> I watched a classic [movie]!

(3S)<sub>M</sub> I watched [most of] a classic [movie]!

(3R)<sub>M</sub> I watched a [cult] classic!

Semantically speaking, the shared lexical portions of (3C), (3S), and (3R) are identical from the minimalist position, despite the fact that the meaning of the speech-acts they comprise are significantly different — such difference is purely a matter of pragmatic interpretation insofar as Calvin can supply (or at least assume) the bracketed information. As explained by Stojanovic (2008), minimalism entails that “the only cases in which context can have an impact on truth value are those of resolving lexical and syntactic ambiguities and of determining the reference of indexical pronouns such as ‘I’, ‘this’, or ‘today’.” (1172). So, although the context-insensitive skeleton is specified to a particular world, the skeleton itself does not alter its meaning between worlds.

Conversely, contextualist readings of (3) would argue that the lexical components {watched} and {classic} do not have singular meanings, but offer a variegated package of semantic options (what Recanati (2002) calls “semantic potential”) to the conversation that must be selected pragmatically via standard cooperative inferences; this makes a contextualist breakdown of Susan’s speech-act across each world look something like:

(3C)<sub>C</sub> I {watched: viewed entirely} a {classic: film loved by many}!

(3S)<sub>C</sub> I {watched: generally attended to} a {classic: film loved by many}!

(3R)<sub>C</sub> I {watched: viewed entirely} a {classic: film loved intensely by a few}!

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<sup>6</sup> I use the subscript ‘M’ here to indicate that this is a *minimalist* approach to calculating semantic content (as opposed to the subscript ‘C’ for the *contextualist* model below).

On this picture, the particular words in (3) are unavoidably dependent upon the context of their utterance for determining their exact definitions. Additionally, what Waismann (1945) calls the “open texture of language” is also what might allow Susan to derive novel applications for the syntactic elements of (3) and truthfully utter it in world *F*, where:

World *F*: Susan watched *Frozen* with her children for the seventy-eighth time.

An interpretation of (3)<sup>7</sup> might view Susan’s attribution of “classic” status to a movie released in 2013 as the sincere description of an eager fan or the ironic complaint of an embittered parent – either way, its novelty is nevertheless understandable by Calvin in ways that remain relevant to the compositional factors of (3), not simply its pragmatic interpretation.

In any case, concerns about the semantics-pragmatics divide strike at a core question for philosophers of language interested in determining how utterances carry meaning. In some ways, this debate is fueled by the historical development of mid-20<sup>th</sup>-century Anglophone philosophy: Borg (2007) frames the minimalist/contextualist split as the progeny of foundational logicians like Frege and Carnap (for the minimalists) pitted against the descendants of early speech-act theorists like Austin and Sellars (for contextualism). For our purposes, we can consider it as a matter of the relationship between two kinds of content: semantic content (of strictly what is said) and what Cappellen (2007b) and others refer to as “speech act content” (the mostly intuitive meaning of an utterance in its context): to use our earlier example, an utterance of (1) as described above has the semantic content regarding vomiting, but the speech-act content of (2).

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<sup>7</sup> That is, the contextualist’s interpretation of Susan’s utterance of (3) in World *F*.



However, this framing poses a looming threat for contextualism: how to prevent one's hermeneutics from collapsing into a hopelessly relativistic system. If speech-act content is separable from semantic content, then at least some speech-acts might *mean* something fully different than what they *say*; put differently, if words carry only (or even primarily) semantic *potential* (Recanati 2002), then it is mysterious how a hearer could reliably make sense of a specifically intended potentiality from a speaker. Moreover, if (as some more radical contextualists have argued) at least some thoughts are simply *ineffable*, then strong versions of the Sapir-Whorf Hypothesis (SWH) loom on the horizon — a worry that threatens to undermine the project of meaning-seeking altogether. In the next section, I explain the problem of the SWH more carefully before demonstrating how *Arrival* — which discusses the SWH explicitly — helps us to make sense of how contextualism can remain sensible.

