

The correct pronunciation of 'gif' (the image format) is...

- a. /dʒɪf/
 - b. /gɪf/
 - c. /jɪf/
 - d. /dʒi əj ɛf/
 - e. /dʒejpɛg/
-

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Phonetics: The Sounds of Language (are awesome)

Matt Zaslansky - LIGN 101

Today's Plan

- Understanding vowels
 - More on IPA Transcription
 - Why are we learning some IPA, anyways?
 - Some phonetic phun
-

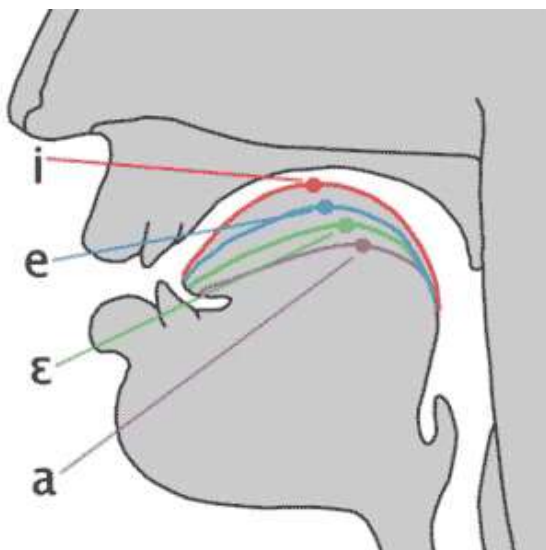
The Alveolar Ridge

- “Why is the alveolar ridge named that when alveoli are in lungs?”
 - As suggested, “Alveolar” refers to the dental alveoli, the tooth sockets, and the ridge is on the Alveolar bone
 - “alveolus” is a Latin word meaning (among others) ‘a small cavity’
 - So, lungs and tooth sockets have alveoli!
-

Vowels!

Vowels are created by shaping your vocal tract

- A vowel is voicing passing through (and resonating in) an unobstructed vocal tract!
 - If we change the position of the tongue, we change the resonances
-



Vowels are different from consonants

- They're always* voiced
 - They can (and do) occur on their own. I.
 - We describe vowels using different characteristics
-

How many vowels are present in Mainstream US English?

- A. 5
 - B. 5, sometimes 6
 - C. 12
 - D. 17
 - E. 21
-

How many vowels are present in Mainstream US English?

- A. 5
 - B. 5, sometimes 6
 - C. 12
 - D. 17
 - E. 21
-

Reminder, your writing system is as trustworthy as a politician turned used-car-salesman

a, e, i, o, u, and sometimes y

~~a~~, e, i, o, u, and sometimes y

~~a~~, ~~e~~, i, o, u, and sometimes y

~~a~~, ~~e~~, ~~i~~, o, u, and sometimes y

~~a, e, u, o~~, u, and sometimes y

~~a, e, u, o, n~~, and sometimes y

~~a, e, u, o, n~~, and ~~sometimes y~~

~~a, e, u, o, n~~, and ~~sometimes y~~ NEVER!!!!

/ i, ɪ, ɛ, æ, ə, ɐ, ʌ, ɑ, ɔ, ʊ, u /

- beet
 - bit
 - bet
 - bat
 - sofa
 - bird
 - but
 - bot
 - bought
 - book
 - boot
-

/i/ - beet, see, seen, sear, seal

/ɪ/ - bit, sit, tin, sill

/ɛ/ - bet, set, sent, fair, sell

/æ/ - bat, sat, pant, pal

/ʌ/ - but, sun, pun, lull (ə in sofa, amount)

/ə/ - bird, purr, earl, butter, clamor (this is often broken into two vowels!)

/ɑ/ - bot, saw, star, paul, pawn, (cot*)

/ɔ/ - corn /kɔɹn/, boy /bɔɪ/ (caught*)

/ʊ/ - book, hood, puss

/u/ - boot, who'd, loose, lure, loon

Do you produce 'Cot' and 'Caught' differently?

