

جامعة نيويورك أبوظبي



PSYCH-UH 2218: Language Science

Class 21: Sign Languages

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Psychology

Sign Languages are full human languages

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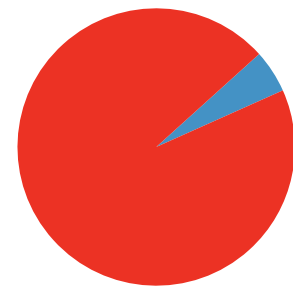
Sign Languages are full human languages that are equal in every (cognitive) way to spoken languages.

This means we can ask all of the same questions of sign languages that we've been asking of spoken languages.

It is important for the hearing community to be aware that sign languages are full human languages.

95% of deaf children are born to hearing parents, and therefore their lives are affected by the beliefs of the hearing community.

Deaf parents

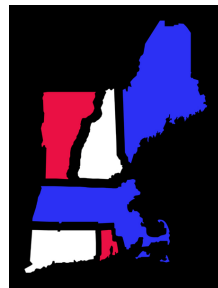
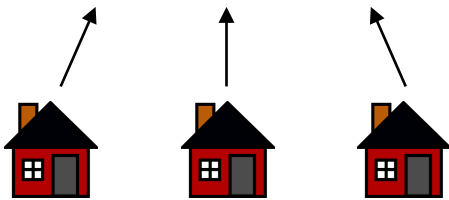
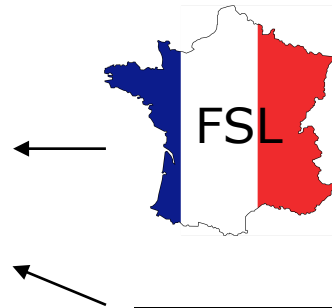


Hearing parents

I'll use American Sign Language (ASL) as a case study because I am most familiar with it

American Sign Language (ASL) is the language used by the deaf community in the US and parts of Canada.

ASL was actually "born" in Hartford, CT in the early 1800s at the American School for the Deaf (founded 1817, still in operation!).



The language was created by the young students there through a combination of exposure to French Sign Language (imported from Paris by Thomas Gallaudet), several village sign languages from New England, and the home signs that the deaf children used with their parents.

We will talk more about this process of language birth later in the lecture.

ASL dictionary: www.aslpro.com

ASL lessons: www.lifeprint.com

What is a Language?

Over the course of this semester, we have been learning about the properties that all human languages have. Here are four critical properties:

A human language will have the following properties:

1. It will have its own **phonology**.
2. It will have its own **morphology**.
3. It will have its own **syntax**.
4. It will be acquired using known **mechanisms of language learning**.

Crucially, by the cognitive science definition, all sign languages are full human languages. I want to demonstrate how we prove statements like this today.

This is the beginning of a **cognitive science definition of language**. This may not be the final definition that linguists settle on, but it is a good first theory for this course. (For example, one could imagine refining what it means to have phonology/morphology/syntax, or one could imagine adding that all language will use language-related brain areas for processing.)

Phonology in ASL

Articulatory features

Recall that we proposed that speech sounds are made up of smaller units that we called features:

	Bilabial	Labiodental	Interdental	Alveolar	Palatal	Velar	Glottal
Stop	p b			t d		k g	ʔ
Nasal	m			n		ŋ	
Fricative		f v	θ ð	s z	ʃ ʒ		
Affricate					tʃ dʒ		
Glide					j	w	h
Liquid				l	r		

Places of Articulation form the column labels

Manners of Articulation form the row labels

Voicing is delineated by the pairs: the one on the right is voiced

Features of Signs

Signs can similarly be characterized as a set of features:

Handshape

Palm Orientation

Location

Motion

Each of these features has a finite set of values that can be assumed, resulting in a large, but finite set of possible signs.