### III Whorfianism and *Arrival*

While in one sense it is about aliens and time-travel, Denis Villeneuve's 2016 film *Arrival* is also about the power of language. After extraterrestrial spaceships land on Earth, linguist Louise Banks (played by Amy Adams) is tapped by the U.S. government to decipher a way to communicate with the beings inside them. As she gradually learns how to read the aliens' writing, she also begins to literally perceive reality differently: the alien "heptapods" are not limited by a strictly linear view of time and, by learning how to share their language, Banks also starts to share their view of temporality. When China prepares to attack one spacecraft (thanks to an unfortunate translation choice that suggested the aliens were about to use a weapon against Earth), Banks uses her new temporal perspective to defuse the crisis before

interplanetary war erupts. As it turns out, the heptapod term interpreted by the Chinese linguists to mean {weapon} could also translate to {tool} — Banks realizes that this ‘tool’ is the alien language itself (and the new understanding of time that comes with it).

### The Sapir-Whorf Hypothesis

In this way, *Arrival* offers an exaggerated demonstration of the Sapir-Whorf Hypothesis (SWH), which the film discusses explicitly in the following exchange between Banks and Ian Donnelly (played by Jeremy Renner):

**Donnelly:** You know, I was doing some reading about this idea that if you immerse yourself into a foreign language that you can actually rewire your brain.

**Banks:** The Sapir-Whorf hypothesis. The theory that-- it's the theory that the language you speak determines how you think.

**Donnelly:** Yeah, it affects how you see everything.

Technically, Edward Sapir was concerned with the *initial* wiring, not the *re-wiring* of a speaker's mind as a consequence of their social context; the linguist commented in 1929 that the world we inhabit and describe “...is to a large extent unconsciously built up on the language habits of the group...[w]e see and hear and otherwise experience very largely as we do because the language habits of our community predispose certain choices of interpretation” (1929, 209). Sapir's student, Benjamin Whorf later developed this thought into the classic description of the SWH:

Formulation of ideas is not an independent process, strictly rational in the old sense, but is part of a particular grammar, and differs, from slightly to greatly, between different grammars. *We dissect nature along lines laid down by our native languages.* The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the world is presented in a kaleidoscopic flux of impression which has to be organized by our minds — and this means largely by the linguistic systems in our minds (1964, 212, *emphasis added*).

In its strongest form, the SWH treats language as a cognitive element so fundamental that communication between speakers of different languages isn't clearly possible; contextualism of this kind makes a relativistic isolation out of a speaker's context. So, contemporary linguists generally agree that language *alone* is not sufficient to determine cognitive processing mechanisms or their associated semantic outputs — that is, they reject a strong interpretation of the SWH — but weaker versions of linguistic relativity have garnered experimental support in a variety of research areas.

Consider the evidence surrounding the role of language on color perception, ranging from comparisons of English speakers to Chinese speakers (Zhong et. al. 2018), Russian speakers (Winawer et. al. 2007), as well as to individuals fluent in the Mexican language Tarahumara (Kay and Kempton 1984);<sup>8</sup> in each case, subjects whose natural language was more fine-grained about various shades of blue and green were more capable of accurately identifying variant shades of blues and greens than English speakers who possessed only the two categories. Özgen and Davies (2002) observed that subjects within a particular language group could be trained to improve their ability at performing similar color discrimination tests, suggesting that color perception is also sensitive to perceptual learning. Jraissati's summary of the debate between universalists and relativists in the analysis of color perception is illustrative: much like contextualist conclusions about the semantics/pragmatics divide, interpretations of the color perception data concur that “perceptual constraints *and language* both have a role to play in categorization” (2014, 389, *emphasis added*).

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<sup>8</sup> For a similar study comparing Mongolian speakers to Chinese speakers, see He, et. al. (2019).

