



Heptapod B and whorfianism. Language extrapolation in science fiction

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ABSTRACT. The Sapir-Whorf hypothesis states that the language someone speaks shapes their thoughts. Although this view may have fallen into disrepute in the field of linguistics, its influence, the Whorfianism, has been the number one showcase in science fiction works that somehow approach language, and more specifically, invented languages. This paper uses Ted Chiang's award-winning novella *Story of your life* (1998) and its filmic adaptation *Arrival* (2016) directed by Denis Villeneuve and written by Eric Heisserer as a case study to investigate this literary phenomenon. The considerations of Guy Deutscher (2010), Stockwell (2006) and Ria Cheyne (2008), as well as the authors' own viewpoints, are vitally important for that. The result is a speculative and comparative analysis that contributes to a better understanding of the frequent connexion of science fiction, glossopoesis and Whorfianism.

Keywords: heptapod B; science fiction; whorfianism; glossopoesis; invented languages.

Heptapod B e whorfianism. Extrapolação da linguagem na ficção científica

RESUMO. A hipótese Sapir-Whorf afirma que a língua que alguém fala molda seus pensamentos. Embora esta visão tenha caído em descrédito no campo da linguística, sua influência, o Whorfianismo, aparece recorrentemente em obras de ficção científica que de algum modo abordam linguagem, e mais especificamente, línguas inventadas. Este trabalho utiliza a premiada obra de Ted Chiang *Estória da sua vida* (1998) e sua adaptação fílmica *A chegada* (2016), dirigido por Denis Villeneuve e escrito por Eric Heisserer, como estudo de caso para investigar este fenômeno literário. As considerações de Guy Deutscher (2010), Stockwell (2006), de Ria Cheyne (2008) bem como dos próprios autores são de vital importância para o que propomos aqui. O resultado é uma análise especulativa e comparativa que contribui para um melhor entendimento da frequente conexão da ficção científica, glossopoesia e Whorfianismo.

Palavras-chave: heptapod B; ficção científica; whorfianismo; glossopoesia; línguas inventadas.

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Introduction

This paper works under the premise that Heptapod B, an invented language, and the disputable Sapir-Whorf hypothesis are used in both literary and filmic texts as a primary narrative framework upon which the whole story is constructed. Consequently, the glossopoesis present in the stories determines a series of factors in the plots. In connexion with that, this paper also seeks to analyse this recurrent science-fictional phenomenon having *Story of Your Life* (1998), written by Ted Chiang, and *Arrival* (2016), written by Eric Heisserer and directed by Denis Villeneuve, as a two-case study. Despite the scope – a literary work and its filmic adaptation – the research focus is not the adaptation process, but the use of glossopoesis in both texts. The narratives tell the story of Louise Banks, a linguist and university professor, who is hired by the U.S. military to promote humans first contact with an alien race, the Heptapods. As Louise becomes proficient in Heptapod B, their written language, she develops a new ability, that is, perceiving time in a cyclic manner.

The literary use of fictional languages that can shape thought is called Whorfianism, out of the linguistic theory known as the Sapir-Whorf hypothesis. In the stories, the authors have constructed a conceptual artificial language from scratch that extrapolates on that idea. In effect, the multitude of literary works that

portray some kind of glossopoeia (artificially constructed languages) in their plots has shown one indisputable fact: Glossopoesis, science fiction and the Sapir-Whorf hypothesis have a strong and lasting bond. “It begins with naming [...]”, writes Le Guin, “[...] invented names are a quite good index of writers’ interest in their instrument, language, and their ability to play with it [...]” (Conley & Cain, 2006, p. 17), she continues; and primarily, artificial languages often show in science fiction novels and films.