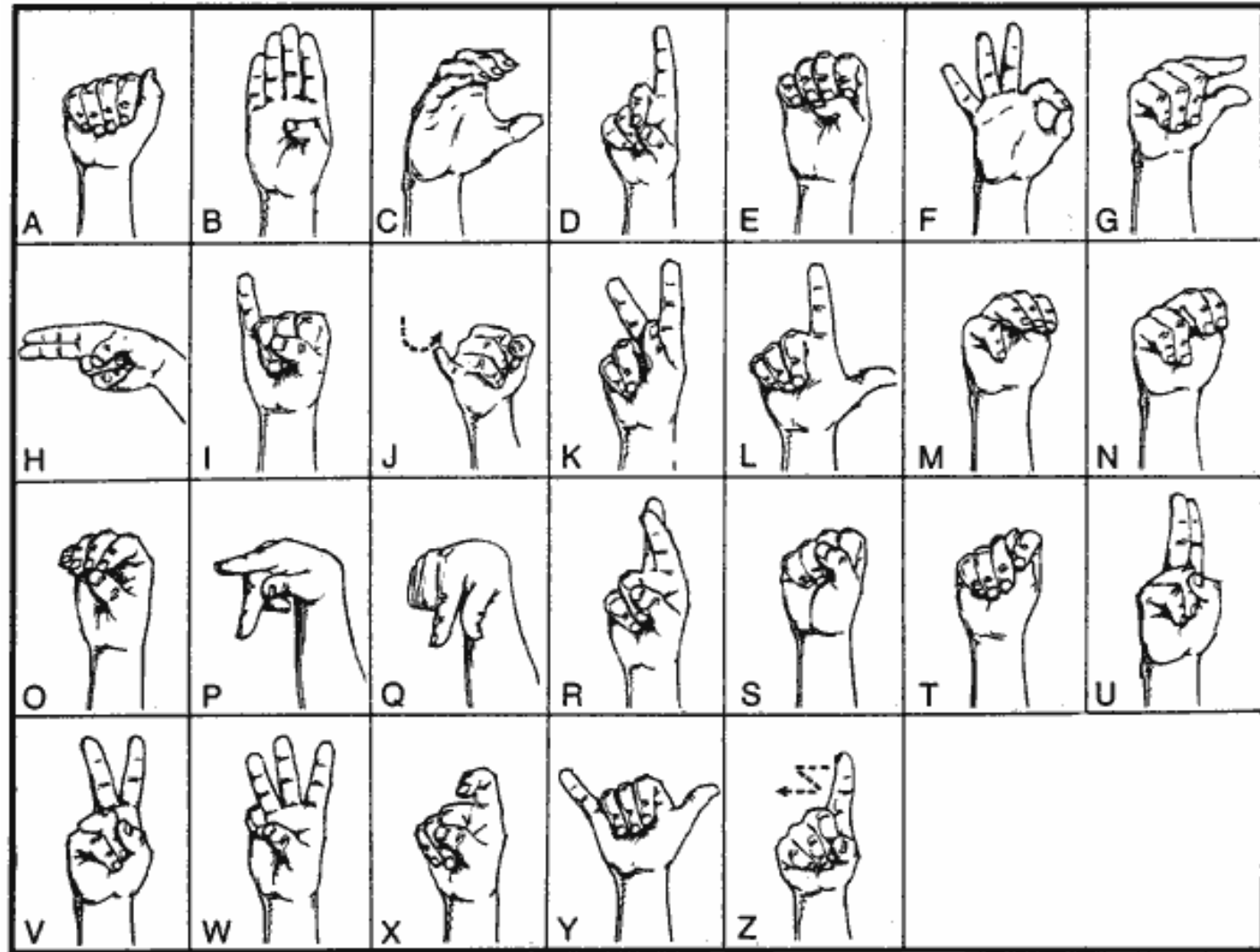
Although the feature system is similar between the two modalities, there is one crucial difference: features in spoken languages are used to compose **speech sounds**; features in signed languages are used to compose **morphemes/words**.

However, at a more abstract level, we can say that features are the primitives (the atoms) in each language type, and they combine to form the first units (sounds or signs) that we observe as language users (the molecules).

Handshape

There are more than 50 fundamental handshapes that can be used as signs in American Sign Language.

