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An Alien & Film's Guide to Thinking in Multiple Dimensions

It's not often humans really consider the concepts of spacetime and dimensions outside of sci-fi or advanced science and mathematics. One such element of sci-fi which humans have long been enamored with is the concept of time travel. We all experience the constant march of time forward. Unlike space, which we are free to traverse as we wish (within limits), we are completely subject to the unwavering movement of time. Consequently, most humans also learn to think in the same way – through time. Many people think via an [internal dialogue](#) which is essentially a set of ordered thoughts that play out across time. In *The Story of Your Life*, Ted Chiang offers the idea that if humans learned to think non-linearly we could grow to perceive time non-linearly as well. Now, I still think this is a bit far-fetched, I don't think humans will ever be able to experience time non-linearly. That being said, I do think humans could learn to think less linearly, and there could be great merit in learning to do so. Analyzing how Chiang presents time, and how the alien's writing is portrayed in the book and contrasting it with how it's portrayed in the movie, will help allow us to consider thinking non-linearly.

If we ever wish to completely think non-linearly as the story portrays, we will have to start with what we already know: thinking linearly. This is hard to do with this story though due to the confusing manner in which it plays with time. With the end at the beginning and the beginning at the ending, it's hard to know exactly where to start dissecting this work. That being

said. I think starting with One of the primary defining moments in the story is a good jumping-off point. The point I'm referring to is when Dr. Louise Banks recognizes that the aliens' spoken language and written language are fundamentally different. Unlike most human languages, where the spoken version is simply a verbalization of our written language, the aliens' were not. In this scene, Banks points out that while spoken languages are necessarily single-dimensional (a stream of ideas through time), written languages aren't bound by that constraint as they have the freedom of the page to express multiple concepts simultaneously. It's this extra dimensionality that allowed the aliens in the story to experience time non-linearly.

Throughout the story, the Alien's Semasiographic writing is called just that – writing. Though this is may be accurate, it is not comparable to our writing system as mentioned above. One of the key points of the alien's language is that they are able to read each semasiograph simply by looking at it, whereas the humans had to decipher each section of it and reconstruct it in order to gain meaning from it. A more analogous system that humans use would be pictures. The all too common adage, a picture is worth a thousand words is actually quite apt in this case. One of the key benefits of a picture, compared to say a thousand words, is the amount of time it takes for humans to process what is happening in the picture. According to researches at MIT, humans can recognize a scene in as little as [13 milliseconds](#). In addition, just as the story makes a point of, it takes up two spatial dimensions in the same way the aliens samasiographs do.

This difference between spoken and written language is similar, in a sense, to the difference between written and recorded (i.e. video) language. In reality, video is more a combination of spoken and written languages. Each frame, being a picture, conveys multitudes of information in fractions of a second. The frames play one after another, a stream of

information in the same way a spoken language works, but with frames of information instead of words. This is essentially using three dimensions to convey information, the two spatial dimensions of each frame, plus the time as the third dimension. In addition, when adding the dimension of time you're able to add audio, which practically only conveys information in the time dimension. (This adds an element of processing akin to multithreading in computers, a common example of human "multithreading" is simply multitasking: being able to think about multiple things simultaneously.)

The film uses these advantages that video offers in order to make the story feel that much more immersive. The primary place these advantages are noticed, besides the obvious visual settings and sound effects, is the transitions between time present in the story. In the book, these transitions are often sharp jumps and make it feel like two completely different stories are being told. This makes it so that the reader doesn't realize that not only are these stories related but are happening in "real-time" for Dr. Banks. In the film, on the other hand, these transitions are practically seamless where audio from one time overlays images from another, or where an event in one time influences events in another. The effect of this on the audience is that it makes the idea that these scenes aren't just memories or another storyline, but rather at a different point in time more clear. Time in the film feels much looser compared to in the book. As the audience realizes what is happening with time in the film, it also affects how they perceive previous events in the film, such as the first scene of the birth and death of her child. This scene takes on a whole new meaning to the audience, as do the meaning behind various points in the film change as the film progresses. The film itself is not stable in time relative to the audience, it is able to go back and forth and change the audiences' perception of it.