Far from completeness, the majority of science fiction glossopoeic ‘projects’ usually present a sketch of the language and one or many philosophical issues. Utterances in the glossopoeia or uses thereof are generally also a means used by the author to communicate with the reader, as pointed out by Ria Cheyne (2008, p. 392, marks in the original):

[...] samples of alien speech included in SF [science fiction] texts – are polyvalent, allowing authors to reach readers on several levels. On the first and most basic, all samples of a created language within an SF text serve to give notice of ‘difference’ [...] from readers’ expectations for contemporary humans. [...] The more ostentatiously an utterance flouts the norms of the language in which the rest of the text is written, the more exotic the author’s intended perception of the beings who speak.

The case of Ted Chiang’s *Story of Your Life* illustrates Cheyne’s premise very well. The author does not put much effort into constructing an invented language supposed to resemble a natural language, as in the case of Tolkien’s numerous linguistic fabrications. Instead, he focuses on building philosophical and scientific questions. This proves that Chiang’s main interest is to communicate with readers, making them envisage the extrapolations he imagines, providing them with the appropriate metaphors and allegories. Indeed, the naming of or the invented language is in itself a means of communication with the audience of the text. It is noteworthy as well that there is not much of a preoccupation on adhering strictly to what is currently held correct and accurate by linguists, which is also perceivable in other similar fictions.

Therefore, the author is using glossopoesis in his text to question reality, morals and science, instead of artistically devising a beautiful and attractive language. In this regard, the disputable Sapir-Whorf hypothesis has been the number one showcase ever. Malmgren (1993) writes that it should not strike anyone as a surprise that most science fictions featuring an alien or invented tongue adopt a Whorfian view of the relation between language and reality since what they seek to emphasise is the extent to which any new language system can affect our view of reality.

Similarly, a great many authors have ventured into Whorfianism, which extrapolates on the idea of language power on thought. Prominent examples of that include George Orwell’s (1949) *1984*, Ursula K. Le Guin’s (1974) *The Dispossessed*, Suzette Haden Elgin’s (1984) *Native Tongue*, and Samuel Delany’s *Babel-17* (1966). The parallels found in such works and the two-case study involving Chiang’s and Villeneuve’s texts are thus used to help describe this literary phenomenon. Also essential to the analysis are the contributions of Conley and Cain (2006), Guy Deutscher (2010), Ria Cheyne (2008) and Peter Stockwell (2006). Before a more in-depth analysis of the two texts that form the scope of this research, however, a description of Whorfianism in literature is imperative.

Whorfianism in science fiction – a comparative analysis

The idea that language can influence or even structure how people think dates back to unmemorable times. Settlers from remote centuries believed that less advanced or ‘primitive’ nations also spoke ‘primitive’ languages. That, however, was most often quite the opposite. This notion began to change, though, when the concern on the issue started enthusing researchers. A vast uncharted terrain was being opened up when languages as exotic as Navajo, Nootka, Paiute were becoming objects of close study. Sapir and Whorf became convinced that the intense dissimilarities between languages must have consequences that go beyond the meagre syntactic organisation and must be associated with a profound discrepancy in manners of thought (Deutscher, 2010).

In further words, Sapir and Whorf were claiming that our mother tongue determines the way we think and perceive the world. Although that view may sound far-fetched to some, it is indisputable that the choice of words one makes can alter the outcome of what is being said positively or negatively, that is, one can either offend or please someone just by changing the exponent of the sentence, despite the fact that the function in the phrase remains intact.

In everyday life, we can verify the power words have. The wrong phraseology can end up offending or pleasing while stating precisely the very same thing. However, such an extrapolation of conferring uncanny

abilities to speakers could perhaps be dismissed as an absurdity extremely difficult to sell to readers as science-fictional in place of pure fantasy. Commenting on Le Guin's assumptions on that matter, Meyers (1980, p. 128, marks in the original) states:

'You get to make up the rules [of your own world in fantasy], but then you've got to follow them. Science fiction refines upon this: you get to make up rules, but within limits'. She follows with the familiar canon that a science fiction story 'must not flout the evidence of science, must not [...] deny what is known to be known'. So far Le Guin sounds like a defender of the plausibility theory in its strongest, hardest form. Nevertheless, she continues by saying that when a story does deny what is known to be known, 'the writer must [...] defend the liberty taken, either with a genuine hypothesis or with a sound, convincing fake [...]'.