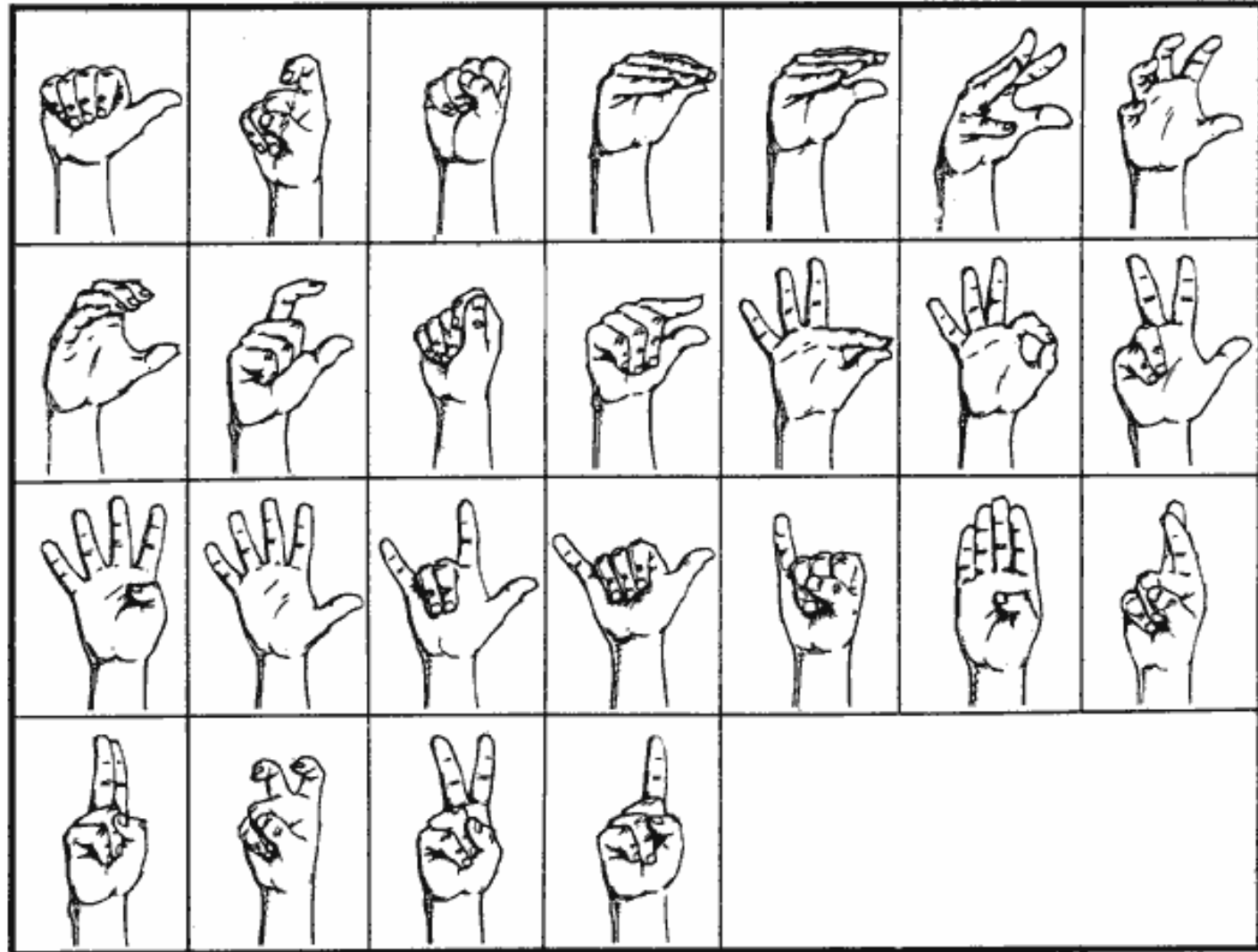
One set of these come from the handshapes that are also used to symbolize **English letters** when an ASL signer needs to spell an English word.



Handshape

The other half are not used for letter handshapes.

One thing to note is that this set of handshapes is for ASL only. Other sign languages may have a completely different set of handshapes (though there will be some similarities because of the physical characteristics of human hands).



Two signs that differ by **handshape** only

This is a signer demonstrating HOME followed by YESTERDAY.

These two signs differ only in the handshape used.



http://www.linguistics.ucla.edu/people/schuh/lx001/Discussion/d07b_videos_ASL_min_pairs.html

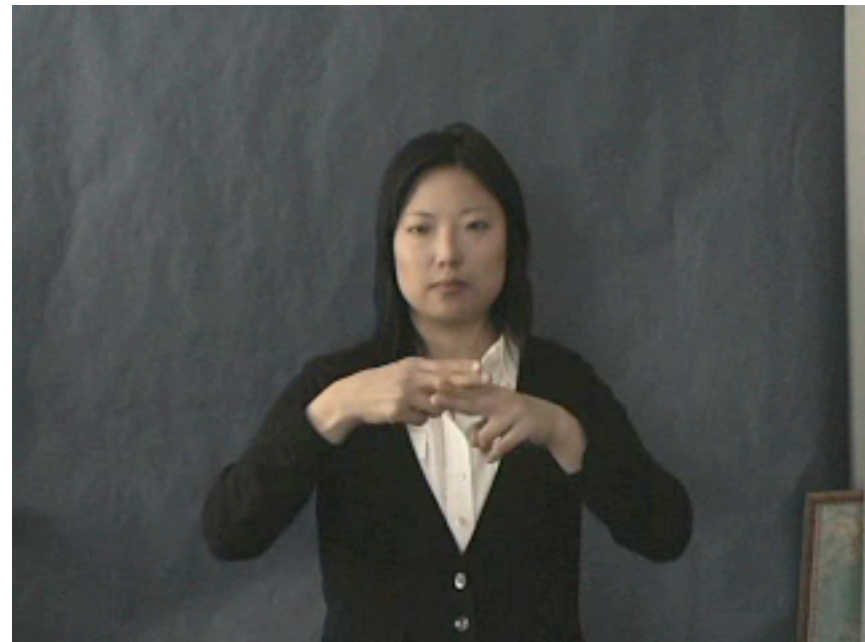
Palm Orientation

Palm orientation is the direction that the palm is facing (even for closed handshapes like T in this picture). The palm can face up, down, forward, back, and to the side.



This is a signer demonstrating SOON followed by TRAIN.

These two signs differ only in palm orientation.