More broadly, Reines and Prinz collate a range of experimental data — from studies of spatial categories, noun types, frames of reference, and grammatical gender — to defend *ontological whorfianism*, the thesis that:

By labeling things, language draws our attention to features of the world, and noticing these features becomes habitual. Those habits bias which of the many discernable categories we recognize by default, and may even impose category boundaries we would not notice otherwise. Language can also influence how we construe category members (as with gendered articles or slang use of color terms). In these ways, language informs our sense of where nature's joints reside, and what various categories are like — our ontologies. (2009, 1030)

This meshes well with Lupyan's *label-feedback* hypothesis which posits that “verbal labels play an active role in perception and categorization by selectively activating perceptual features that are diagnostic of the category being labeled,” thereby allowing for at least some form of cognitive penetration into perceptual content (2012, 4).<sup>9</sup>

Altogether, this suggests the possibility of an empirical case for semantic contextualism: if the reference of color terms like ‘blue’ are in some sense fixed (or at least affected) by our cultural or linguistic environment, then the semantic content of those terms are not fully redeployable cross-contextually as the semantic minimalist demands.

### Temporal Perception

However, *Arrival* offers an even more fanciful demonstration of linguistic relativism: language unlocking the perception not simply of new forms of color, but of new forms of *temporality*.

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<sup>9</sup> For additional examples of ontological whorfianism focused specifically on gender- and sex-specific stereotypes, see Boroditsky et. al (2003), Saalbach et al. (2012), and Imai et al. (2013).

Much of the sci-fi film's plot revolves around the 'tool' which the heptapods intend to deliver to Earth; initially, Banks is brought in as a linguist to learn how to speak to the aliens, but she eventually discovers the tool in question is, in fact, the alien's language itself. Tension builds in the film's third act as a result of different contextual interpretations of the same heptapod word by human researchers in different countries: while Banks reads the word to mean something like {tool}, researchers in China interpret it to mean {weapon}. The contextual effects of the Chinese reading are made explicit via Banks' discussion with Forest Whitaker's Colonel Weber about the potential consequences of the Chinese approach to communicating with the heptapods via the game of mah-jongg:

**Banks:** Let's say that I taught them chess instead of English; every conversation would be a game. Every idea expressed through opposition, victory, defeat — you see the problem? If all I ever gave you was a hammer...

**Weber:** Everything is a nail.

Conditioned by the context of the conversation and the historical choices of the speakers, the semantic potentiality of the heptapod word is actualized in extremely different ways — to near-dire effects.<sup>10</sup>

Eventually, it is revealed that the aliens' intention on Earth is indeed peaceful; they have come to teach humanity their language and prepare both species for an unnamed threat in the distant future. Whereas humans perceive the universe spatiotemporally via sequentially ordered laws of cause and effect, heptapod perception is what Pearson (2019, 57) calls "spatioteleologically-minded" wherein an agent perceives every temporal point of their life (in

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<sup>10</sup> For a more comprehensive treatment of how the SWH has been adapted in contemporary science fiction, see Koparan (2020).

one sense) simultaneously; by learning how to speak their language, Banks begins to likewise perceive reality in the same temporally-unbound fashion, flashing backwards and forwards in time, “remembering” future events and using that knowledge to affect the present so as to eventually bring about those same future events.<sup>11</sup>

But this means is that while the SWH is an explicit element of *Arrival*'s plot, the film's more fundamental reliance on radical contextualism is in the cinematic structure of the narrative's *own* temporality. Both its nonlinear story and its application of a kind of time-travel mechanic based around fatalistic precognitive perception concretizes the dependence of the plot within its context in much the same way that semantic contextualism demands that the meaning of a term depends also on *its* context.

Consider how Banks manages to prevent the seemingly-imminent Chinese attack on the heptapods: by using her newfound powers of temporal perception, she “remembers” a future conversation she *will* have with General Shang (played by Tzi Ma).<sup>12</sup> In a scene set eighteen months after the primary events of the movie, Shang meets Banks at a cocktail party celebrating global unification in the wake of the heptapods' *peaceful* arrival and thanks her for calling him on his private phone line to convince him not to fire on the spacecraft; it is from this future conversation that Banks learns both the number to call and the words to speak to change

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<sup>11</sup> While Chiang's original novella includes the same setup, the reason for the heptapods' arrival on Earth is left mysterious and the international competition (and near-war) is absent. Instead, Chiang offers more detail about the teleological perspective of the heptapods, connecting it, for example, to Fermat's Principle of Least Time.

