

## ENACTING CHRONOLOGY

### Language and time in Chiang's "Story of Your Life" and Villeneuve's *Arrival*

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**Abstract** – This paper examines Ted Chiang's novella "Story of Your Life" from the point of view of its treatment of the interconnected themes of language and time, and of its relation to the recent film adaptation *Arrival*, directed by Denis Villeneuve. Among the issues discussed is the debt owed by both Chiang's story and Villeneuve's film to the writings of Benjamin Lee Whorf and Jorge Luis Borges.

**Keywords:** Ted Chiang; "Story of Your Life"; Denis Villeneuve; *Arrival*; Eric Heisserer; Benjamin Lee Whorf; Jorge Luis Borges

*"We are told that he was once chastising a slave for stealing,  
and when the latter pleaded that it was his fate to steal,  
'Yes, and to be beaten too', said Zeno."  
(Diogenes Laertius 2005, p. 135)*

For readers interested in language not only in its strictly formal or even communicative aspects, but also in its relation to perception and cognition at both an individual and a cultural level, Ted Chiang's novella "Story of Your Life", originally published in 1998 and reissued in a number of venues since, provides plentiful food for thought. Winner of several distinguished literary awards for fantasy and science fiction in the years immediately following its initial publication,<sup>1</sup> Chiang's story has recently achieved further celebrity by virtue of the fact that it provides the point of departure for Eric Heisserer's screenplay for the film *Arrival* (2016), directed by Denis Villeneuve. Interestingly, "Story of Your Life"—like a number of other works by Chiang as well—would appear to draw some of its own inspiration from some of the more intellectually provocative stories of Jorge Luis Borges, an author who is at one point explicitly mentioned within its pages. This makes for an intriguing chain of cultural transmission, one involving a creative interaction between different literary genres and even imaginative mediums, which it will be part of my purpose in what follows to explore.

The plot of "Story of Your Life" is relatively simple, if it is seen in terms of the events of which it consists and not of the manner in which they are recounted, and for the purposes of exposition a linear timeline can be constructed without difficulty. The Earth is visited by a fleet of alien spaceships which, while themselves remaining in orbit, install instruments referred to as "looking glasses" at multiple locations over the planet. These function as "two-way communication devices, presumably with the ships in orbit" (116),<sup>2</sup>

<sup>1</sup> These include the Nebula Award for Best Novella, and the Theodore Sturgeon Award for the best short science fiction story published in English in the preceding year, both conferred in 1999.

<sup>2</sup> All references to "Story of Your Life" will be to the volume *Stories of Your Life and Others* (Chiang 2002).

and teams of experts, including physicists and linguists, are assigned to each of them with a view to establishing communication with the aliens and determining their intentions. The narrator of the story, a linguist named Louise Banks, is one such expert, working in collaboration with a physicist named Gary Donnelly. By means of the looking glass to which they have been assigned, they are able to interact with the creatures which, radially symmetrical in form and possessed of seven tentacle-like limbs, are referred to as heptapods. Louise makes considerable headway in communicating with the aliens once she realizes that their spoken and their written languages—designated Heptapod A and Heptapod B respectively—do not coincide with one another, and reflect indeed entirely different ways of representing reality. She herself becomes proficient at understanding and eventually at writing the alien script, and begins at the same time to absorb something of the worldview that script reflects, one which is radically different from that of human beings. The aliens never explain why they are visiting the Earth, and one day, after the last of a series of interchanges with the various teams distributed over the planet, they take their leave for no apparent reason. In the course of their mission a romantic attachment has developed between Louise and Gary, and some time after the departure of the aliens they will marry and have a daughter, who remains unnamed in the story. Eventually the marriage will founder, for reasons that are not revealed. Louise and Gary will both set up house with new partners, and communication between them will virtually cease. Their daughter will be killed in a rock climbing accident when she is twenty-five years old, and what is chronologically the latest incident recorded in the story—if we discount Louise’s cursory mention of her own death at an unspecified time in the future—is that of Louise and Gary travelling together to identify the body.

This is neither the order nor the manner in which events are presented to us however. The story begins and ends a few minutes prior to the conception of Louise’s daughter, an event that Louise, speaking in the present tense, knows is about to occur. Many of the narrator’s ensuing musings are addressed to that as yet unborn child, referred to in the future tense simply as “you”, although there are a number of reflections of a linguistic and philosophical character which are formulated in the present tense in the impersonal terms of formal discourse. In her narration Louise shifts forward and backward in time, the transitions often being triggered by associative links between recollections of events occurring in the past and in the future, as it appears that she “remembers” (this is the word she uses) the future as vividly as she does the past: “I know how this story ends ... I also think a lot about how it began” (112). There are anticipations from the beginning of the story that the child who is about to be conceived is not destined to live long, not long enough at least to have children of her own. In addition to sometimes difficult but just as often extremely gratifying episodes in her life as a mother, Louise also remembers the breakup of her marriage, and that both she and her husband will subsequently embark on new relationships with different people. The most painful incident she remembers is being summoned to identify the body of her daughter, an event that will take place more than twenty-five years hence. Interspersed with these previsions of the future are Louise’s recollections of the project in which she has participated in the past, when together with Gary Donnelly she painstakingly deciphered the language of the aliens and the mysterious script in which they expressed themselves. It is only gradually that we are able to assemble all of these fragments into a linear temporal sequence and understand the relation they bear to one another. Not until we are nearing the end of the novella, for instance, do we learn that Louise’s husband in the narrative present, referred to consistently as “your father” and “your dad” throughout the story, is none other than that Gary with whom she was working in the past.