- A. Yes, they're two different vowels
- B. No, they're the same vowel
-

A note on /ɔ/ vs. /ɑ/

- These are two vowels for some people
 - Cot (/ɑ/) vs. caught (/ɔ/)

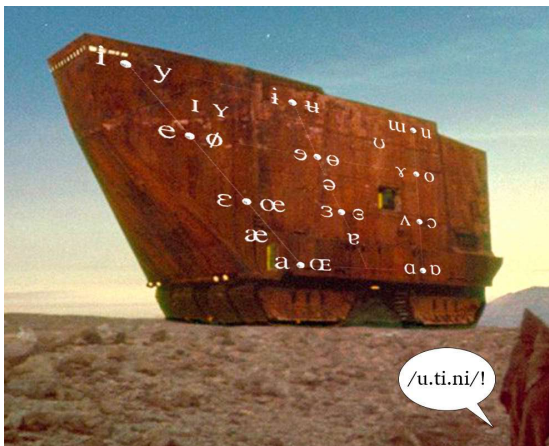
- For many speakers, these have merged in all but a few cases
 - I am not one of these speakers
- But even for some of those speakers, “horse” and “corn” still have /ɔ/. (/hɔ:rs/ and /kɔ:n/)
 - Also, “boy” /bɔ:j/

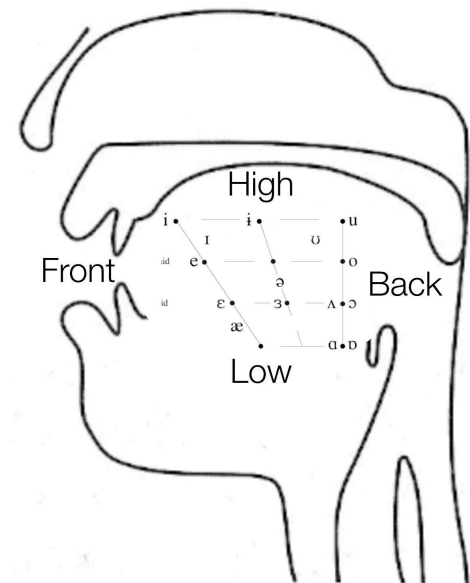
What's the difference between /ʌ/ and /ə/?

- They sound the same, but we use /ə/ in *unstressed* positions in words
- If there's just one vowel in the word, and it sounds like 'uh', it's /ʌ/
- This is the same difference between /ɜ/ and /ə/ (although for this class, you can write /ə/ for both)
- More details at this link (http://wstyler.ucsd.edu/posts/difference_schwa_wedge.html)

Describing Vowels

- For vowels, we talk about three additional dimensions
- 1- Where is the tongue in terms of height?
 - (High, Low, or Mid)
 - Also “Closed, Open, or Mid”
- 2- Where is the tongue in terms of horizontal space?
 - (Front, Central, or Back)
- 3- Are your lips rounded or not?





Diphthongs

- Vowels where the tongue moves through the mouth
- Start at one vowel, move to another vowel
- Things like “boy” (/ɔj/), “buy” (/aj/), “bay” (/ej/), “boat” (/ow/), “cow” (/aw/)
- Others are monophthongs

MUSE Diphthongs

/ɔj/ - boy, soy, toy, join, oil, Roy

/aj/ - buy, right, try, sigh, die, fire

/ej/ - play, bay, may, ray, lay, trail

/ow/ - boat, oat, wrote, pope, toll

/aw/ - how, now, brown, cow, prow, louse

So, Mainstream US English has lots of vowels

- 12 Monophthongs
 - / i, ɪ, ɛ, æ, ə, ɐ, ʌ, ɑ, ɔ, ʊ, u /
 - 5 Diphthongs
 - /ɔj, aj, ej, ow, aw/
 - And we describe these vowels in terms of high-to-low, front-to-back, and rounded or not.
-

Now that we understand how speech sounds are produced...

- We can identify the proper symbols in the IPA
 - We can start to transcribe speech using the IPA
-

Online Audio IPA Charts are a useful resource

- <http://www.internationalphoneticalphabet.org/ipa-sounds/ipa-chart-with-sounds/>
(<http://www.internationalphoneticalphabet.org/ipa-sounds/ipa-chart-with-sounds/>).
- We also have videos at <https://savethevowels.org/ipa> (<https://savethevowels.org/ipa>).
- **Make sure the sounds you're using are on your quick reference sheet!**
- As is memorizing some words for each symbol and then process-of-eliminating
 - "Hmm, it's not the vowel in 'snack' or 'but' or 'boat', but it does"



The word “thickened” has consonants with how many different places of articulation?