<sup>12</sup> “Remembering” a *future* event is a relatively small example of the grammatical complexities of time travel discussed by Adams (1980/2000) and referenced in the opening paragraph of this paper.

Shang's mind.<sup>13</sup> Suppose, however, that after learning this future-based information back in the primary time slice of the film (when Shang is still about to order his forces to attack the heptapods), Banks were to choose *differently* and say something to Shang *other* than his wife's dying words: the Chinese army would then fire on the ships, global unification would (presumably) not happen, and the cocktail party where Banks learns Shang's phone number would never occur — how, then, could Banks have learned Shang's number in the first place? This kind of temporal paradox (wherein Banks deploys a form of temporal editing) upsets the sensibility of the entire narrative; it is only by understanding and maintaining the significance of each plot point within the structural context of the movie as a whole that Banks' choice to repeat Shang's future words to him on the phone are able to avoid degrading into nonsense.

In this way, *Arrival* exemplifies an important species of time-travel narratives that explicitly rejects the possibility of potentially-paradoxical temporal editing: it is to an exploration of the genus I now turn in Section IV before arguing specifically in Section V for the beneficial analogy of *Arrival*-type films to semantic contextualism.

#### **IV Two Forms of Time-Travel Stories**

Thus far, my presentation of contextualism and minimalism has focused primarily on sentences and sentence-meaning; I now intend to analogize the same mechanics to events and timelines.

In so doing, I aim to not only recapitulate the contextualism-minimalism debate, but to

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<sup>13</sup> Both Carruthers (2018) and Mayer (2017) argue that Banks' gender is another contextual factor crucially affecting her experience and understanding of the situation such that she is able to successfully connect with both the heptapods and Shang.

demonstrate that contextualism can competently account for our intuitions, despite SWH-related concerns.

Suppose there exists a sequence of events called Timeline  $\emptyset$  (Fig. 1) with a time-traveler  $L$  born at  $t_1$  who is currently alive at  $t_6$ :

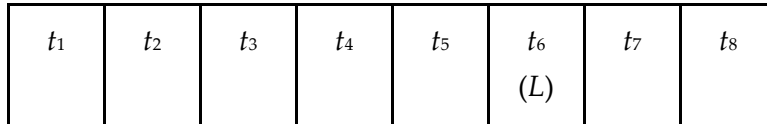


Fig. 1: Timeline  $\emptyset$

Now suppose that  $L$  travels backwards along Timeline  $\emptyset$  from  $t_6$  to  $t_3$  and acts in some way that affects each of the subsequent events in the temporal chain. Across the canon of time-travel stories, there are two basic ways that this plot device might ripple throughout the timeline:  $L$ 's action either causes an alternate timeline to develop or it does not.

In the first case,  $L$ 's change creates an alternate timeline (Fig. 2) where every subsequent event is different than in Timeline  $\emptyset$ . Often, for reasons constrained by the plot,  $L$  (whose subjective experience tracks  $L_3 \rightarrow L_4 \rightarrow L_5$ ) alone is aware of the differences between  $t_6$  and  $t^*_6$ , but those differences unavoidably affect the entirety of the world of Timeline  $A$ .

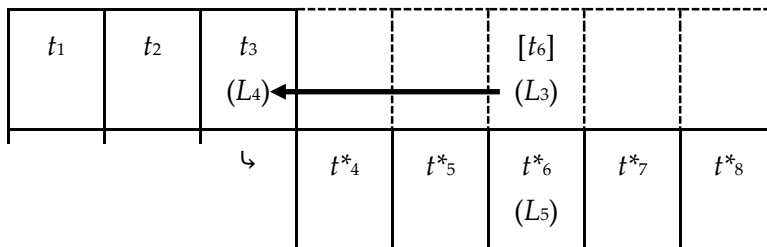


Fig. 2: Timeline  $A$



Because  $L$  has altered the timeline from what it would have been if she had not traveled from  $t_6$  to  $t_3$ , call  $L$ 's action here *temporal editing*.<sup>14</sup> Such a time-travel method is featured in films like *The Butterfly Effect* (2004), *About Time* (2013), *Avengers: Endgame* (2019), and the *Back to the Future* trilogy, given that the plot of each are predicated on the various unpredictable changes that inevitably result from even the smallest of temporal edits.