What enables Louise to remember the future, it gradually emerges, is that she absorbed the aliens' mode of conceiving time at the same time as she was learning their written language. For the heptapods all history is simultaneous, and they are able to see what the future holds as well as what has already occurred. Louise contrasts this manner of perceiving time with that of human beings in the following terms:

Humans had developed a sequential mode of awareness, while heptapods had developed a simultaneous mode of awareness. We experienced events in an order, and perceived their relationship as cause and effect. They experienced all events at once, and perceived a purpose underlying them all. (159)

What is implicit in this is the idea that the future, since it is knowable in advance at least by some of the intelligent entities inhabiting the universe, must in some sense be foreordained and therefore inalterable, and this in turn raises the issue of whether, or in what ways, it is meaningful to speak of free will. This venerable but for most people rather abstract philosophical problem takes on very tangible relevance for Louise once she has acquired the capacity to view reality as the heptapods do. Since she knows that her marriage is destined to fail, and since she knows also that her daughter will die at a tragically early age, the question arises of why, by marrying Gary and giving birth to a child, she should choose to participate in the trajectory of events that will necessarily have such unfortunate outcomes. But choose she does, notwithstanding her foreknowledge of what is to come. Not only does Louise accept the inevitability of what is fated to occur, but at the conclusion of the story there is an unmistakably affirmative tone to the words with which she tells her daughter that she has made the conscious decision to allow her to come into the world.

The plot of Villeneuve's film, solidly based though it is on Chiang's story, diverges significantly from it in a number of respects, as does the manner in which events unfold on the screen as compared with the page. The mysterious objects that suddenly appear on the earth, somewhat reminiscent of the featureless black monoliths in Stanley Kubrick's *2001: A Space Odyssey* – the influence of which can be felt at various points in the film – are not simply "communication devices" but actual spacecraft bearing alien occupants. The teams assigned to the objects enter these vessels and encounter the heptapods directly, though they remain separated from them by a transparent barrier. The personage identified as Gary in Chiang's story is renamed Ian in the film, and Louise's daughter too acquires a name. This is Hannah, which is significant because it is spelled the same way forwards and backwards, and therefore reflects the nature of time as Louise comes to understand it, as well as the manner in which the story itself is articulated. Since grammatical tense cannot be used for the purposes of temporal orientation as it is in Chiang's story, it is not clear at first that the scenes from Hannah's childhood, and those depicting her eventual death in consequence of a rare disease, belong to the future. For anyone who is not forewarned, indeed, the most natural assumption is that these are events that precede the arrival of the aliens, and it is only midway through the film that we begin to understand that the apparent flashbacks are really glimpses of what is to come. This means that the spectator of the film undergoes a process of temporal realignment comparable to that experienced by Louise herself when she begins to remember the future. Whereas the story both begins and ends with the moment prior to the daughter's conception, the film only concludes with that moment, whereas it commences with the recollections, which are in fact anticipations, of Hannah's childhood, final illness, and death. It also appears that there is a specific event that will trigger the rupture between Louise and Ian. Louise remembers explaining to her daughter that she knows something that is destined to happen, and that

when she told her father he said she had made the wrong choice. That something concerns the disease which will eventually kill Hannah, and the choice referred to is evidently that of deciding to have a child fated to such an early death.

As is only to be expected given the nature of the medium, not to mention the ineluctable exigencies of the box office, the story in the film is more orientated towards action and the generation of suspense than is the case with the story, which is more subdued and meditative in atmosphere. The arrival of the aliens provokes escalating violence in the world as people feel increasingly menaced, something that does not occur in the story. The hysteria reaches the point that a group of renegade soldiers at the base at which Louise is working plant a bomb on the alien vessel just before Louise and Ian board it. The heptapods anticipate the danger and thrust Louise and Ian violently away from the vicinity of the bomb immediately before the explosion occurs, and it later transpires that one of them has been fatally wounded by the blast. The vessel puts itself out of reach of further human aggression by stationing itself high above the ground, but sends down a pod in order to allow Louise to make one final visit. In the course of this last encounter Louise learns that the heptapods are attempting to assist humanity, and that some time in the far distant future it will be humanity that does as much for them. The surviving heptapod also tells her that she too has learned to see the future as the heptapods do, and that this capability, made possible for her by the acquisition of their language, is a “weapon” she must somehow use. Meanwhile, however, the various nations involved in the project of talking to the heptapods cease to communicate with each other, as some of them decide to take military action against the aliens. Some of those involved in the project realize that the point of the aliens’ intervention in human affairs is precisely to oblige the nations of the world to communicate with one another, but in the meantime events are precipitating towards a crisis that makes this impossible. The Chinese military chief General Shang mobilizes his forces and issues an ultimatum to the aliens, and other countries follow suit. It is Louise who manages to salvage the situation by speaking to Shang on a satellite phone, spontaneously dialling a number she was unaware of possessing, and telling him something in his own language that defuses the situation. Shang will unilaterally decide to order his forces to stand down, communication is restored between the nations, and the alien spacecraft will vanish. Some eighteen months later Louise encounters Shang at a peace conference, and he tells her that it is she who succeeded in changing his mind by phoning his private number. When she tells him that she does not know this number he shows her his phone, telling her that “Now you know”,<sup>3</sup> and adding that although he does not understand how her mind works he believes that it was important for her to see it. He also tells her that “I will never forget what you said ... You told me my wife’s dying words”, and he proceeds to repeat those words to her in her ear. These, it turns out, are the crucial words that Louise has spoken to Shang on the phone eighteen months earlier, and thus it is that she and Shang have between them effectively created the past that has made possible this present.