An example of a plausible, convincing fake in Le Guin's work is the ansible, a communication device capable of transmitting data with no time interval that appears in several of her novels. Despite sounding bizarre, language power on thoughts has some real-life scientific background. Sapir and Whorf, the linguists that first wrote about the hypothesis, exemplified their assessment by compiling instances from numerous languages, and in particular from Hopi, an Amerindian language. For example, Hopi lacks a notion of time seen as a dimension; there are no forms equivalent to English tenses, but there are a series of forms which makes it possible to talk about several durations, from the speaker's perspective. Guugu Yimithirr, an aboriginal language spoken by roughly 780 people in northern Australia, has an entirely unexpected mode of talking about spatial relations – namely the geographic system. Odd as it may sound, Guugu Yimithirr native speakers have developed an unmatched ability to locate themselves using cardinal points, regardless of where they are. They have perfected their ability so much that their language does not even have words for left or right (Deutscher, 2010).

A comparative analysis of Chiang's innovation reveals it remains the most irreverent example of that. As noted earlier, other literary works have resorted to Whorfianism in their approaches to language. George Orwell's (1949) *1984*, for instance, features the Newspeak. This invented language is meant to destroy unwanted words and expressions while, in turn, supposedly deleting people's memories or thoughts that offend against the Party's ideology. In line with that, the invented language includes diminishments and transformations of English such as 'goodthink', thinking according to the parameters of the Party, 'thoughtcrime', heretical thought, not following the Party's orthodoxy, 'doublethink', contradictory thought to accommodate conflicting ideas that the Ingsoc enforces on individuals even if they make no sense, 'joycamp', concentration camps, 'Minitrue', or the Ministry of Truth, which was responsible for altering history registry in favour of the Party's interest (Orwell, 1949).

Elgin's *Native Tongue* (1984) features the invented language Láadan 'the women's language', thought to express female perspectives in such a manner to influence on the discursive constructions that form the concept of social reality. The language has a neuter pronoun *be* that means 'he', 'she' or 'it'. The word for 'woman', with, also translates 'person' (Noletto, & Lopes, 2018). Finally, Le Guin's (1974) *The Dispossessed* presents the constructed language Pravic, admittedly artificial, invented by the founders of an anarchist socialist society to indoctrinate citizens in their ideology (Noletto, & Lopes, 2019).

Those stories all depict language as a powerful technology that can and is used as a tool to control and subvert people. In a similar fashion, Chiang portrays his language as a special technology capable of enabling in humans the same perception of reality shared among the aliens. No further attempt at explaining how this work is offered except the Sapir-Whorf hypothesis. In fact, Whorfianism underpins fundamental and vital parts of the plots just as observed in the other fictions that resort to glossopoesis that have been mentioned here. In *1984*, it serves the purpose of exposing how totalitarian the government is and how horrific life in Oceania is.

In *The Dispossessed*, the invented tongue works as a secondary narrative framework: while the main plot suggests a criticism on capitalist societies, Pravic, the artificial language, criticises socialist or communist nations because of their totalitarian nature. In *Native Tongue*, Láadan is the main focus of attention in the story. It is described by the author as a solution or means to attack an oppressive situation but ends up consisting of, yet, another control instrument devised by elites. Similarly, in *Babel-17*, language and a Whorfian view of language are used as the central plot device of the story, shaping the storytelling as a whole. In all the instances, language is regarded as technology, as a tool. Science-fictional texts use science, usually equipment or novel theoretical physics as a narrative device, therefore it seems plausible to state that science-fictional glossopoesis is also about that; using communication and language as the technology common to all texts in the genre.