Location

There are thirteen locations in ASL:

neutral (in front of chest)

whole face

upper face

mid face

lower face

side face

neck

trunk

upper arm

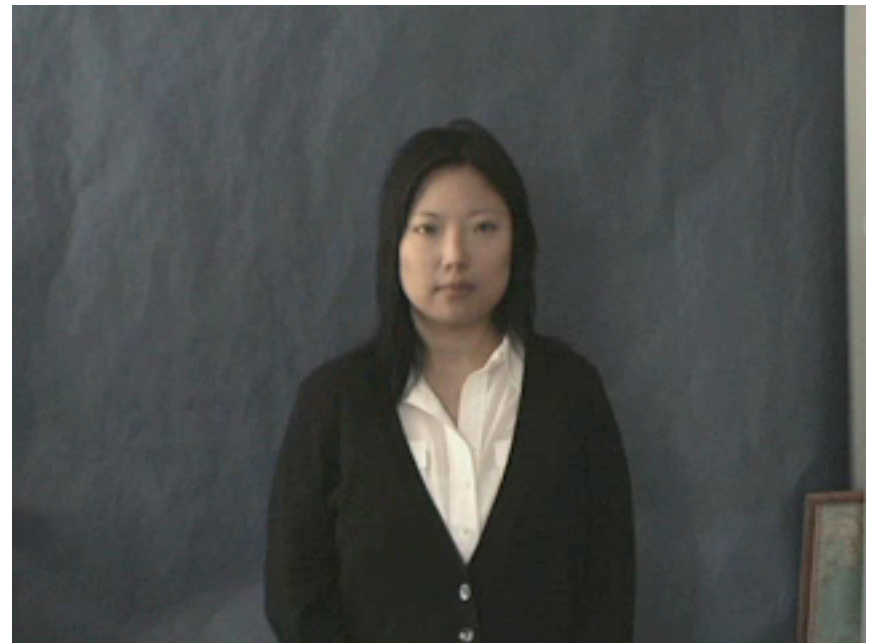
forearm

inside wrist

back wrist

weak hand

This is a signer demonstrating APPLE followed by ONION, which differ by location only (lower to side face).



[http://www.linguistics.ucla.edu/people/schuh/lx001/Discussion/d07b_videos ASL_min_pairs.html](http://www.linguistics.ucla.edu/people/schuh/lx001/Discussion/d07b_videos_ASL_min_pairs.html)

Motion

Motion in ASL is much more complex than the other features. There are three major types of motions, each with different subtypes:

- Linear:** Up, down, in, out, and to the two sides (contralateral and ipsilateral)
- Internal:** Opening the hand, closing the hand, bending at the wrist, twisting at the wrist, wiggling the fingers.
- Complex:** Moving toward a location, moving away from a location, touching a location, brushing a location, crossing (hands or fingers), exchanging hands, grabbing, inserting, and circular motions.

Motion

Here is a signer demonstrating two signs that differ only in motion:
CHOCOLATE followed by CHURCH



[http://www.linguistics.ucla.edu/people/schuh/
lx001/Discussion/d07b_videos ASL_min_pairs.html](http://www.linguistics.ucla.edu/people/schuh/lx001/Discussion/d07b_videos_ASL_min_pairs.html)

Morphology in ASL

ASL Morphology: Noun/Verb pairs

In English, there are some noun/verb pairs that differ only in the **location of stress**: first syllable for nouns, second syllable for verbs

pérmít

permiṭ

récord

recórd

súspect

suspeṭ

two taps

one tap

ASL has a similar set of noun/verb pairs, but in ASL the distinction is carried by the **number of taps**: two taps for a noun, one tap for a verb

food

eat

airplane

fly

chair

sit

Here is chair/sit:

<http://lifecycle.com/asl101/pages-signs/c/chair.htm>

ASL Morphology: not affixation, simultaneous articulation

With spoken languages, information can be added to words through **affixation**.

jump + ed = "jump in the past"

ASL takes advantage of the fact that the visual modality allows for **simultaneous articulation** of the primary sign and a second motion to add information:

Repeated circular motion: an ongoing, or **continuous**, event at that point in time

Repeated straight motion: a punctuated event that happens multiple times, or **habitually**

<http://www.start-american-sign-language.com/sign-language-instruction-asl2-4.html>

Syntax in ASL

Pronouns and space!

When it comes to pronouns (I, you, he/she/it, we, they), ASL once again makes use of the unique properties of the visual modality.

Pronouns are produced by pointing. Pronouns for the people in the conversation point directly to them. Pronouns for others point to a specific area of space that then becomes the location for that person for the conversation!

me



you



he/she/it



If the pronouns are plural (we, they), you can sweep your finger horizontally!

<http://lifepprint.com/asl101/pages-layout/indexing.htm>

Verbs and Space!