Among the themes addressed in both the story and the film are what might generically be described as the problem of communication, the manner in which language encodes and perpetuates ways of perceiving and conceiving reality, and the nature of time and the related issues of free will and predestination. The issue of communication is perhaps that which most immediately springs to the eye, although it is developed somewhat differently in “Story of Your Life” and in *Arrival*. Since both works are

<sup>3</sup> All transcriptions from the soundtrack of *Arrival* are my own.

concerned with the efforts of a linguist and translator to understand and make herself understood by creatures inhabiting a linguistic universe entirely different from her own, it is in this activity that metaphorical implications concerning the problems besetting communication in general are most obviously to be sought. What both works are concerned with, in different ways, are the obstacles impeding communication, and the manifold risks attendant on the failure of communication. In "Story of Your Life" this failure is chiefly manifest in the sphere of interpersonal relations, as the story illustrates some of the many ways in which individual human beings are insulated from one another, and unable to converse even when they ostensibly share a common language. This appears even in comparatively minor details. When Louise meets a representative of the military named Colonel Weber, for instance, she says that "I could see he wasn't accustomed to consulting a civilian" (114). She remembers various episodes of mutual incomprehension between herself and her future daughter, and that there will be an "asymmetry in our relationship" (143). She confesses that she will not understand the "fascination with money" that her daughter will develop, and her consequent career choice as a financial analyst, although she will respect her decision and admits that similar misunderstandings arose with her own mother (135-36). However intimate they are becoming at the personal level, Gary and Louise too realize that they belong to what are essentially different worlds of thought, Gary confessing at one point that he is having difficulty learning the language of the heptapods because "it's too foreign for me", and Louise similarly acknowledging that "I've given up on trying to learn the mathematics" (148). Once we are apprised that the Gary of past events is also the husband from whom Louise will separate in the future, this sense of the communicative divide separating individual human beings becomes even more acute.

The unwillingness of the physicist to learn languages, and the unwillingness of the linguist to learn mathematics, is in some ways reminiscent of the "two cultures" controversy that raged in the early nineteen sixties in the aftermath of the famous Rede Lecture of 1959 in which C.P. Snow described two intellectual communities which, to the detriment of social development, "had almost ceased to communicate at all" (Snow 1969, p. 2).<sup>4</sup> In Villeneuve's *Arrival* this division is reprised in somewhat different terms in the relation between the linguist Louise and the physicist Ian, and is encapsulated in an emblematic episode occurring near the beginning of the film. Louise and Ian first meet on a military helicopter bearing them to the site of one of the alien spacecraft, and Ian is saying something to her that Louise cannot hear over the noise of the engines. She is only able to understand him when she dons a pair of headphones, these constituting one of the recurrent images in the film, as are various other communications devices that modern technology makes available. Ian is reading an excerpt from a book in which Louise has expressed the view that "language is the foundation of civilization. It's the glue that holds the people together. It's the first weapon drawn in a conflict"—the use of the word "weapon" in connection with language being significantly premonitory of subsequent developments. But Ian does not agree with her, his own conviction being instead that the cornerstone of civilization is not language but science. He has drawn up a list of questions to ask the aliens, most of them of a scientific and technological nature, and Louise asks a trifle impatiently: "Why don't we just talk to them, before throwing math problems at them?". Whereas Ian sees language as an instrument for eliciting information, Louise sees

<sup>4</sup> Snow's lecture, subsequently published as *The Two Cultures and the Scientific Revolution*, and in expanded form as *Two Cultures: and A Second Look*, supplied a catchphrase that has often been reiterated since.

it in relational terms. Colonel Weber, overhearing this exchange, says that this is why they have both been enlisted into this mission, implying that both modes of conceiving communication are necessary, although, as it turns out, he is himself more interested in obtaining information from the aliens than in establishing any relation of reciprocity with them.

If in Chiang's story the problem of communication is chiefly enacted in the realm of interpersonal relations, in Villeneuve's film it is projected onto the stage of world events. As tension intensifies all over the planet, the countries which have formerly been cooperating in the effort to communicate with the aliens sever video and radio contact with one other. Louise's unit also isolates itself from the rest of the world, notwithstanding Louise's protest that "we need to be talking to each other". But a contrary impetus is also at work. It is the scientist Ian who makes a breakthrough in deciphering a final dazzling array of glyphs that the heptapods have produced on the occasion of their last visit to the ship, and understands that what it means is that "we are part of a larger whole". Louise infers from this that the heptapods are endeavouring "to force us to work together for once". The problem is how to restore communications with the former allies with whom they have by now lost contact: "What we need is to get all the other nations online before one starts a global war". Following a private intuition, Louise goes alone to the alien ship, where she has her final revelatory confrontation with the heptapod she calls Costello, and is given to understand that by learning to see the future she has gained a capability which she must use to save mankind. She will employ that capability when she seizes a satellite phone she is not authorized to use and puts through the call to General Shang that will save the world from catastrophe, repeating words that she remembers from the future and that have an intimately personal meaning for him.