However, some time-travel narratives rely on a temporal structure wherein  $L$ 's actions result in something more like Timeline B (Fig. 3):

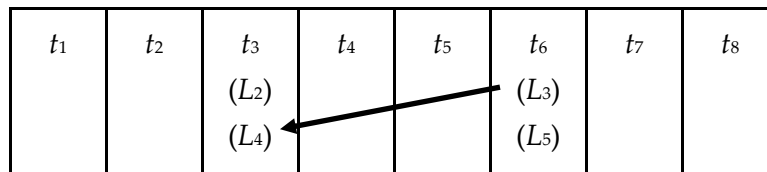


Fig. 3: Timeline B

In this model,  $L$ 's traveling through time still has an important effect on  $t_3$  (and, potentially,  $t_4$ ,  $t_5$ , and so forth), but no alterations are made to the ontological structure of the timeline because  $L$ 's actions at  $t_3$  are not "new":  $L$  *always* affected  $t_3$  in the relevant way, even though  $L$  may not have been aware of this in her initial experience of  $t_3$ . On this model, the following three points are true:

1. At  $t_3$ , both  $L$ 's chronologically younger self ( $L_2$  who experienced  $t_3$  naturally in the first place) and  $L$ 's older self ( $L_4$  who traveled from  $t_6$ ) are present.
2.  $L$ 's younger self ( $L_2$ ) might or might not know at  $t_3$  that  $L$ 's older self ( $L_4$ ) is present, but this knowledge need not have a direct bearing on whether or not  $L$ 's older self is present.

<sup>14</sup> Wasserman (2018) describes, discusses, and dismantles such a "branching" model of time in much more detail than this paper (pp. 78–90).

3. Should  $L_4$  stay in  $L$ 's own past and live through the natural passing of time, both versions of  $L$  (the older and younger) will exist simultaneously until  $t_6$ , at which point  $L_3$  will travel back to  $t_3$  and  $L_5$  will continue experiencing the natural passage of time into  $t_7$ .

In this way, whatever effect  $L$  has at  $t_3$  is an effect that  $L$  *always* had at  $t_3$ , even though  $L$ 's younger self at  $t_3$  was likely unaware of this effect. Such a model of time-travel is found in 1989's *Bill and Ted's Excellent Adventure* (such as when the title characters hide the keys to open the locked cell), 1984's *The Terminator* (given that Skynet's attempt to kill John Connor's mother actually led to Sarah Connor meeting John's father), 2014's *Interstellar* (both when Cooper directs his past self to find the hidden base, as well as because humanity's descendants eventually create the dimension which allows for Cooper's time-travel),<sup>15</sup> 1986's *Star Trek IV: The Voyage Home* (when Scotty and McCoy rationalize their choice to give the formula for transparent aluminum to Plexicorp by suggesting that the plant manager invented the compound in the first place), and 2004's *Harry Potter and the Prisoner of Azkaban* (given the results of Harry and Hermione's final trip with the time-turner).<sup>16</sup>

Among researchers interested in the philosophy of time-travel, Timeline  $B$  is a crude example of a *Ludovician* model (named in honor of David Lewis, whose foundational discussion of causal loops argued that time-travel was possible, but changing the past was not).<sup>17</sup> Notice that Timeline  $B$  and Timeline  $\emptyset$  are apparently identical, save for  $L$ 's temporal location — there is no event in the timeline that is changed by  $L$ 's actions; narratively speaking, the primary

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<sup>15</sup> For another intricate example of a Timeline- $B$ -style narrative from the same director, see *Tenet* (2020).