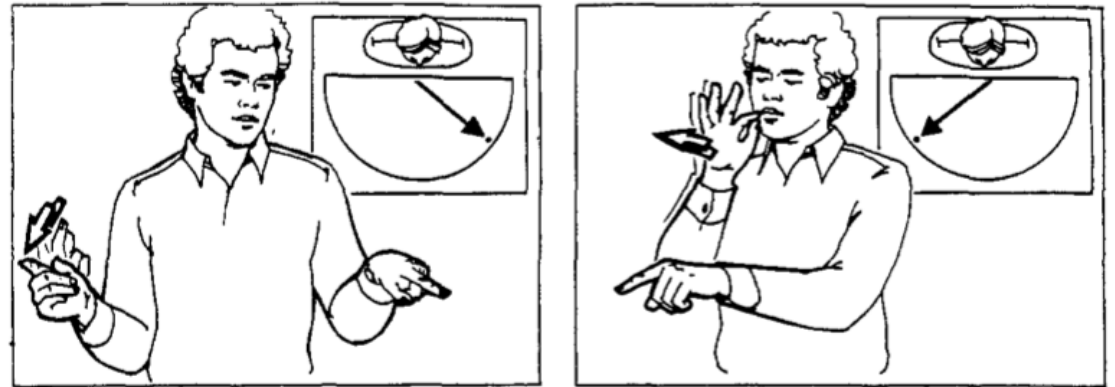
ASL uses space for some verbs to indicate the directionality of the event.

For example, the verb bite is directional: one thing bites, the other is bitten.

In ASL, you can set a location for each entity - one on the left and one on the right, and then show who bit whom by moving the sign for bite from one side to the other!

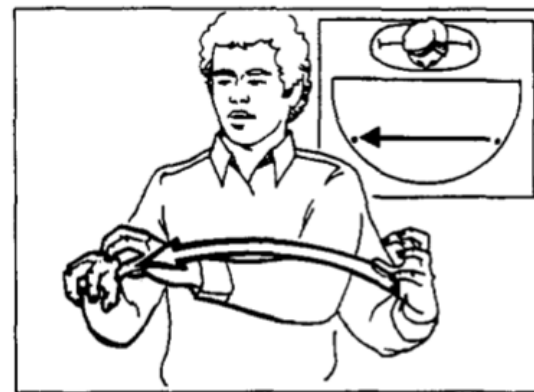
Here is a video with a plain verb followed by an agreeing/directional verb:

<http://www.start-american-sign-language.com/free-online-sign-language-asl1.html>



DOG-INDEX_a

CAT-INDEX_b



_a BITE _b

"The dog bites the cat."

Common misconceptions about sign languages

Misconception 1: It is not uncommon to encounter people who believe there is only one sign language.

In fact, there are over 200 signed languages in use in the world. Although this is far fewer than the 6000-7000 spoken languages, it is still quite a bit of linguistic diversity.

Misconception 2: It is not uncommon for people to believe that sign languages are related to spoken languages, and therefore show the same relations to other languages.

American Sign Language (ASL) is not a signed form of American English, and British Sign Language is not a signed form of British English. They are distinct languages. In fact, whereas American and British English are mutually intelligible, ASL and BSL are not mutually intelligible.

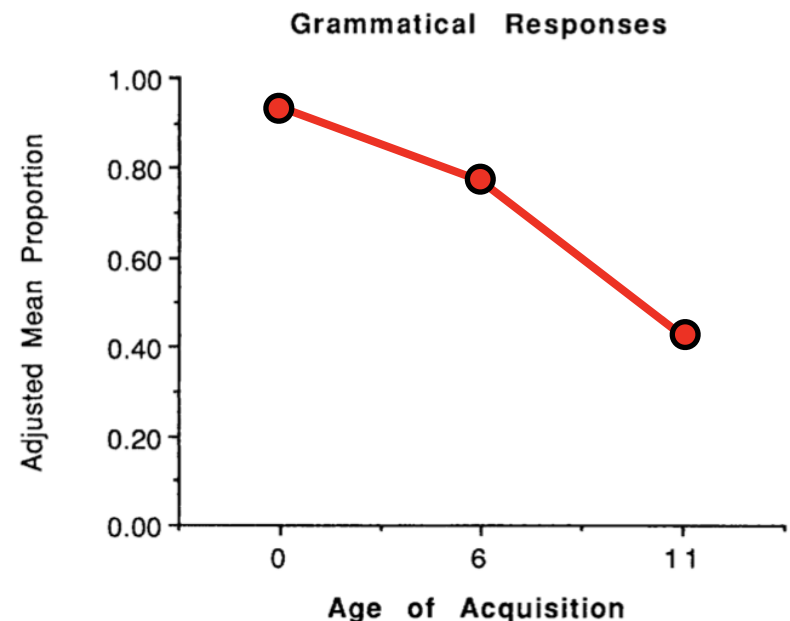
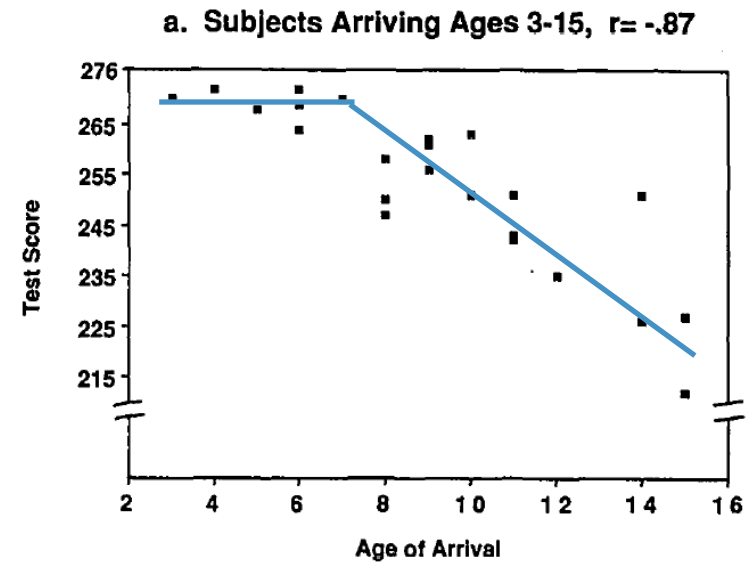
There are some sign languages that are mutually intelligible because they are related, usually through educators spreading the language, such as various Nordic sign languages, but ASL and BSL are not related. (Interestingly, ASL and French Sign Language are distantly related!)