Whorfianism in Heptapod B – a speculative analysis

A speculative analysis theorises about the symbolism found in a work of art. Both *Story of Your Life* (1998) and *Arrival* (2016) are a rich source of symbolism. For instance, in the stories, the aliens get their name from their seven-leg unusual appearance (*Hepta*, Greek for seven; *Pod*, Greek for feet); and in fact, this peculiarity is the first significant piece of information about the aliens. By and large, naming in literature is hardly ever a subject of mere coincidence or randomness, chiefly when artificial languages are involved. Authors are usually cautious about choosing names of characters, places, and so on. Equally then, some reasons prompt the thinking that it is not arbitrary at all the fact that the aliens have seven limbs. It is very humanlike to think of limbs in pairs, so it is possible that the seven limbs are intended to make the aliens look odd, or there is a concealed symbolism that, too, has to do with the linguistic theory that orients the plots.

The number seven has become mystified in various cultures. In the Bible, for example, seven is a symbol of perfection or completeness, and because of that, it is related to God. Quite a lot of essential occurrences of the number seven are found throughout the Bible: God created the world in six days, and the seventh day was declared sacred; Jesus died on the 14th of Nisan ($2 \times 7 = 14$). Intersections with biblical stories are not uncommon in Chiang's work. *Tower of Babylon* (1990) and *Hell is the Absence of God* (2001) are good examples of that. Thus, the perception of biblical or religious motifs in his oeuvre is plausible. Outside the holy book of the Christians, likewise, the number seven continues to intrigue: there are seven days of the week, seven seas, seven continents, seven colours in the rainbow, seven notes on a musical scale, and as it is, seven levels in the periodic table of elements. Nonetheless, even more fascinating is that for the Mayan numerology, those who are born on a seventh day are believed to have the ability to see both backwards and forwards in time (Johnson, 2009). As it follows, the Sapir-Whorf hypothesis has itself been strongly influenced by particular tongues of the Uto-Aztecan branch of languages. It is clear, thus, that the seven-leg shape must not be simply out of chance.

In addition to that, the Heptapods have entirely different vocal equipment, which allows them to produce sounds comparable to “[...] a wet dog shaking the water out of its fur” (Chiang, 1998, p. 119). In the film, however, they sound very similar to the tripods in *War of the Worlds* (2005), the cinematic adaptation of H. G. Wells's homonymous novel (1898). No wonder, since that tone just happens to be a pervasive sound effect in many of Villeneuve's films. We can hear different reverberations in the cinema adaptation that are both as odd and unpronounceable. By any means, the human larynx is not capable of reproducing such sounds or say noises. Therefore, Louise uses recordings in playback to engage the Heptapods in crude conversation, at least in the first act of the story, right before she realises the written form is much more suitable for interracial communication. It is clear to this point that the Heptapod A variation is created to be an allegory of extra-terrestrial, leaving the more complex philosophical issues to be centred around Heptapod B.

With the use of videos and computer programmes, she then tries to see which graphemes she might identify and use to compose her own utterances. Louise eventually recognises Heptapod B as a ‘semasiographic’ writing system that follows a non-linear order; or in reality a more circular ‘word order’, as shown in the film. Heptapod B can thus be described “[...] as a more flexible and effectively entirely different language [...]” from its oral variety (Conley & Cain, 2006, p. 180). Also, it is, as Cheyne (2008) points, a performative language, rather than informative; they use it ‘to actualise’. Of course, since they can look into the past or the future at will, they can predict what their interlocutor will say, but only if they really say it, otherwise there will not be anything to predict, for the aliens are not capable of reading minds or at least that is what the text implies. There are examples of that in the human world as well. At a wedding, for instance, everyone anticipates the words “I now pronounce you husband and wife [...]”, but unless those words are actually uttered, the ceremony is not valid (Cheyne, 2008, p. 395).

Their writing involves, in every case, a single continuous and circular line, which means that they have to know how the entire sentence will be laid out before they can write the very first stroke. Both in the novella and in the film, descriptions of how the language works are offered. The film's examples reproduce the novella's ones:

The language had no written punctuation: its syntax was indicated in the way the semagrams were combined, and there was no need to indicate the cadence of speech. There was certainly no way to slice out subject-predicate pairings neatly to make a sentence and a paragraph, or a page, was size (Chiang, 1998, p. 112).