<sup>16</sup> Notably, *Back to the Future*'s indication that Chuck Berry's knowledge of his hit "Johnny B. Goode" came from his cousin Marvin's chance meeting with the time-traveling Marty McFly complicates that story's temporal mechanics into an inextricable contradiction.

<sup>17</sup> "The Paradoxes of Time Travel" (Lewis 1976) is the original paper and the 'Ludovician' term was coined by van Inwagen (2010); for further discussion, see Effingham (2020, 66–90).

function of a time-travel story of this stripe comes as a matter of *epistemological revelation* to the audience (and, perhaps, the characters), not as an ontological formation of the subsequent events in the narrative (because temporal editing is metaphysically precluded from *B*-style narratives).<sup>18</sup> And not only does *Arrival* function along the model of Timeline *B* (as described in the previous section's discussion of Banks' conversation with Shang), but it does so in a particularly nuanced fashion that skillfully tricks the viewer into confusing future and past events until Banks' question to the aliens reveals that she does not recognize the daughter that she (and the audience) has glimpsed memories of throughout the movie — she can't, because, at that point in time, Hannah has not yet been born.<sup>19</sup>

In common parlance, both Timeline-*A*-style and Timeline-*B*-style stories result in different temporal paradoxes: in the case of the former, temporal editing leads to various contradictory outcomes (such as the Grandfather Paradox); most problematic would be like that encountered in *Back to the Future* (1985) or *Hot Tub Time Machine* (2010) wherein *L* travels backwards to a time prior to *L*'s birth (say,  $t_1$ ) and prevents *L* from being born at  $t_1$ . Although some theorists argue for potential solutions to the philosophical puzzle, stories often treated this as the narrational equivalent of dividing by zero (the worst consequences of which, as Doc Brown explains in *Back to the Future Part II* (1989), “could cause a chain reaction that would unravel the very fabric of the space-time continuum and destroy the entire universe): it is not simply that we have difficulty imagining what sort of outcome would result from this action —

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<sup>18</sup> Effingham (2020, 72) considers a similar point about epistemological versus metaphysical puzzles of time-travel in his discussion of the “bilking” problem for Ludovicianism.

<sup>19</sup> For more on the role of motherhood as a key contextual element of *Arrival*, see Mayer (2017, 32) and Carruthers (2018).

it is nonsensical for audiences to even postulate. In contrast, *B*-style stories depend on the ontological (or “predestination”) paradox wherein a stable causal loop is generated; however, as Ludovicians argue, it’s not actually clear that a causal loop is, in fact, paradoxical, provided that it is stable — and, indeed, in each of the stories in question, it is.<sup>20</sup>

## V Film as Time as Context

The analogy I wish to draw, then, is between a contextualist reading of a speech-act and the *B*-style model of a time-travel story — that is, to treat the time-traveler *L* and her actions in Timeline *B* as the personification of a term’s semantic potential in a particular speech-act. At  $t_3$ , because *L*’s younger and older forms are simultaneously present in the world, *L* “means” more than one thing at the same time (namely, both  $L_2$  and  $L_4$ ) — successful reference to *L* will depend heavily on a variety of additional factors beyond treating  $\{L\}$  as a simple referent at  $t_3$ . But this epistemological puzzle is resolvable naturally through any number of normal means by both speakers and film audiences: once the meaning of the term/time-traveler is clarified, the confusion evaporates and the speech-act — or the timeline — makes sense.

In a similar way, we can compare non-Ludovician, Timeline-*A*-style models to a minimalist semantics that views *L* as an analog to an element of a propositional skeleton; because the meaning of a sentence (like ‘I watched a classic,’ discussed in §II) never changes cross-contextually on this view, temporal editing effectively creates a new sentence — or timeline. The benefit of this is that we can easily imagine all manner of temporal edits to be

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<sup>20</sup> For a film that intentionally — and problematically — subverts this model (by diegetically recognizing the inevitability of certain future events such that the main character sacrifices himself to prevent them, thereby changing the movie from a *B*-style to an *A*-style film), see *Looper* (2012).

made, both to and around  $L$  as the timeline changes from  $t_4$  to  $t^*_4$  and so on (or as the sentence's propositional skeleton is completed) in any number of ways; but this entails the risk of dividing by zero and undermining hope for understanding the timeline as a whole — hence the frequent concern in such stories to avoid temporal paradoxes.