Sign Languages and the Critical Period

ASL shows a critical period effect

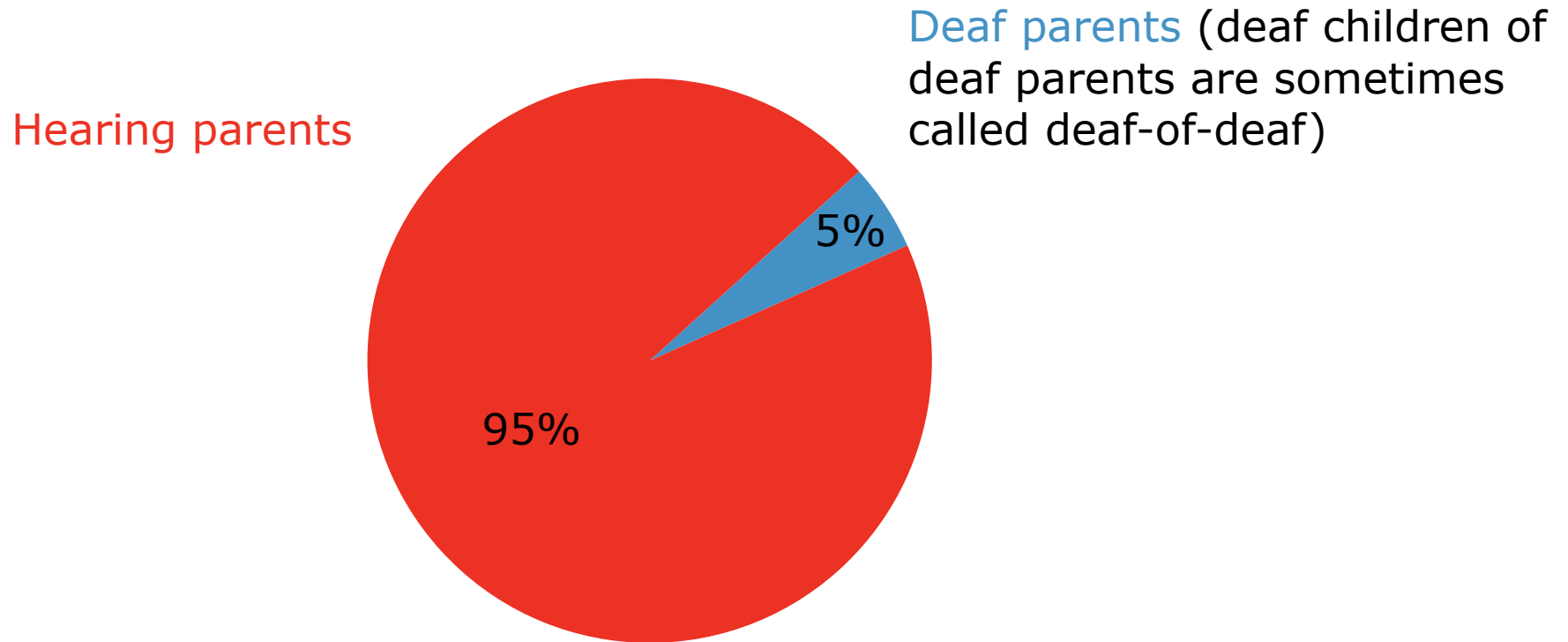
Recall that Johnson and Newport showed that age of acquisition directly impacts the success that people have with language. We call this a **critical period** for language acquisition.