Although Ted Chiang does not present a visual representation of Heptapod B, there are vivid accounts about it. Dr Banks outlines their writing as something far more complex than mere pictography; the language shows rules of ‘visual syntax’, she remarks (Chiang, 1998). Louise then explains what she means by saying:

In their written language, however, a noun is identified as subject or object based on the orientation of its logogram relative to that of the verb. Here, take a look. [...] For instance, when ‘heptapod’ is integrated with ‘hears’ this way, with these strokes parallel, it means that the heptapod is doing the hearing. [...] when they’re combined this way, with the strokes perpendicular, it means that the heptapod is being heard. This morphology applies to several verbs (Chiang, 1998, p. 109).

Syntax can be defined as a set of rules, not only in a natural human language, which must be followed in order to make a sentence, a programme or even a picture meaningful. If the rule of syntax in language, for example, is broken, words can be tossed as however one wants, but the sentences will not make any sense. As it happens, this can apply to the visual ‘text’ as well. Visual syntax explores colours, lines, shadows as a part of visual grammar. Heptapod B is said to have such representational properties that vaguely resemble some inhuman writing or esoteric symbolism. One of these comparisons posed by Louise is the Buddhist representation of human versus cosmos dynamics known as mandalas: “The semagrams seemed to be something more than language; they were almost like mandalas” (Chiang, 1998, p. 127). The word mandala originates from Sanskrit for ‘circle’, and mandalas have served the purpose of representing time and timely cycles in a person’s life. Nowadays, many esoteric people use them as a symbol of ‘a zen way of thinking’ – to meditate towards a state of inner peace. It is thought-provoking to relate that to the nihilistic way the Heptapods view the freedom-determinism dichotomy because that is the way Buddhists approach ‘fate’, never-changing karma that must be accepted and embraced. There is no real beginning, and no real end since life is a cycle.

There is another religious doctrine or, say, tradition, culture, which fits the idea of cyclic time. Again, Hopi (a Uto-Aztecan language akin to Mayan) regards time, or so believed Edward Sapir, as cyclic rather than linear. Deutscher (2010) remarks that Hopi is somewhat a timeless verb language, or ‘tenseless’. Hopi apparent cyclic view of time is the one thing that most amazed Edward Sapir and Benjamin Lee Whorf, and this is likely the very origin of Chiang’s Heptapod’s cyclic time perspective. The use of a circular or cyclic-looking kind of written system is, therefore, a reference to that, albeit, perhaps unintentionally; a hidden mode of linking the Heptapod language to the linguistic theory of language determinism.

Following that line of thinking, it is possible to correlate the origin of the design of Heptapod B whorls with the ancient Mayan ‘Ouroboros’. An ouroboros is an ancient symbol depicting a serpent or a dragon eating its own tail, it is found in many cultures, and in the majority of cases, it represents infinity and life’s cycle. The Mayas believed the white snake biting its tail (*Quetzálcoatl*) represents a perfect alignment of the cycles of the Earth, the Sun, and the centre of the galaxy, which, in a way, are also biting their tails as they are in the shape of circles or ellipses. The concept was developed for the film by production designer Patrice Vermette and Martine Bertrand and encompassed a circle or a stroke with varying nuances in the contours’ width.

As previously stated, the Heptapods perceive time in a non-linear fashion. Human languages usually follow just a linear order in which words are added one after the other composing a straight line, which depending on the language can be from left to right, from right to left or even from top to bottom, but always in a straight line. There is always some sort of word order as well: a natural order that words must follow if they are to make any sense. English, for example, most commonly follows the SVO order (subject + verb + object). With Heptapod, though, one does not know where to start reading, it is required to look at everything at once and simply recognise it. That is a reflection of the way they see time, and simultaneously, it is the means that allows them to do that – the Sapir-Whorf Hypothesis at its strongest level of acceptance.

