WHAT IS SPEECH:

- Speech is a sound wave, a series of sound air compressions consisting of bursts, vibrations, and aperiodic noise.

- Our minds are making use of many kinds of information to reconstruct what we think we are hearing.

- We are not passive observers.

- We are constructing our reality inside our minds according to our world and what we are expecting to be true.

  Physical descriptions of speech sounds:
  - Some kind of perturbation of the airwaves when it comes out of your mouth when talking.

  - Phones are a physically real thing and a description of sound as it exists in the world.

  Mental descriptions of speech sounds:
  - Phonemes, which is something psychologically real.

  - Something that forms some kind of category.

  - Represents an atomic unit that we can use to build words.

  - It is linguistically meaningful.

  - The atomic unit does not have a meaning of its own but it contributes to the meaning in an important way

    Example:
    - You take the P out of “pet” and replace it with a B, which completely changes the meaning and word.

    - Letters are essentially atomic units that can be used to create many words.

  - Phonemes are our cognitive perceptions of our words.

- All the features to identify sound are continuous

- We can make spectra by morphing one sound into another very gradually.

- The physical description of sounds form a continuum

Categorical Perception:

- When we categorize discrete information on a spectrum if the sounds are different.

Example:

- If we hear a spectrum of something saying ‘Da’ and midway through the spectrum we were ‘Ta’.

- We treat the whole spectrum as it neatly divides into two discrete categories.

- The mental representations are not equivalent to the physical sounds.

- We need to describe them in different levels/ways such as physical phenomena and mental representations, which are useful for language.

HOW WE MAKE SENSE OUT OF THE THINGS WE HEAR:

How do we map raw acoustic physical sounds to our mental categories?:

- It is a type of bottom-up processing.

- We take the raw wounds from our sensory organs.

- Using that information, we use it to build some mental representation of a sound.

- We also do top-down processing.

- We use what we know about the world and fill in the gaps or change what we heard on what we think the word/sound should be.

Coarticulation:

- Speech sound is affected by every other speech sound around it.

- Sounds change depending on their environment.

- We produce sounds by moving muscles in our oral and nasal track.

- Every time we make a sound we have to move muscles into some contact with each other.

- When producing sounds, our tongues have to move very fast in our mouths to produce those sounds very quickly when we are talking.

- There will be a blur between one position.
- Once we know how the sounds affect how the next one is going to sound.
- Vowels such as “Sh” will push vowel formant down and affects how vowels sound and compress the space the vowel occupies.
- If we hear the sounds “Sh” or “S” in a word, we are able to mentally prefer how the next vowel is going to sound.
- Sounds can also be affected by the sounds that come after them.
- We have to use that information on the sound we heard previously, so the context of the sound previously is working backward.
- The point of our senses is to reconstruct the world given the information from our senses.
- The target of speech perception is those mental categories, those mental representations.
- It helps figure out what word a person is saying.

LEXICAL BIAS EFFECT:

- We have a bias to interpret sounds in such a way what we’re hearing will form a recognizable word.
- William Guangdong had an experiment to demonstrate this.
- He would present words with an ambiguous sound and construct words like dash.
- However, because there is ambiguity midway through the spectrum of the word, some people might have heard dash or tash depending on how they depict it.
- It could have been either one because it’s ambiguous.
- Guangdong found that there is a very strong bias on our perception of sound.
- There is sound bias because we want to interpret the sounds so that it makes a real word.
- We are more likely to lean to dash because it is a real word, unlike tash.
- It is after the fact and as a post-doc correction of what we already heard.

- It is not until you hear the whole world whether you decide that ambiguous sounds should have the identity of a D or a T until you realize it makes a word or not.

- After you hear the word you then go back in your mental representation and you are positive about what that word was you heard.

- There is also an effect of sentence context too.

THE PHONEME RESTORATION EFFECT:

- We can use semantic and syntactic information to fill in missing phonetic information.

  Example:
  - When someone coughs mid information we don't realize a sound is missing.

  - If you then remove the sound of the cough the sentence sounds off.

  - The cough actually took place of the missing sound.

  - Our brain is really good at filling in the missing information when it thinks it has a good reason to do so.

  - If there is a cough layered on top there is a plausible story our brain tells us.

VISUAL INPUT:

- What we see has a big effect on what we hear.

  McGurk Effect:
  - The illusion occurs when you see something that clashes with what you are hearing.

  - What we see overrides what we hear.

