Undergraduate

The Feasibility of Radically Translating Alien Language

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Language and Reality

The degree to which language shapes cognition, thought, and perception is an ongoing debate in the field of linguistics—a debate without clear consensus. Some veins of thought appear to believe that the relation between language and perception is so inextricable that they give form to one other. For example, the Sapir-Whorf Hypothesis (SWH) suggests that language, shaping cognition, is a filter of reality. Also called the Linguistic Relativity Hypothesis, the SWH postulates that language categorizes concepts into words and phrases, and people perceive the world through the lens of these categories. However, not every category translates perfectly between languages.[1]

As of 2010, there were 6,809 cataloged languages in the world.[2] With the consideration of widespread linguistic variation, the SWH presupposes that people who think and conceptualize their reality through these different structures must perceive their reality differently.

One of the most identifiable features of linguistic structure is its grammar. Across languages, there are many discrepancies between sentence structure, word formation, and much more. Two examples of languages that Whorf studied to further the SWH were "Standard Average European" (SAE) languages and Hopi, an Uto-Aztecan language.[1] SAE languages and Hopi have disparate approaches to referencing time. In SAE languages, events are characterized as occurring in a definite time marked with past tense—that they have occurred, are occurring, or will occur. Hopi language, contrastingly, characterizes events as an ongoing set of processes as opposed to definite. There is less of a distinguishable tense compared to SAE; rather, the time between the present and a previous event is expressed in terms of spatial distance from the speaker. The length of time between each event is determined by the length of the event and whether it is ongoing or completed.[3]

Whorf, upon studying this, claimed that there was a sense of "timelessness" to the Hopi language. Further linguistic investigations reveal that time is amply present in Hopi language, but there is certainly a difference between time awareness and reference between SAE languages and Hopi languages.[4]

The SWH claims that given the varying constructions of time within these languages, their native speakers will conceptualize events in relation to time differently. As Whorf claimed in his development of this hypothesis, "the world is presented in a kaleidoscopic flux of impressions which has to be organized by our minds—and this means largely by the linguistic systems in our minds."[1] Figure 1 provides another example of two different linguistics conceptualiza-
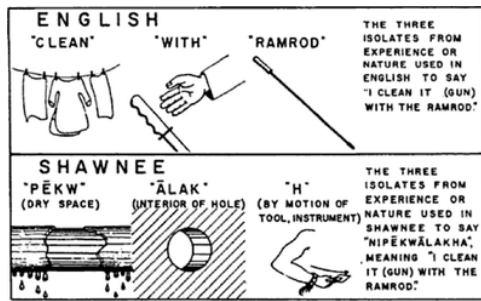
Figure 1: Whorf's illustration of two different linguistic conceptualizations of the same action. In English, we understand "clean with ramrod" with three isolates of experience. The language of Shawnee, contrastingly, uses three different isolates of experience to illustrate the same point, that being day space, interior of hole, and by motion of tool.

tions, this time between English and Shawnee.

Imagining Alien Language

Fictional accounts capitalize on the curiosity of the SWH, such as the science fiction film, *Arrival*, directed by Denis Villeneuve, and the short story it was based on, "Story of Your Life" by Ted Chiang.[5] The film follows linguist Dr. Louise Banks as she is tasked with translating an alien species's native language, which is radically unfamiliar to our established human languages. The alien language Heptapod is visually circular and doesn't necessarily start or end in one place, contrastingly to the linear languages we see among humans. There is no speech translation occurring in Heptapod. Instead, Dr. Banks becomes fluent in the written language of the Heptapods in order to discern

their purpose for being on Earth. This would be a case of radical translation, which philosopher Willard Van Orman defines as the translation of a completely unknown language with no historical or cultural links to familiar languages.[6]

Arrival takes the SWH in full stride. Eventually, when Dr. Banks has become almost entirely fluent in the language, it begins to alter her perception of reality on the basis of how the Heptapod language conceptualizes time. The film continuously shows clips of her future interjected into her present, which mirrors Dr. Banks' awareness of reality. Her knowledge of the future means she can alter the present accordingly. She now views her life in a circularly temporal format—not linear, but fragmented, where past, present, and future all overlap.[7]

The surplus of academic papers pub-

lished on the film's concepts underscore both the public and scientific interest in the SWH.[8,9,10] The film's use of the scientific field of linguistics to ground a fantastical concept—such as nonlinear perception—is relatively novel in science fiction, opening up different avenues for intellectual conversation and pursuits. However, the SWH runs the risk of being conflated in its association with *Arrival* and other fictional renditions of its applications. In reality, it is still bound within the limits of human language acquisition processes and how much our brains can support the understanding of linguistic structures.