One problem addressed by both Chiang's story and Villeneuve's film is that of sufficiently understanding the context in which communication takes place as to be able to comprehend the meaning of the utterances being produced, and even the precise reference of the words being used. In a certain sense this is even reflected in the way the titles of both Chiang's story and Villeneuve's film alter their meanings as referential frameworks change. The phrase "story of your life" assumes different connotations once we know something of the circumstances leading up to the conception of the future child: it is more the story of how she would come to be than of what she would do in the course of her brief life. And the title *Arrival* similarly takes on a new resonance in the light of our knowledge, coming at the end of the film, that Louise is planning to have a child.<sup>5</sup> Both Chiang's story and Heisserer's screenplay have Louise citing the story, famous though almost certainly apocryphal, of a misunderstanding that arose during James Cook's meeting with aborigines on the Queensland coast of Australia in 1770. Chiang's version is as follows:

One of the sailors pointed to the animals that hopped around with their young riding in pouches, and asked an aborigine what they were called. The aborigine replied, "Kanguru". From then on Cook and his sailors referred to the animals by this word. It wasn't until later that they learned it meant "What did you say?" (120-21)

In "Story of Your Life" this anecdote will summon up to Louise's mind a future episode in which her daughter will not understand the difference between the words "maid" and

<sup>5</sup> The title is in fact displayed again at the end of the film, which in this respect at least returns to its point of departure.

"made" and will therefore misconstrue the meaning of the expression "maid of honour" (121). Later she will remember another occasion in which her daughter and a friend will convey to one another their impressions of a man who is courting Louise by means of coded language, ostensibly referring to the weather, that the person who is the real object of their comments does not understand (123-24). Chiang's use of the ambiguity of language as a metaphor for the possibility of perceiving reality in different and mutually exclusive ways will be discussed later.

The problem of needing to establish a communicative context in order to clarify meanings presents itself in *Arrival* in a somewhat different form. At the beginning of the film Colonel Weber interviews Louise in her office, and when he asks her to translate from an audio file recorded during an encounter with the aliens Louise tells him that she would need to interact with the speakers to understand what they were saying. Dissatisfied with this response, Weber is preparing to consult a certain Danvers at Berkeley, and Louise suggests that he ask this individual what the Sanskrit word for "war" is, and its translation. After Weber has interviewed Danvers, he tells her that the word is "Gavisti", and that "he says it means an argument". Louise informs him that what the word actually means is "a desire for more cows", a reply which satisfies the colonel to the extent that it is she who is recruited to decipher the alien language. This incident is premonitory of things to come. Later in the film, Louise is asked to translate a conversation in Mandarin and picks up the words "suits, honour, flowers". She recalls that these are the names of tile sets in Mahjong and wonders whether the Chinese are "using a game to converse with their heptapods?". This becomes of vital importance because, as Louise explains to Colonel Weber, "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 ..." And the colonel completes her thought: "Everything's a nail." The problem becomes even more urgent when Louise asks one of the heptapods what their purpose is in coming to the Earth, to which the answer is "Offer weapon". Louise later says that "we don't know if they understand the difference between a weapon and a tool. Our language like our culture is messy and sometimes one can be both". Everything hinges upon what the aliens mean by the word "weapon", since it is the phrase "Use weapon" that has provoked the Chinese leader into withdrawing from the international mission, declaring that he no longer trusts the aliens who seek to divide humanity. During their final interview on board the alien ship, the heptapod that Ian and Louise have decided to nickname Costello says that "Louise has weapon", and urges her to "Use weapon". It is at this point that Costello explains what their purpose is: "We help humanity ... In three thousand years ... we need humanity help". When Louise asks how it can know what will occur in the future Costello replies that "Louise sees future ... Weapon opens time". It is shortly after this that Louise, finding herself able to understand the alien script, comprehends that "the weapon is their language. They gave it all to us".

In both Chiang's story and Villeneuve's film, language is bound up with worldview. In "Story of Your Life" Louise discovers that what the aliens use is "a semasiographic writing system", which "conveys meaning without reference to speech" and that "there's no correspondence between its components and any particular sounds" (131). What this means in effect is that, as Gary puts it, "their writing constitutes a completely separate language from their speech" (132), and one that is not bound by the sequentiality of spoken discourse.<sup>6</sup> To Gary's query as to why the heptapods should use

<sup>6</sup> Chiang plays with the idea of such languages, independent of speech and therefore unencumbered by its constraints, in another story, entitled "Understand", first published in 1991. In this work the protagonist,

two languages when one would suffice Louise replies that for them “writing and speech may play such different cultural or cognitive roles that using separate languages makes more sense than using different forms of the same one” (132-33). Proposing the word “semagram” to describe the glyphs used in Heptapod B, since neither “logogram” nor “ideogram” adequately expresses their function, Louise describes this written language as follows:

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 our subject-predicate pairings neatly to make sentences. A “sentence” seemed to be whatever number of semagrams a heptapod wanted to join together (134)

