Jessica Coon: Linguistic consultant on Arrival

MEET THE PROFESSIONALS

Jessica Coon, Associate Professor of Linguistics at McGill University

What are your linguistics research interests?

My research is primarily in syntactic theory, which is the study of how words are built up hierarchically to form phrases and sentences. I have some specific interests within syntactic theory, including nominal case and agreement (the relationship between nouns and predicates), ergativity and split ergativity (a special pattern of how nouns relate to predicates), and verb-initial word order (languages in which the verb is ordered first in a sentence).

I arrived at these particular topics in large part through my work on languages of the Mayan family, especially Ch'ol and Chuj. There are thirty Mayan languages currently spoken in southern Mexico and Guatemala, and I was fortunate to have the opportunity to begin linguistic fieldwork on Ch'ol, a language of Mexico, while I was an undergraduate at Reed College. I continued this work during my PhD studies at MIT. Currently I am working on Chuj, a language spoken in the Guatemalan highlands, and also by refugees here in Montreal.

Working with endangered and under-documented languages has always been an important part of my work. For one thing, since linguists are interested in a theory of how *human language* works, it is important that we build and test our theories with information from a wide range of the world's languages – not just majority languages like English, French, and Mandarin. This work is increasingly urgent, since most of the world's roughly 7,000 languages are endangered or threatened to some degree. The study of endangered and under-documented languages can also have a positive impact on the communities where these languages are spoken, and collaborative linguistic fieldwork can help with everything from language visibility and status to the creation of descriptive and pedagogical materials.

How did you come to work on Arrival?

The movie was filmed here in Montreal and they were looking for a local linguist. First the filmmakers got in touch with my colleague here at McGill University, Morgan Sonderegger, a phonetician who studies speech sounds. He helped them develop the non-human sounds you hear in the film when the Heptapods communicate orally ('orally'?), as well as some of the visual spectrograms you see on

Scene from Arrival starring Amy Adams, Jeremy Renner and Forest Whitaker.

the computer screens in the military camp.

Next, they wanted to talk to someone who does linguistic fieldwork – someone who works with speakers of the world's understudied languages in order to document and analyze the grammars of these languages. Most of the world's languages – and perhaps extraterrestrial languages – don't have dictionaries, grammar books, or online descriptions. Field linguists like me and Arrival's Dr Louise Banks seek to understand how these languages work by recording and analysing texts, asking for translations when there is a common language, and trying to create new sentences in the language and asking speakers to provide judgements about whether the sentences sound right or not. In this way, fieldworkers are conducting miniature scientific experiments: we build a hypothesis about how the language works, and then we test our hypothesis by creating sentences to confirm or disprove it.

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In the film, this is the background that the fictional Dr Banks has, and this is why she is recruited to decipher the Heptapods' language. The filmmakers contacted me and asked me to read different drafts of the screenplay, work closely with the set-design team on the visual aspects of the film's linguistics, and to consult with Amy Adams about the character she would be playing.

The field linguistics in Arrival concerns the visual rather than the aural mode – was that your decision, and if so why?

Arrival is based closely on the excellent short story Story of Your Life by science-fiction writer Ted Chiang. The major plot elements in Arrival hew very closely to those of Chiang's story,

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so I can't take credit (or blame!) for any of the major themes.

Nonetheless, the choice to focus on the written language ('Heptapod B' in the original story) makes sense to me. One thing I really like about this movie is that the aliens are interested in talking to us, but they aren't humanoid creatures with two legs, two arms, and a human vocal tract (compare many of the talking aliens in Star Trek, Star Wars, Avatar, etc.). This makes the job of the linguist more challenging and probably more realistic: the sounds that the Heptapods make are completely non-human and not reproducible by Dr Banks. Of course, it's possible to record and play back sounds, but in order to interact naturally and quickly with the Heptapods in the way a fieldworker would want to, the written system appears to be more accessible. This is aided by the tablet technology we see in the film, the concept and visuals for which were created by Stephen and Christopher Wolfram, which she can use to piece together symbols from their parts.

The circular form of 'writing' used by the aliens in Arrival is unlike human language, and yet the linguist works out the system – how do you see the parallels between the alien and human languages in relation to phonology, morphology, syntax, etc.?