In real life, images, and videos also play an important role in the way we think. It is much more convenient to imagine a picture of a mountain in your head than it is to imagine 1000 words describing a mountain. Not only is it harder to think of a thousand words, but it would also take so much longer to read, say, and process those words. In addition, you can't possibly keep all of those words in mind simultaneously while thinking about the mountain, whereas with a picture you can visualize the entire thing at once with ease. This ease that images and video provide is the primary reason that our memories are in this form instead of our language of writing. It is so much more efficient to store memories and ideas in this manner than to store long blocks of text detailing events. (This is one of the main concepts behind the [Method of Loci](#) or a mind palace)

The story uses this idea of storing memories as images to its advantage. Switching between times in both the book and the film implores the reader to view these as memories since that's what we're used to. We would never think that it would be the future, as we (obviously) can't visualize the future. The film is able to do this extremely well thanks to its ability to use visuals. The book still manages to do this quite well though, thanks to how it is written. As Dr. Banks begins to see the future, it feels like both experience and memory to her. The boundary between experiences and memories becomes blurred, and past, present, and future all begin to appear concurrent.

The story further plays with time beyond the transitions by using periodicity. The story begins with an ending: Dr. Banks' daughter dies just as the story begins. Similarly, it ends with the beginning of Dr. Banks and Dr. Gary Donnelly's marriage and soon the beginning of her daughter's life. This is also not far from where the story began. This creates continuity between

the beginning and end of the story, in addition to all throughout. This idea of periodicity is subtly repeated throughout the whole story in the alien's written language, which is presented as various symbols placed around a circle, which is renowned as a symbol of periodicity. This periodicity throws the reader/audience into a sense of confusion as to where they are within the confines of the story. At this point, they know how most of the story progresses and know what will happen next, however, due to the periodicity, there is no concrete, definitive point in time that they are in at any given point.

So after all this, how does Chiang's *Story of Your Life*, and the accompanying film *Arrival*, affect the way we think and communicate as humans? Obviously, by visualizing images or video in our head, we are in fact able to think in multiple dimensions, as the story suggests will allow us to experience time non-linearly. Unfortunately, that's not the case. But, we could still learn something from the alien's supposed language. Although we are able to imagine and think about things in multiple dimensions, this is primarily limited to visualizing physical objects, or events. We don't have set ways to visualize more abstract concepts such as continuity, or something being meta, or a million other concepts. We also don't have an easy, efficient way to communicate these visualizations. The aliens in the story were able to manipulate some sort of ink, or something in order to form their samasiographs. The best we are able to do is to demonstrate an action or present a premade visual. When something is often difficult to communicate through words, we find ourselves saying "let me just show you" as we know that visuals are much more efficient to convey and process information.

Although our standard communication does not perfectly have a visualized alternative, there is a language that does: Mathematics. The story makes reference to this fact too. The

easiest way to explain this is through an example. The idea of orthogonality (same as being perpendicular), is represented by the symbol \perp and has many visualizations, the most common being a right angle, or a corner of a cube. Not only is this somewhat abstract concept able to be visualized and expressed, but it can also be used to represent other abstract concepts, a common one being independence. Two vectors are considered independent if they form a right angle and two independent vectors are said to span two dimensions. So, if we apply this to what we have been discussing, the idea of thinking in multiple dimensions can be abstracted to a set of orthogonal, and thus independent vectors.

So, taking a cue from mathematics, we might be able to construct a full language that can be visualized just as the alien's language is. If we could then take this language and find a way to be able to easily communicate it to others in real-time without the need for premade visuals or physical demonstrations, then we would be able to communicate more complicated ideas with great ease and efficiency. Through the comparison of the film version of the story, to the written version of the story, we can garner an analogous version of the alien language: pictures. The power of pictures allows the film to feel so much more immersive than the written version. Pictures are also the foundation of our memories, which the stories use to their advantage. The immersion and reliance on human's perception of time and memories, allows the film to better portray the ideas of periodicity and concurrency that are ever-present throughout the story. Unlike the alien language, however, pictures are unable to communicate all ideas present in our written language. More abstract concepts with no obvious physical manifestation are void of any shared symbol for visualization. Mathematics, though, provides a possibility to create, or borrow symbols in order to construct a complete visual language. And who knows, maybe with the use

of a completely visual language, we might actually be able to experience time non-linearly just as the aliens do. But if you ask me, this is still just wishful time travel sci-fi.

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