  - If you close your eyes you will hear the sounds clearly.

- However, it is not only affected by visual input and can be affected by our sense of touch.

- A study by Carol Fowler where she wanted to test the influence of touch on auditory influences.

- Participants would touch another person's lips while they were hearing sounds.

- They might hear something like "Ga" but their fingers would feel a pair of lips going through motions of "Ba."

- That was enough to change what they thought they were hearing.

- Participants were also not trained to change touch sensations into different sounds when touching someone's lips.

- Our perception of sound is influenced by the presence of nearby sounds, the identity of the word we think we are hearing, the meaning of surrounding sentences, and influenced by our senses.

- It is our brain's way of making sense of our world.

LANGUAGE ACQUISITION:

- John Locke states the mind is like a white paper, void of any characters and without any ideas.

- Our mind is furnished from experience.

- We are ready to accept any input from the world around us.

- Skinner claims our linguistic behavior is a function of ambient and environmental stimuli.

- There is a direct causal relationship between the environment and our linguistic behavior.

- We learn to say things in an appropriate way because we are rewarded for doing so.

- When you're a small child and hungry and thirsty and are able to articulate those feelings, you will be given food and water from your parents.

- Language is verbal behavior.

- However, children are rewarded if they phrase sentences that are grammatically wrong.

- If skinner was right, children should not be rewarded if they are grammatically correct.

- As long as parents understand the gist they get rewarded, which doe not make sense in a behaviorist context.

- Everything the child will and everything people say is all literal strings of words.

- All sound we produce is a vocally linear sequence of words.

- We mentally represent sentences as a hierarchical structure.

- We reconstruct hat underlying tree structure.

- We take a string of words and convert it into a tree structure.

- How do we learn what the hierarchal structure is if we never see or hear it?

- We are able to make a hypothesis of the hierarchical structure of a sentence.

Poverty of the Stimulus:

- The stimulus that they learned is exposure to underdetermines their knowledge of the language.

Children Lack:

- Sufficient input

- Correction

- Negative evidence.

- Parents don't correct grammatic structure because children do not respond well to correction in the grammatical domain.

- Children do not care about whether they say is grammatically correct or not.

- It appears we come with some pre-programmed cognitive skills because children are able to pick up languages easily.

- We have an invisible hierarchical structure that we have to somehow infer when looking at a sentence.

- The solution is **universal grammar (a specific genetic endowment that enables us to learn languages)** by Chomsky.

- We are all equipped with language acquisition devices.

- We are pre-programmed to learn specific structures.

- We are born with certain structures in our mental grammar, which is the claim by universal grammar.

- There are some universal properties shared by all languages.

- Because it is universal, it is genetically endowed in us.

- We are hardwired for certain kinds of computations.

- We were all exposed to a certain language when we were children, which relates to universal grammar.

- No one is born knowing how to speak fluently in their language.

- We just share the basic building block to fill the gaps induced by the poverty of the stimulus.

- Our language-specific input won't be enough to fill the language on its own, which is why we have a universal grammar that fills in the gaps for us.

BIOLOGICALLY CONTROLLED BEHAVIORS:

- The behavior emerges before it's necessary.

- Its appearance is not the result of conscious decisions.

- Its emergence is not directly triggered by external events.

- Direct teaching and intensive practice have relatively little effect.

- There is a regular sequence of" milestones" as the behavior develops.

- There is likely to be a critical period for the acquisition of the behavior.

- There is language acquisition that ticks off all these steps.

- Children go through different stages such as babbling, one-word stages, two-word stages, etc until they sound adult-like

- Virtually, every human being receives virtual input when they are young.

- Virtually, all of us are exposed to our native language even before we are born because we can hear from our mother's womb.

- Sadly, there are cases of child abuse and neglect and they don't receive input and they never do attain adult-like native fluency in their 1st language.

- Young children could only learn certain things at certain ages and times **called critical periods.**

- However, this theory was somewhat proved wrong because children who missed their critical period were able to learn languages and learn a lot about the world.

- Children only require passive exposure to the language.

- However, there is still a critical period because kids are able to learn languages easily at certain critical times when they are young.

KEY CONCEPTS:

- Physical vs mental descriptions of speech sounds.

- Categorical perception.

- Top-down vs bottom-up processing.

- Influence of context.

- Phoneme restoration effect.

- McGurk effect.

- Empiricism vs. Nativism.

- Universal Grammar.

- Poverty of the Stimulus.

- Critical Period.