A popular technique used in *A*-style narratives to avoid such problems is to evoke a “multiverse” picture of reality wherein multiple branching timelines diverge at various decision points.<sup>21</sup> Consider, for example, in *Avengers: Endgame* (2019) when the title characters travel from the year 2023 to 2012 and accidentally help Loki escape from custody — rather than this change unraveling the universe, it simply creates a new branch in the timeline.<sup>22</sup> However, notice that this solution effectively avoids a temporal paradox by applying a spatial solution: rather than grappling with the metaphysical ramifications of temporal editing, multiverse stories shift the narrative into non-temporal territory by multiplying the ontologies of their worlds without restraint; Wasserman calls this the “irrelevance” objection to the branching timeline model, saying “trips to parallel universes are not journeys in time, so [such a story] would not be a case of time travel” (2018, 89–90).<sup>23</sup> Interestingly, comparable dialectical moves are also found in defense of minimal semantics: as Bezuidenhout (2017) demonstrates, one of the key problems with the early debates between contextualists and minimal semanticists was

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<sup>21</sup> In the philosophical literature, this is sometimes called an indexed-world model (Effingham 2020, 73–75),

<sup>22</sup> The consequences of both this change and the concept of branching-worlds in general are explored more extensively in the Disney+ series *Loki* (2021).

<sup>23</sup> Notably, multiple non-Ludovician models of time-travel allow for the past to actually be changed in virtue of a non-spatial metaphysical explanans called *hypertime* (which, to oversimplify, functions as a secondary, meta-level temporal dimension), but it's not clear that such a view has been fairly represented in a narrative (at least not without converting “hypertime” into a spatial category). For an example of one short story that might qualify, see Eisenstein and Eisenstein (1971); for examples of philosophical hypertime models, see van Inwagen (2010), Goddu (2011), Effingham (2020, 76–90), and Wasserman (2018, 90–99).

inconsistent use of terminology — perhaps allowing for a similar “irrelevance” objection to obtain to philosophy of language disagreements that are (ironically) largely matters of semantics.<sup>24</sup>

For time-travel stories that are *clear* examples of *time-travel* (without the spectre of spatial/nontemporal narrativ solutions), it seems like we have good reason to prefer *B*-style stories. And what this amounts to is not so much a Nietzschean sense of temporal recurrence for the metaphysical underpinning of *B*-style timelines (for, ontologically speaking, the events of *t*<sub>3</sub> happen only once — any sense of repetition is merely a phenomenological feature of *L*'s personal experience), but rather the Deleuzean sense of time as “an organism, a great organic unity” (1986, 30). In contrast to frameworks that treat linear temporality as a necessary condition upon which our intuitions depend (in the manner that *A*-style stories assume we can mentally track temporally edited characters and events, despite the fact that the world around them has changed), Deleuze's sense of time's texture and structure treats temporality as the ordered fabric upon and through which the self is constituted. As Marrati explains:

Duration is no longer conceived as a psychological category but as an ontological field in itself. Time is not “in” the soul, nor is it an *a priori* form of the transcendental subject, as Kant maintained. Nonchronological time, time grasped in its foundation, is subjectivity itself — the only subjectivity (2008, 76).

Even Nietzsche's repetition, then, “is no longer a repetition of successive elements or external parts, but of totalities which coexist on different levels or degrees” (Deleuze 1994, 287).

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<sup>24</sup> Though these inconsistencies have long been recognized; see Bach (1999).

*Arrival* portrays the nature of this view well, countenancing a metaphysical picture of temporality that emphasizes the embedded subjectivity of agents within the unchanging temporal structure; as Fleming and Brown (2018) explain, the spatioteleological nature of heptapod subjectivity seems strangely extricable from time's flow: time is not something that "happens" to the aliens, but is something that an agent — along with all of its purposes — functions within. When Banks calls Shang, both she and the audience subjectively flip quickly between the scene of impending war and the scene of the cocktail party eighteen months "later": both are, subjectively, happening *now*.