The language had no written punctuation: its syntax was indicated in the way the semagrams were combined, and [because Heptapod B is a self-sufficient mode of expression] there was no need to indicate the cadence of speech. There was certainly no way to slice out subject-predicate pairings neatly to make sentences. A ‘sentence’ seemed to be whatever number of semagrams a heptapod wanted to join together; the only difference between a sentence and a paragraph, or a page, was size (Chiang, 1998, p. 111-112, marks in the original).

As it is, following Cheyne’s descriptions of literary fictional languages, Louise goes on to provide information about how a translation must be done, subjective impressions of the constructed language, data

about the grammatical structure, and discussions of other properties of the language, or notable quirks and features within the language:

Much more interesting were the newly discovered morphological and grammatical processes in Heptapod B that were uniquely two dimensional. Depending on a semagram's declension, inflexions could be indicated by varying a certain stroke's curvature, or its thickness, or its manner of undulation; these were non-segmental graphemes; they couldn't be isolated from the rest of a semagram. And despite how such traits behaved in human writing, these had nothing to do with calligraphic style; their meanings were defined according to a consistent and unambiguous grammar (Chiang, 1998, p. 114).

Every 'depiction' of Heptapod B in both Chiang's as well as Villeneuve's and Heisserer's texts serves the purpose of defining the Heptapods as deterministic, exact and reasoned beings who are bound by a simultaneous time perception. The impossibility of detaching strokes or bits of the 'whorl' in the Heptapod circular semagrams appears to be yet another allusion to their non-linear perception of time. It also displays the writers' acceptance of the power language exerts on the mind (at least in the novella), or the reflection of it on culture. The mention of declensions, inflexions, stroke's curvatures or any other 'language exoticism' is a phenomenon that Stockwell (2006) and Cheyne (2008) classify as an alien characterisation. That means the author collects linguistic items that sound or look foreign to speakers of English in order to instil in the readers a strong impression of alienness and difference (in the glossopoeists' jargon that is called a kitchen sink conlang, short for constructed language).

Next, Louise presents an outline of some characteristics that she compares to a language that is often regarded as exotic by western language speakers, namely Arabic. Chiang emphasises the language's exoticism by adding that no human being can deal with the complexity of the Heptapod B writing whorls in the necessary speed, reinforcing that no stroke and no bit of the 'sentence' can be altered without changing all the rest.

The heptapods do not write a sentence one semagram at a time; they built it out of strokes irrespective of individual semagrams. I had seen a similarly high degree of integration before in calligraphic designs, particularly those employing the Arabic alphabet. But those designs had required careful planning by expert calligraphers. No one could lay out such an intricate design at the speed needed for holding a conversation. At least, no human could (Chiang, 1998, p. 123).

Louise labels this as a 'two-dimensional grammar', and again a fact is reinforced here; only a simultaneous consciousness can naturally construct a sentence in Heptapod B. Stockwell (2006) arguments that where invented languages are mentioned but do not appear entirely, this reproduces the idea that they are imagined to be so far in advance in relation to the reader's mind that the narrator cannot render them in a way which is at all comprehensible. Indeed, one of Chiang's premises is that, again, only someone with a simultaneous consciousness can fully understand Heptapod B. Louise comments on the visual effects that the looks of the aliens semasiographic writing may exert on, say, primitive minds:

[...] The writing looked like fanciful praying mantids drawn in a cursive style, all clinging to each other to form an Escheresque lattice, each slightly different in its stance. And the biggest sentences had an effect similar to that of psychedelic posters: sometimes eye-watering, sometimes hypnotic (Chiang, 1998, p. 112).

Psychedelic nausea, eye-watering sensations and hypnosis experiences are the results of a long stare at the whorls. Furthermore, Louise compares the logograms to Escheresque lattice forms. Maurits Cornelis Escher was a Dutch graphic artist who made mathematically inspired woodcuts, lithographs and mezzotints. Escher's works feature mathematical solids and operations, explorations of infinity, reflection, symmetry, perspective, hyperbolic geometry and tessellations. Indeed, Louise associates the aliens' logograms with the exact sciences:

"There are other examples, but you get the idea. It's essentially a grammar in two dimensions."