What becomes increasingly apparent is that the heptapods’ script reflects a manner of perceiving the world which is profoundly different from that of human beings, and that it is for this reason that little progress is being made in trying to communicate notions of mathematics and physics: “For anything remotely abstract, we might as well have been gibbering” (136). At the same time, certain ideas that are difficult to grasp for human beings seem to be readily accessible to the aliens. As an instance of this, Gary demonstrates to Louise, by means of diagrams that are a somewhat unusual appurtenance to a science fiction story, what happens when a ray of light passes from air to water and changes direction in consequence of the different refractive index of the two mediums. He explains that “the route that the light ray takes is always the fastest possible one. That’s Fermat’s principle of least time” (141). Surprisingly, the heptapods have indicated their understanding of this, although a complex calculus is needed to describe it mathematically. Learning that concepts in physics that were fundamental for the human mind were difficult for the heptapods, but also that the contrary was the case, Louise wonders “what kind of worldview did the heptapods have, that they would consider Fermat’s principle the simplest explanation of light refraction?” (144). Here we are beginning to edge towards the Whorfian notion of cultural worldviews or *Weltanschauungen* correlated in some way with the languages spoken in different speech communities.

Louise continues to pursue this avenue of inquiry by analyzing not only the semagrams in their finished state, but also the process by which they are produced. She realizes that “the heptapod had to know how the entire sentence would be laid out before it could write the very first stroke” (146-47), and discovers in this a surprising analogy with what Gary tells her about Fermat’s principle. Gary says that “you’re used to thinking of refraction in terms of cause and effect: reaching the water’s surface is the cause, and the change in direction is the effect. But Fermat’s principle sounds weird because it describes light’s behaviour in goal-oriented terms” (148). He goes on to say that “while the common formulation of physical laws is causal, a variational principle like Fermat’s is purposive,

endowed with hormonally enhanced intelligence, dedicates himself to devising an artificial language which he describes as follows: “It is gestalt-oriented, rendering it beautifully suited for thought, but impractical for writing or speech. It wouldn’t be transcribed in the form of words arranged linearly, but as a giant ideogram, to be absorbed as a whole. Such an ideogram could convey, more deliberately than a picture, what a thousand words cannot. The intricacy of each ideogram would be commensurate with the amount of information contained; I amuse myself with the notion of a colossal ideogram that describes the entire universe” (Chiang 2002, p. 63). It is perhaps worth noting that in a brief article published in *The New Yorker* in 2016, Chiang speculates on how differently Chinese culture might have evolved if the ancient Chinese had developed a phonetic rather than a logographic writing system (Chiang 2016, p. 77).



almost teleological" (148),<sup>7</sup> and this provides Louise with her clue: "I thought to myself, *the ray of light has to know where it will ultimately end up before it can choose the direction to begin moving in*. I knew what that reminded me of" (149). There is in another words a congruence between the process involved in producing a semagram, which requires prior knowledge of the end result even before the first stroke is begun, and the conception of a ray of light as somehow "knowing" its destination before commencing its journey. The aliens can understand Fermat's principle because they themselves think in such a manner, and this is evidenced in the way they produce their written language.

Louise sets out to learn Heptapod B, and teaches herself to produce semagrams in much the same way as the aliens do, simply drawing the strokes that will combine to form the final sentence without attempting to plan the separate steps of the process. But as she is proceeding she becomes aware that to the degree she is becoming proficient in its use "Heptapod B was changing the way I thought" (151):

As I grew more fluent, semagraphic designs would appear fully-formed, articulating even complex ideas all at once. My thought processes weren't moving any faster as a result, though. Instead of racing forward, my mind hung balanced on the symmetry underlying the semagrams. The semagrams seemed to be something more than language; they were almost like mandalas. I found myself in a meditative state, contemplating the way in which premises and conclusions were interchangeable. There was no direction inherent in the way propositions were connected, no "train of thought" moving along a particular route; all the components in an act of reasoning were equally powerful, all having identical precedence. (151-52)

This enables Louise to understand the difference between the human and heptapod visions of the world:

When humans thought about physical laws, they preferred to work with them in their causal formulation. I could understand that: the physical attributes that humans found intuitive, like kinetic energy or acceleration, were all properties of an object at a given moment in time. And these were conducive to a chronological, causal interpretation of events: one moment growing out of another, causes and effects creating a chain reaction that grew from past to future.

In contrast, the physical attributes that the heptapods found intuitive, like "action" or those other things defined by integrals, were meaningful only over a period of time. And these were conducive to a teleological interpretation of events: by viewing events over a period of time, one recognized that there was a requirement that had to be satisfied, a goal of minimizing or maximizing. And one had to know the initial and final states to meet that goal; one needed knowledge of the effects before the causes could be initiated. (154-55)

Since she is a linguist, it is not surprising that Louise should draw not only her conceptual vocabulary, but also her metaphors and analogies, from the field of linguistics, and some are remarkably suggestive ones. As has already been mentioned, the issue of the ambiguity of language has already arisen at several points of the story, in circumstances that make it clear that it is only with reference to context that precise meanings can be established. Louise makes this ambiguity a metaphor for the nature of reality itself, but at the same

<sup>7</sup> Gary's account of these two ways of thinking about the phenomenon of refraction echoes the terms of the epistolary skirmish that took place in the 1660s between Pierre de Fermat and the Cartesian Claude Clerselier, who objected that "the principle upon which you build your proof, namely that nature always acts by the shortest and simplest ways, is but a moral principle, not a physical one", and that this principle implies the existence of "some kind of awareness in nature; and by nature, we mean here only that order and that law which are established in the world as it is, and act without forethought, without choice, and by a necessary determination" (quoted in Ekeland 2006, pp. 54-55). An interesting account of this debate is to be found in Ekeland 2006, pp. 50-57.

time denies the possibility of referring to context in order to arrive at a single unitary interpretation. A structurally ambiguous sentence such as “The rabbit is ready to eat” (this is Louise’s own example) can be construed in two very different ways, and “only context could determine what the sentence meant” (158). But the ambiguity of the universe is irreducible. Returning to the phenomenon of what happens when a ray of light strikes water obliquely, Louise explicates this idea as follows:

Explain it by saying that a difference in the index of refraction caused the light to change direction, and one saw the world as humans saw it. Explain it by saying that light minimized the time needed to travel to its destination, and one saw the world as the heptapods saw it. Two very different interpretations.