Ultimately, Ludovician, Timeline-*B*-style stories (like *Arrival*) do, in fact, present a coherent model of film as time as context that does not actually change (although epistemologically/phenomenologically, both the characters and the audiences can subjectively change over the course of the film as they learn previously-unknown information) — the only caveat is that one must understand the story as a whole in order to make sense of things. In a similar way, contextualist models of semantics present a coherent model of meaning wherein a speech-act might seem to have an ambiguous semantic content (when conceptually isolated from the world that helps give it meaning), but, once one is sufficiently aware of the context as a whole, it is similarly easy to make sense of things. In both cases, the film and the sentence is akin to what Timothy Morton (2013) calls a "hyperobject" — they are things that extend through space and time in a way that requires a perceiving subject to fully experience them before they can fully understand them.<sup>25</sup>

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<sup>25</sup> For more on the role of hyperobjects in *Arrival*, see Fleming and Brown (2018, 342). For a broader application of the same concept (which implies that a film *qua* film is a hyperobject), see Hall (2016); for related discussion, see

The reconfiguration of Banks' subjectivity throughout *Arrival* gives the audience a glimpse of what it is like to be a heptapod — a creature so otherworldly it heralds the arrival of what Fleming and Brown (2018) dub the 'chthulucinema' as a suggestion of what a post-human story would begin to look like. A key component of this strangeness is in the aliens' approach to language: because their view of time is nonlinear, when one makes some utterance at  $t_3$ , it already knows what its interlocutor is going to say in response at  $t_4$ . Nevertheless, the speaker also knows that they must still make the utterance at  $t_3$ . As Pearson points out, this relationship to language turns *all* speech-acts into *performative utterances* (in the sense of proto-contextualist J.L. Austin's use of the phrase); in short, heptapod language "is not for communication, but rather for doing, by speaking at the appropriate time" (2019, 57–58).<sup>26</sup>

Put differently, *Arrival's* treatment of the alien language effectively *collapses* the semantic/pragmatic divide, given that *all* heptapod speech-acts are fully pragmatically motivated. While this might not directly translate into an analysis of human language, it offers an important touchstone for further thought about how our temporality affects our understanding of semantics, pragmatics, and their logical relationship. Furthermore, in a different way, it underlines important limitations on the perspective of the *storyteller* (who is at least potentially aware of the overall structure of their intended narrative even as they are still writing its earliest pages): once they have written a temporally-bound scene into their narrative,

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the discussion of *neuroimages* (which infuse an agents' subjectivity with their sense of the approaching future) in Pisters (2012).

<sup>26</sup> Notably, Pearson quotes Ted Chiang's own discussion of the performativity of heptapod language to make this point.



even they cannot alter it in later scenes without sacrificing the sensibility of their story's timeline in the manner described in this paper.

## VI A Grammar in Two Dimensions

In *Story of Your Life*, Chiang's version of Louise Banks explains how heptapod written language is particularly unusual: whereas all human languages are *glottographic* (and use a written language which directly represents spoken words and follows the same grammatical paradigm), written heptapod is *semasiographic* with a unique visual syntax and grammar that "conveys meaning without reference to speech. There's no correspondence between its components and any particular sounds" (p. 137). In the story, this "grammar in two dimensions" poses a new problem for the human teams trying desperately to communicate with the aliens; for us, it offers one final analogy to how related, but distinct, the meaning found in visual or cinematic experiences can be to that contained within our propositional discourse. Both are ultimately important and both share a curious dependence on temporality that cannot properly be overlooked.

In the preface to *Difference and Repetition*, Deleuze claims that the best kind of philosophy is "in part a kind of science fiction" (1994, xx) after remarking that "conclusions should be read at the outset" (ix). In conclusion, it's worth noting that *Arrival* is, and does, both.<sup>27</sup>

## References

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