He began pacing thoughtfully. "Is there anything like this in human writing systems?"

"Mathematical equations, notations for music and dance. [...] I think it's like a full-fledged, general-purpose graphical language" (Chiang, 1998, p. 109-110, marks in the original).

In a moment of awakening both in the novella and in the film, Louise realises her thoughts are changing dramatically. In the literary text, she commences to experience something similar to what she had once gone through while learning Russian; she is starting to think in Heptapod B. The big difference lies again on Chiang's tacit acceptance of the strongest version of the Sapir-Whorf hypothesis; of course, he breaks all

presumed barriers with it. In the film, likewise, close to the 58th minute of it, Dr Banks begins to premonition moments with her unborn and even unconceived child. The visions surely confuse her, but she soon becomes aware of what was really happening:

More interesting was the fact that Heptapod B was changing the way I thought. For me, thinking typically meant speaking in an internal voice; as we say in the trade, my thoughts were phonologically coded. My internal voice normally spoke in English, but that wasn't a requirement. The summer after my senior year in high school, I attended a total immersion program for learning Russian; by the end of the summer, I was thinking and even dreaming in Russian. [...] my thoughts were becoming graphically coded [...] I saw semagrams with my mind's eye, sprouting like frost on a windowpane (Chiang, 1998, p. 126-127).

Louise is developing the same capability the Heptapods possess – moving her cognition cyclically through time, 'remembering the future'. She is already dreaming in Heptapod B, which by the way is a sharp sign of proficiency in a language. During the film, Banks even mentions the Sapir-Whorf hypothesis by name as she talks to Dr Donnelly and reveals her mind disturbances (Heisserer, 2016; Villeneuve, 2016). However, there are expected human limitations as she keeps recounting in the book:

Even though I'm proficient with Heptapod B, I know I don't experience reality the way a heptapod does. My mind was cast in the mold of human, sequential languages, and no amount of immersion in an alien language can completely reshape it. My worldview is an amalgam of human and heptapod (Chiang, 1998, 140).

At this point, Chiang seems to be trying to make his story sound a bit more plausible, realistic and scientifically oriented, a believable fake. This concern is not shared in the film, since Louise assumes the role of the saviour of humanity, interfering with the sequential futuristic events adding an essential cinema science fiction/fantasy 'flavour' to the plot, common to popular culture. It seems reasonable that Louise cannot get to the same level of the nonlinearity of time as the Heptapods, simply because human physiology is drastically different from that of the aliens:

Seven lidless eyes ringed the top of the heptapod's body. It walked back to the doorway from which it entered, made a brief sputtering sound, and returned to the center of the room followed by another heptapod; at no point did it ever turn around. Eerie, but logical; with eyes on all sides, any direction might as well be 'forward' (Chiang, 1998, p. 97).

Not leaving the plausibility concerns completely behind, here Chiang seems to be trying to extrapolate on the Sapir-Whorf hypothesis associating the language features of a being to all aspects of its physical characteristics. That makes not only much sense but also is coadunate with scientific thought; it is not that language reshapes physiology; it actually evolves accordingly. The next quotation clarifies a little bit what we are implying here:

"So they can read a word with equal ease no matter how it's rotated". Gary said. He turned to look at the heptapods, impressed. "I wonder if it's a consequence of their bodies' radial symmetry; their bodies have no 'forward' direction, so maybe their writing doesn't either. Highly neat." (Chiang, 1998, p. 106, marks in the original)

It is really intriguing! The implication of that may be that the learning of the alien language could make a pre-existing but dormant aspect of human cognition accessible. Opposing the idea of word destruction in Newspeak in order to refrain people from thinking what was not desirable to the Party, the new language would provide Banks with a piece of mental equipment to use a segment of her mind that had always been there but had never been accessed (Adger, 2017). This is more in the line of what is told in *Native Tongue* and *Babel-17*.