The same effect holds for the acquisition of sign languages. There are tons of studies on this. Here is one representative example for ASL (Mayberry and Eichen 1991). In this experiment, people with over **40 years of ASL experience** were shown ASL sentences, and asked to recall them. The graph shows the number of grammatical sentences that the subjects created. **Age of acquisition** makes a big difference even after 40 years of practice!



Why is the critical period an important issue for sign languages?

This is not just about proving that sign languages are full human languages. The fact that there is a critical period for sign languages means that it is important to expose deaf children to sign language as early as possible.



Parents of Deaf children in the US in 2000
(Mitchell and Karchmer 2004)

Hearing parents are raising most of the Deaf children

If hearing parents do not know that sign languages are full human languages, they may not find a way to expose their children to language.



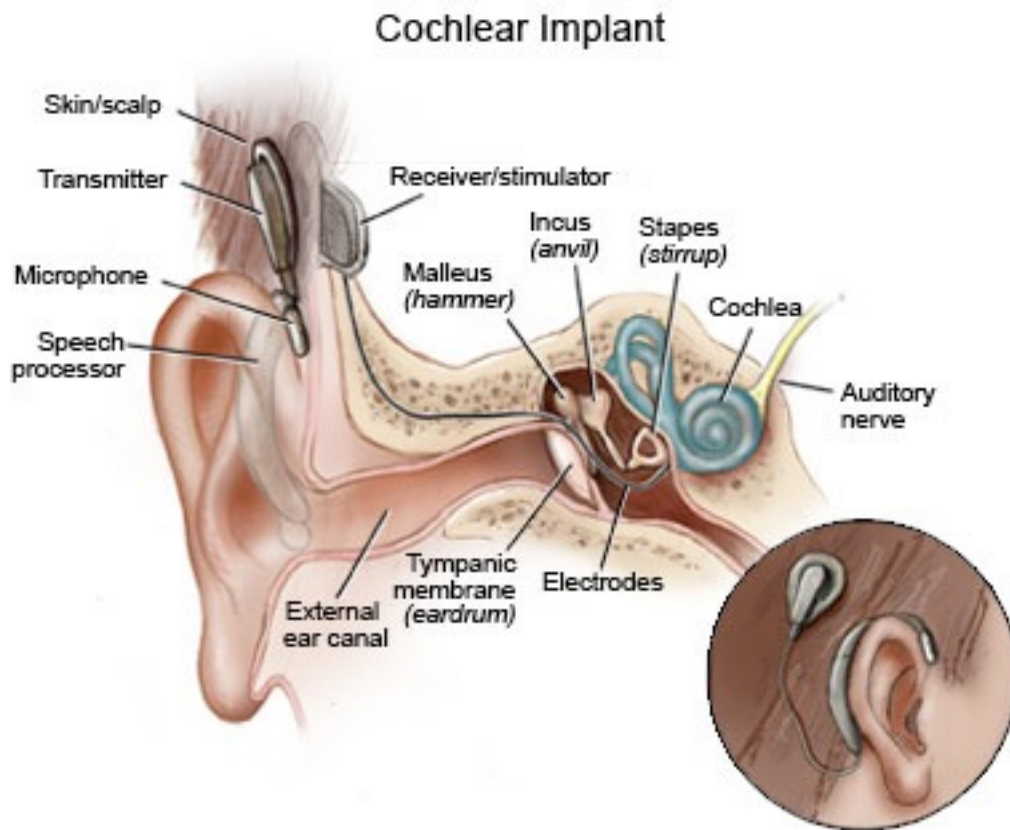
Remember, these parents probably do not sign themselves.

So exposing their children to sign language requires enrolling them in a special school, which can be very expensive.

But without this effort, the children will not have access to human language, not unlike Genie or Isabell!

What about Cochlear Implants?

Cochlear implants are medical devices that can restore hearing in some deaf and hard-of-hearing patients



The **cochlea** is the snail shaped organ in this diagram. It converts sound waves into electrical impulses that travel along the auditory nerve to the auditory cortex.

A **cochlear implant** is a microphone and computer processor that convert sound into electrical impulses that are delivered directly to the auditory nerve.

As the name suggests, cochlear implants are only indicated for use in patients with hearing loss due to cochlear degeneration. Crucially, the auditory nerve must be intact, as that is what the cochlear implant connects to.

Do cochlear implants make sign language unnecessary?

Cochlear implants are amazing devices, and **someday** our understanding of the human body may eliminate some forms of deafness.