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Nobody will be learning Heptapod B the way they work to learn Klingon, Elvish, or Na'vi. These latter three are all examples of true 'constructed languages' – languages invented by knowledgeable language enthusiasts, called 'conlangers' (although there is overlap, most conlangers are not professional linguists, and most linguists are not conlangers). Conlangers work to create fictional but rule-based languages, which typically share commonalities with known human languages, often with some creative twists. To my knowledge, no conlangers were consulted during the creation of Heptapod B and there's a reason for this: when Dr Banks learns Heptapod B, something unexpected and life-changing happens – a tall order for an invented language.

Though we can't learn to speak Heptapod, the idea behind the symbols is simple: the circular nature of the logograms connects directly to the timeless

nature of the Heptapods' visual mode of communication, which is taken to reflect their cognitive system more generally. There is no clear beginning or end to the logograms, and the smoky blobs appear all at once. While Heptapod A – the spoken language – is constrained by time in the same way that our spoken language is, Heptapod B apparently is not.

Dr Banks' task of deciphering the language is more challenging than the average fieldwork scenario, and not just because she is in a spaceship. Linguists have a head-start when working on human languages, even previously undescribed ones. As linguists, we have come to know that human languages tend to follow certain patterns in their grammars: while they differ from one another in many interesting ways, an important discovery of linguistics is that this variation is limited. Once we discover certain features in any given language, we can begin to make educated guesses about other features.

Dr Banks doesn't have this kind of advantage when she begins to work with the Heptapods. In the film, we see her decipherment of the Heptapods' written language in a montage-type sequence, light on technical details. (As one filmmaker put it to me, if they had spent too much time on this we would feel like we were watching a Ted-talk about alien communication, not a blockbuster film.) While we can't predict what an alien lifeform's communication system would be like, and we have no reason to think that it would follow the same principles we find in human languages, the tools that linguists and fieldworkers have to work with speakers will be put to use in the same way: the goal is to discover the patterns (whether in phonology, morphology, or syntax), and map these patterns to the intended meaning.

Were there any linguistic details you had to compromise on when helping out on Arrival?

I gave a lot of detailed feedback on the screenplay, and while they incorporated many changes, there are still parts of the movie that will make linguists cringe (theoretical linguists, they explained, are not Hollywood's primary audience). The way I see it, linguists now just get to join the ranks of other scientists who get to complain to their friends when their science is not perfectly replicated onscreen.

Many people, especially linguists, have complained about the spotlight the Sapir-Whorf Hypothesis receives in the film. The Sapir-Whorf hypothesis, also known as linguistic relativity, is the idea that the language we speak constrains or even determines how we think and how we perceive the world. Though a number of studies have found interesting small effects of language on things like reaction time (say, in identifying colors, or shapes), there is no evidence that speakers of one language have a radically different worldview than speakers of another language. Of course, people do have different cultures and different beliefs – but these are not attributable to grammatical differences among their languages. I recommend John McWhorter's book The Language Hoax to anyone interested in learning more about the ideas behind this hypothesis, and the evidence against anything but a very weak version of it.

While I don't believe that learning an alien language is likely to have significant cognitive effects, I also did not try to talk the filmmakers out of it. The Sapir-Whorf hypothesis is not a minor element, but an integral part of the plot in Arrival – if you remove it, you just have a linguist talking to aliens, and the movie is much bigger than this. As a work of science fiction, Arrival's job is to get us to think about the role of communication in our lives, what language is, and how different it could be once we deal with non-human intelligent lifeforms. I think Arrival succeeds in this respect.

Were there any unexpected outcomes of working in Hollywood?

Yes (though I actually never left Montreal, where the film was made). I loved working with the set-design team, and was surprised to learn how much attention was paid to even seemingly tiny details, and how much work went into scenes that only appear briefly in the movie.

I have also been pleasantly surprised by the media attention the linguistics in the film has received. It's been a lot of fun to have the opportunity to talk about linguistics to general audiences all over the world, especially to young people who are interested in language, but who don't yet know that there is a scientific field devoted to its study. Plus, Arrival is not only unique in starring a linguist, but also in starring a woman scientist, so I was happy to get to relate to the film in this way.

What advice have you got for linguists who'd like to make it in Hollywood?!

Begin by writing more movies starring linguists!¶