The Neurological Limits of Human Language

Human brains are fine-tuned to adopt and develop the understanding of languages created by and for humans.[11] While there are some components of the language acquisition process that point to our perceptions not being completely consistent with reality, it is still the same neurological framework that underscores all humans' experience with language. As such, we can account for slight variations within conceptions, but are still limited by universal human neural processes.

A key debate in linguistics is the distinction between empiricism and nativism. Empiricism suggests that humans learn based on experience, essentially conditioning the individual into adopting a certain language's rules.[12] Contrastingly, nativism suggests that the ability to learn certain language rules universal to all humans is built into our brains, and we are biologically constrained by the possible forms human language could take.[11]

Nativist approaches put forth the fact that human evolution has only transpired over a relatively short amount of time, and in that development there emerged a "species-specific computational capacity for language" built on foundations of perceptual systems shared across all cognitive domains.[11] As such, infants are genetically endowed with a disposition to discern human language and speech.[12] With basic understanding of a universal grammar and rules for language, language variation is shaped through experience. Infants' hearing is conditioned by the speech sounds they regularly hear in their native language, so that they pick up contrastive phonemes—important differences in the smallest unit of speech

Figure 2: Dr. Louise Banks in Denis Villeneueve's Arrival, attempting to communicate to the Heptapods a linguistic concept that serves as foundation for their encounter.
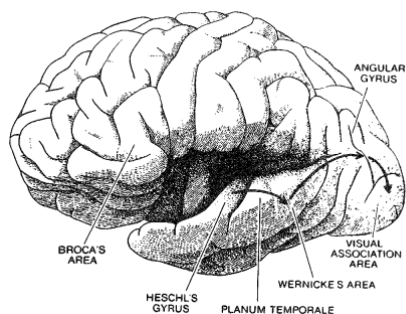
Figure 3: Behavioral neurologist Norman Geschwind's model of neural pathways involved in language processing and production. The human brain has evolved to supply us with adequate means of discerning and understanding our species's languages.

sound—that give meaning to words in their language. With this, contrastive phonemes unimportant to their native language start to fade, so that infants hear a warped acoustic reality that is fine-tuned to the understanding of their native language.[11]

The human brain is, therefore, endowed with a species-specific foundation that both hosts cognitive linguistic structures and highly specified acquisition processes for these distinctly human structures.

Translating Alien Language

In fictionalized applications of the SWH, such as the exaggerated version within *Arrival*, adopting a new linguistic structure must account for a brain equipped to handle that linguistic structure and its inherent perceptual alterations. To feasibly account for a radical translation—one that involves interpreting alien languages that are completely unlike our own—we assume that such a foreign language was developed by and for "brains" completely like ours.[13] We presume that our acquisition processes and our ability to map linguistic structures align.

Any translation that occurs between human languages is possible because we share certain basic forms of human behavior, and we share the same neural framework that hosts our maps of linguistic structures.[13] On the other hand, there is no guarantee that alien brains capable of viewing time non-linearly share an even remotely similar neurological framework. A language that intensely disturbs our fundamental perception of temporal reality is likely not one that would readily map onto our brains.

The SWH, as such, is limited by the perceptual abilities latent in human understanding—those granted to us at birth and those that help us to specifically understand human languages. The hypothesis generates supplemental intrigue in more subtle ways than radical translation, perhaps in the way it stimulates our imagination regarding the variety of human experience. In reality, the point of *Arrival* is not to radically translate the alien. It is, as Emily Alder says in The Conversation, about communicating with each other. "The film's message," she writes, "is that difference is not about body shape or colour but language, culture and ways of thinking. It's not about erasing that difference but communicating through it."[8]

The SWH allows us to dream a little more. When we previously thought our perception to be shared by the people around us, we feel more unique in assuming differently. The world becomes just slightly more vast in the knowledge that there are different ways to experience it—but even then, we all experience it, fundamentally, as humans.

Acknowledgements

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FEATURES

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