The physical universe was a language with a perfectly ambiguous grammar. Every physical event was an utterance that could be parsed in two entirely different ways, one causal and the other teleological, both valid, neither one disqualifiable no matter how much context was available. (158-59)

When the ancestors of humans and heptapods first developed consciousness, Louise concludes, “they both perceived the same physical world, but they parsed their perceptions differently; the world-views that ultimately arose were the end result of that divergence” (159).

Villeneuve’s *Arrival* cannot of course reproduce Louise’s discoveries as Chiang describes them. At least to some degree, the film gets around this problem through the stratagem of incorporating a kind of documentary presentation of the results of the research being pursued by Louise and the other linguists involved in the project. The narrating voice, echoing Louise’s insights in “Story of Your Life”, informs us that “there is no correlation between what a heptapod says, and what a heptapod writes”, and that “unlike all written human languages, their writing is semasiographic. It conveys meaning, it doesn’t represent sound”. And the voice goes on to add that “unlike speech, a logogram is free of time” and that “like their ship, or their bodies, their written language has no forward or backward direction. ... Which raises the question: ‘Is this how they think?’”. The question of the kind of relation that exists between language and thinking processes is thus emerging into ever greater prominence, and if Chiang’s story implicitly invokes the Sapir-Whorf hypothesis without actually citing it overtly, Villeneuve’s *Arrival* is much less guarded. In the course of a conversation with Louise Ian says that he has been reading up on the idea that “if you immerse yourself into [sic] a foreign language ... you can actually re-wire your brain”. Louise helpfully informs him that what he is referring to is the Sapir-Whorf hypothesis, and that this is “the theory that the language you speak determines how you think”. Ian adds that “it affects how you see everything”, whereupon he asks Louise: “are you dreaming in their language?”. By this time the spectator of the film will have become aware that Louise is not only dreaming, but remembering when she is fully awake as well, events that will occur in the future. Later, in speaking of the heptapod script to Colonel Weber, she will explain that “if you learn it, when you really learn it, you begin to perceive time the way that they do. So you can see what’s to come. Look, time ... isn’t the same for them. It’s non-linear”.

As Heisserer’s Louise makes explicit if Chiang’s does not, the theory that lies behind all this is that of what Benjamin Lee Whorf called his “linguistic relativity principle”, according to which “users of markedly different grammars are pointed by their grammars toward different types of observations and different evaluations of externally similar acts of observation”, with the consequence that they will arrive at “somewhat different views of the world” (Whorf 1959, p. 221). In a famous discussion of the Hopi Indians entitled “An American Indian Model of the Universe”, first published in 1950 but

probably written around 1936 (Carrol 1959, p. 18), Whorf asserts that "the Hopi language contains no reference to 'time', either explicit or implicit" (Whorf 1959, p. 58), and he then goes on to make a number of observations that bear comparison with some of those found in Chiang's novella and presumably influenced them:

Just as it is possible to have any number of geometries other than the Euclidean which give an equally perfect account of space configurations, so it is possible to have descriptions of the universe, all equally valid, that do not contain our familiar contrasts of time and space. The relativity viewpoint of modern physics is one such view, conceived in mathematical terms, and the Hopi Weltanschauung is another and quite different one, nonmathematical and linguistic. (Whorf 1959, p. 58)

This is similar to Louise's reflection, couched in linguistic metaphors that are second nature to her and that doubtless play no small part in helping her to define her own thinking, that "every physical event was an utterance that could be parsed in two entirely different ways, one causal and the other teleological" (159).<sup>8</sup> As Whorf asserts in a much-quoted passage, "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 impressions which has to be organized by our minds" (Whorf 1959, p. 213). Whereas Whorf maintains that this organization is effected "largely by the linguistic systems in our minds" (Whorf 1959, p. 213), Louise confines herself to exploiting the metaphoric possibilities latent in the word "parsed", although the fact that she herself begins to see the world differently once she learns Heptapod B implies a linguistic "determinism" in some ways analogous to that which, whether correctly or not, is often attributed to Whorf himself.<sup>9</sup>

There is however another writer who lies behind Chiang's story, not only as regards its interest in the relation between language and thought but in other respects as well. This is Jorge Luis Borges. Borges's story entitled "Tlön, Uqbar, Orbis Tertius", published in *The Garden of Forking Paths* in 1941, describes an imaginary planet named Tlön whose inhabitants believe that reality exists only in the mind, and explains how this worldview and the language spoken on the planet are closely bound up with one another:

The nations of that planet are, congenitally, idealist. Their language and those things derived from their language—religion, literature, metaphysics—presuppose idealism. For the people of Tlön, the world is not an amalgam of *objects* in space; it is a heterogeneous series of independent *acts*—the world is successive, temporal, but not spatial. There are no nouns in the conjectural *Ursprache* of Tlön, from which its "present-day" languages and dialects derive: there are impersonal verbs, modified by monosyllabic suffixes (or prefixes) functioning as adverbs. For example, there is no noun that corresponds to our word "moon",

<sup>8</sup> Whorf argues that the Hopi metaphysics "imposes upon the universe two grand cosmic forms" which he calls "*manifested*" or objective and "*manifesting*" or subjective. For the Hopi, Whorf argues, "there is no temporal future; there is nothing in the subjective state corresponding to the sequences and successions conjoined with distances and changing physical configurations that we find in the objective state" (Whorf 1959, p. 59, p. 62). This might be adumbrated in "Story of Your Life" in the difference between Heptapod A and Heptapod B.

<sup>9</sup> This is not the place to enter into the merits of Whorf's theses, which have been fiercely contested from a number of quarters. Suffice it to say that, as has been argued by George Steiner among others, inasmuch as each work of literature generates a world of its own, within which thought and language are inextricably connected with one another and mutually reinforcing, "our perceptions of language *in literature* are relativist and, if the term may be allowed, *ultra-Whorfian*" (Steiner 1972, p. 27). In the case of Chiang's story, the world that is created is one in which—whether we acknowledge its validity or not—it happens to be a Whorfian perspective that prevails.

but there is a verb which in English would be “to moonate” or “to enmoon”. “The moon rose above the river” is *hlör u fang axaxaxas mlö*, or ... “Upward, behind the onstreaming it mooned”. (Borges 1998, pp. 72-73)<sup>10</sup>

In another story by Borges entitled “The Immortal”, published in *The Aleph* in 1949, a Roman named Flaminius Rufus encounters a troglodyte whom he names “Argos”:

I reflected that Argos and I lived our lives in separate universes; I reflected that our perceptions were identical but that Argos combined them differently than I, constructed from them different objects; I reflected that perhaps for him there were no objects, but rather a constant, dizzying play of swift impressions. I imagined a world without memory, without time; I toyed with the possibility of a language that had no nouns, a language of impersonal verbs or indeclinable adjectives. (Borges 1998, p. 189)

The affinities between this conception of time as a function of a thought world which is encoded in the grammatical features of a language, and Whorf’s account of linguistically constrained worldviews, are striking, and have been noted by more than one commentator.<sup>11</sup> Such a notion is also, of course, very similar to what Chiang is using as a plot device in “Story of Your Life”. In view of the title of Chiang’s story, it is curious, and perhaps not entirely fortuitous, that contained within one of the volumes shelved in the library described in Borges’s story entitled “The Library of Babel”, this too included in *The Garden of Forking Paths*, is “the true story of your death” (Borges 1998, p. 115).

Borges would also seem to have furnished much of the inspiration for some of the other meditations on time with which “Story of Your Life” is replete.<sup>12</sup> At one point in the story “The Garden of Forking Paths”, from which the volume in which it was published derived its title, a character refers to “that night at the centre of the *1001 Nights*, when the queen Scheherazade ... begins to retell, verbatim, the story of the 1001 Nights, with the risk of returning once again to the night on which she is telling it—and so on, *ad infinitum*” (Borges 1998, p. 125). Louise seems to be making oblique reference to this when she addresses the problem of whether it is possible to know the future, and points out that most people would probably reject the idea “because of free will” (156). She goes

<sup>10</sup> Cf. Louise’s rendering in Chiang’s story of the heptapods’ description of their planet as having two moons, one larger than the other, as “inequality-of-size rocky-orbiter rocky-orbiters related-as-primary-to secondary” (146), and of “process create-endpoint inclusive-we’, meaning ‘let’s start’” (167). *Arrival* emulates this in phrases such as “Abbot is death process”.

<sup>11</sup> See for instance Burgess 2008, p. 98, and Mikkelsen 1976, pp. 92-98. Mikkelsen acknowledges that “it is doubtful that Borges had read Whorf’s treatise on the Hopi Indians before he wrote ‘Tlön, Uqbar, Orbis Tertius’”, but suggests in a note that “Whorf may have given a lecture pertaining to Hopi linguistics which Borges could have attended” (Mikkelsen 1976, p. 95, p. 95n).

<sup>12</sup> Borges’s essay “A New Refutation of Time” argues that the concept of time is vulnerable to the same critique as was applied to those of the object and the subject by George Berkeley and David Hume respectively (Borges 1999, pp. 317-32). In several places Borges expresses an interest in the theories of J.W. Dunne, who in his book *An Experiment with Time* argued that in a higher reality than that human beings normally perceive all moments in time are simultaneous, and that what we call time is merely an illusion created by human consciousness. Dunne also believed in precognitive dreams which afford sporadic access to this higher reality (Dunne 1929). See Borges’s essay “Time and J.W. Dunne” (Borges 1999, p. 217-19), and the reference to Dunne in his fictional essay “A Survey of the Works of Herbert Quain” (Borges 1998, p. 108). Dunne’s theories had a considerable impact on such writers as H.G. Wells and J.B. Priestley, the latter of whom dedicates an entire chapter to them in his book *Man and Time* (Priestley 1968, pp. 265-94), and in view of the occasional points of contact between Dunne’s theory of time and that articulated in “Story of Your Life” it would be interesting to speculate whether they might not have exerted a direct or indirect influence on Chiang himself.