This same implication is corroborative with the Heptapods' claim that they have brought a gift, a tool with them for humankind to use, which in the film happens in exchange for humankind's help in 3,000 years. "It's their language. [sic] They gave it all to us", says Louise in ecstasy as she realizes what the heptapods came here to do" (Chiang, 1998, p. 115, all marks in the original). The gift-exchanging idea is also present in the book as it is in the film, but the gift left by the Heptapods is not disclosed in Chiang's text. There is a mention of multiple occasions in which they supposedly exchange gifts. In most opportunities, the Heptapods 'give out' information and knowledge already known to human scientists. The aliens routinely only demonstrate their notations on physics and mathematics of the data humans share with them, instead of partaking anything new. It is like performing in a play according to Louise (Chiang, 1998).

The idea of acquiring such a skill only by learning a different language, be it as alien and exotic as it might, does sound absurd and implausible, yet, it does find some connexion with one of the examples given

in the previous topic, as previously demonstrated. Moreover, Stockwell quite appropriately remarks, it must be taken into account that “[...] the literary context is an artistic one, where poetic license ought to be allowed” (Stockwell, 2006, p. 9). Science fiction texts, however, are precisely about extrapolating science, usually Physics, but not only, to the point of escaping what is viewed as actuality. Fictional extrapolations in the field of linguistics, for some reason, appear to be more inflexibly analysed than equivalent conjectures in other areas of knowledge.

The “[...] debates over linguistic patterns adopted by literary writers become very vehement, as if the language itself, even though imaginary in origin, has a status and reality of its own, and a life beyond the world in which it belongs [...]” (Stockwell, 2006, p. 9). Cheyne (2008, p. 391) agrees while quoting Suzette Haden Elgin by saying that “[...] the grammar descriptions of ET languages provided in science fiction are, most of the time, grossly unscientific or they perpetuate the worst myths of traditional grammar and language study on Earth”.

Julie Johnson (1983, p. 217) makes a critical analysis on the matter of the typical scientific unorthodoxy, more peculiarly in linguistics. She reasons that “[...] the arts are influenced by science through its philosophical implications, not its mathematical proofs”. Consequently, the implications may not always fit the facts as science considers them, “[...] but the influence [of the facts] is nonetheless real [...]” and substantial (Johnson, 1983, p. 219). In this case, the metaphysical implications of scientific facts and theories are more critical to reasoning, imagining and fantasising than the precision in application or interpretation. After all, the purpose of science and arts is not as antagonistic as some may think; it is more of organising experiences from distinct perspectives, but always so that they have meaning. That is one of the main features that sets the texts apart from pure fantasy and defines them as science fiction.

Final considerations

All that satisfactorily displays reasons why the Sapir-Whorf hypothesis has long been a target of speculative fiction since extrapolating on that thoughtful and imaginative theory creates the possibility of attaining a new way of thinking, or of becoming more than human. It is no surprise that most of the science fictions featuring an invented tongue as its narrative framework adopts just the linguistic relative view of the relation between language and reality. Since the language one speaks structures and even limits its speaker's view of reality or, be that as it may, their entire way of thinking, language can serve the purpose of indirectly defining how characters perceive or interact with their own societies. As such, it is an incomparable means of describing an invented nation or race; *1984*, written by George Orwell (1949), explores it; Suzette Haden Elgin's Láadan in *Native tongue* (1982) approaches it; Ursula K. Le Guin's Pravic in *The Dispossessed* (Le Guin, 1974) is yet another example, and so is it with *Story of your life* and *Arrival*.

Invented languages have an indexical function, which is to support the construction of the fictional world and raise the reader's sense of its believability, meaning: that of the invented world. This utility is indexical for the reason that it is one of the chief apparatuses by which readers can define the degree of openness between their world and the fictional world. Artificially constructed writing systems have an emblematic function in the sense that the language itself represents a thematically relevant idea. For being originally a scientifically composed theory, the Sapir-Whorf hypothesis, even having fallen into disrepute, offers the bases for the functions and discussions delineated throughout this paper.

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