However, cochlear implants do not (yet) provide a complete replacement for hearing:



speech/
music:

<https://www.youtube.com/watch?v=SpKKYBkJ9Hw>

music:

<http://auditoryneuroscience.com/prosthetics/music>

music:

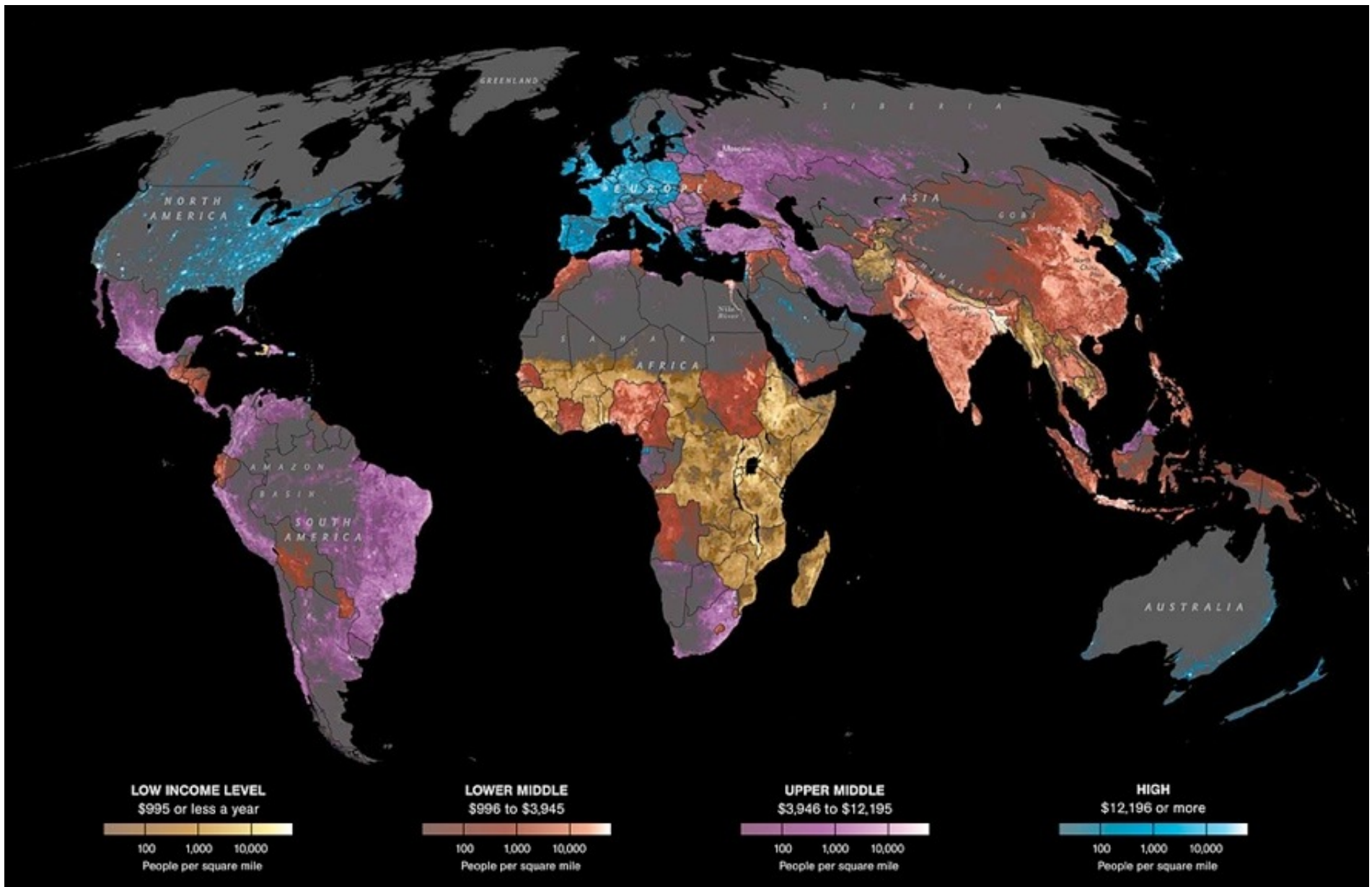
<http://www.npr.org/sections/health-shots/2015/05/18/406838781/deaf-jam-experiencing-music-through-a-cochlear-implant>

These links demonstrate **vocoded** speech (and vocoded music), which is an approximation of what cochlear implants sound like.

It is clear that the sound input from cochlear implants is impoverished compared to biological cochleas, which can lead to **difficulties with language acquisition**.

Implants are not always an option

Cochlear implant surgery costs between **\$60,000** and **\$120,000**.



Sign language is still important, even with cochlear implants

Birth:



No language input

Sign language

2 years:
Cochlear implant



Spoken language

Spoken language

4 years:
Test of spoken
language skills



60-70%



90-100%

Explaining the difference



↓
No language input



↓
Spoken language



60-70%

How can sign language help spoken language when they are so different?

First, they aren't different. They are both full languages, just in different modalities.

Second, there is a critical period for language. So it is important to have language input during the first 2 years of life.

Sign language is language input just like spoken language, so it is helpful to language acquisition!



↓
Sign language



↓
Spoken language



90-100%