on as follows:

I liked to imagine the objection as a Borgesian fabulation: consider a person standing before the *Book of Ages*, the chronicle that records every event, past and future. ... With magnifier in hand, she flips through the tissue-thin leaves until she locates the story of her life. She finds the passage that describes her flipping through the *Book of Ages*, and she skips to the next column, where it details what she'll be doing later in the day: acting on information she's read in the *Book*, she'll bet \$100 on the racehorse Devil May Care and win twenty times that much. (156)

Louise's imaginary reader evades the snare of endless recursion set by the self-referencing book by skipping the passage describing her reading that book. When she chooses however not to make the bet that the book tells her she is destined to make, she finds herself embroiled in another logical quandary: "the *Book of Ages* must be right, by definition; yet no matter what the *Book* says she'll do, she can choose to do otherwise" (156). Louise muses that it might seem that "the existence of free will meant that we couldn't know the future. And we knew free will existed because we had direct experience of it. Volition was an intrinsic part of consciousness" (157). But then she asks herself "what if the experience of knowing the future changed a person? What if it evoked a sense of urgency, a sense of obligation to act precisely as she knew she would?" (157).

In Borges's "The Garden of Forking Paths", a story that is deeply interested in the relation between time, free will and destiny, the narrator remarks that "he who is to perform a horrendous act should imagine to himself that it is already done, should impose upon himself a future as irrevocable as the past" (Borges 1998, p. 121). Once he has chosen to perform an act, in other words, he should think and behave as if it were predetermined. In a certain sense, this is what Louise decides as well, though the acts she has in mind are very far from being "horrendous" ones. She says that the heptapods "are neither free nor bound as we understand those concepts; they don't act according to their will, nor are they helpless automatons" (162). What distinguishes the heptapods' mode of awareness, she says, "is not just that their actions coincide with history's events; it is also that their motives coincide with history's purposes. They act to create the future, to enact chronology" (163). In order to illustrate how both conceptions of agency might be admissible however much they seem to contradict each other, she invokes yet another metaphor, this being that of the phenomenon of multistable perception much cited in Gestalt psychology. She uses the example of an image that can be perceived in alternative ways, just as the universe itself can be "parsed" in different ways:

Freedom isn't an illusion; it's perfectly real in the context of sequential consciousness. Within the context of simultaneous consciousness, freedom is not meaningful, but neither is coercion; it's simply a different context, no more or less valid than the other. It's like that famous optical illusion, the drawing of either an elegant young woman, face turned away from the viewer, or a wart-nosed crone, chin tucked down on her chest. There's no "correct" interpretation; both are equally valid. But you can't see both at the same time. (163)

Louise finds herself borrowing yet other notions from the domain of linguistics, this time turning to her own purposes some of the key concepts of speech-act theory as she strives to comprehend the heptapod use of language. She raises the issue of why it is that the heptapods should exert themselves to use language at all, since they already "knew everything that they would ever say or hear" (163). The answer is that "language wasn't only for communication: it was also a form of action" (164). After regaling the reader with a concentrated lesson in speech-act theory, concluding with the statement that "with performative language, saying equalled doing", she says that "for the heptapods, all

language was performative. Instead of using language to inform, they used language to actualize” (164). And Louise goes even further. As she recognizes the script-like nature of a conversation she is having with a military officer, each step of which she is able to anticipate, “I suddenly remembered that a morphological relative of ‘performative’ was ‘performance’, which could describe the sensation of conversing when you knew what would be said: it was like performing in a play” (165). Thus “an utterance that was spontaneous and communicative in the context of human discourse became a ritual recitation when viewed by the light of Heptapod B”, and “like physical events, with their causal and teleological interpretations, every linguistic event had two possible interpretations: as a transmission of information and as the realization of a plan” (166).

Thus Louise has succeeded in finding common ground between some of the more recondite notions of physics and those of linguistics, and what becomes important, as will be the case in *Arrival* as well, is not so much the intellectual discoveries in themselves as how they will affect her personal life and outlook. One of the more significant divergences between the film and the story is that in the latter Louise says that “now that I know the future, I would never act contrary to that future, including telling others what I know: those who know the future don’t talk about it” (163). The Louise of *Arrival*, however, *will* disclose that future when she divulges to Ian what she knows about Hannah’s destiny. She anticipates telling her daughter that “I know something that’s going to happen. ... And when I told your daddy ... he said I made the wrong choice”. Though it is this decision that will lead to a rupture between Louise and Ian, and doubtless affect the future in various other ways as well, it too is presumably part of the script she must follow. About to commit herself to a course in life that will inevitably entail sorrow as well as joy, she declares that “despite knowing the journey, and where it leads, I embrace it. And I welcome every moment of it”. At the end of “Story of Your Life”, too, Louise is aware that the trajectory of her existence is predetermined and unchangeable, and not only does she accept this fact but she deliberately chooses to perform the role that has been allotted to her, to align her will with the dictates of destiny and “enact chronology” as the heptapods do. “From the beginning I knew my destination”, she says, evidently thinking of Fermat’s ray of light as it is perceived in teleological terms, “and I chose my route accordingly” (172). If she knows that the story of her own life has already been written, she also knows that it is she who will help to write it.

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