- a. 1
- b. 2
- c. 3
- d. 4
- e. 1337

/θɪkɪnd/

θ - interdental

k - velar

n - alveolar

d - alveolar

The word “thickened” has consonants with how many different *manners* of articulation?

- a. 1
- b. 2
- c. 3

d. 4

e. Probably still not 1337

/θɪkɪnd/

θ - fricative

k - stop

n - nasal

d - stop

How many of those consonants are voiced?

a. 1

b. 2

c. 3

d. 4

e. 1337 is still not the answer

/θɪkɪnd/

θ - voiceless

k - voiceless

n - voiced

d - voiced

→

###

Dis

Sec

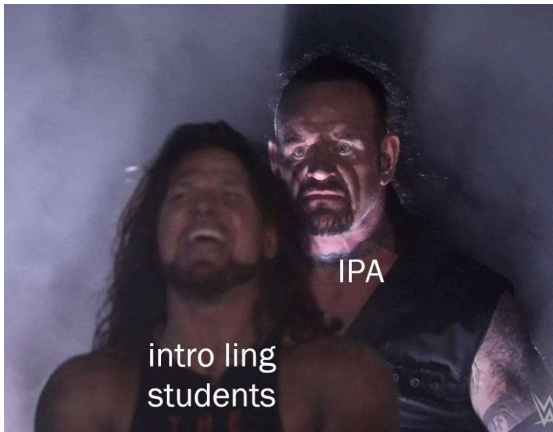
wee

abc

trar

◀ ▶

A few more transcription pitfalls



Lies your writing system tells you

- The letter “C”
- “ng” is usually /ŋ/, as in “ring” /ɹɪŋ/
- “th” can be /θ/ or /ð/
- “x” is usually /ks/, as in axis /æksɪs/
- English does not allow double (‘geminate’) consonants
 - “soccer” is /sɒkəɹ/, crass is /kræs/

Do not capitalize when making IPA transcriptions!

- Capital and small-caps letters in the IPA mean different things!

More lies

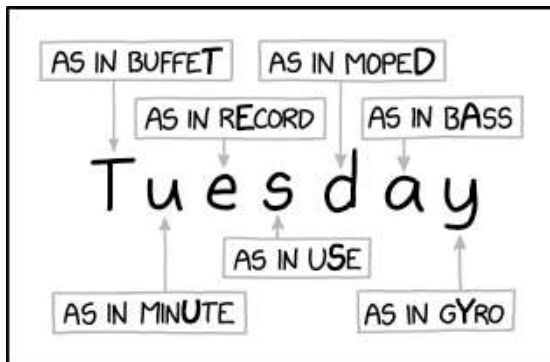
Sliced - /slaɪst/

- Buzzed - /bʌzd/
- Close (near) - /kloʊs/
- Close (a door) - /kloʊz/

Silent letters aren't real

- “k” in “knee”
 - “b” in “lamb”
 - “e” in name, I will cry.
-

English writing is often ambiguous



PET PEEVE: AMBIGUOUS
PRONUNCIATION GUIDES

(Image Credit: XKCD 2819 (<https://xkcd.com/2819/>))

LING101 Students: *Transcribing words like "kitty" or "better"*

/r/:



Sometimes, consonants take over

- Words like ‘cotton’ or ‘people’ or ‘bull’ can have a final consonant which feels ‘alone’
 - There doesn’t seem to be a vowel there
- We refer to these as ‘syllabic consonants’
- You can use /ən əl/ to represent that, or the IPA ‘syllabic’ diacritic (| or ̩)

- So 'cotton people bull' = /kɑʔən pipəl bəl/ or /kɑʔən pipəl bɪ/
 - Note that for many, 'bull' is still /bʊl/
-

You'll want to use the tie bar for affricates

- It's good habit to write /tʃ̥/ and /dʒ̥/ with the tie bar when they're affricates
 - Rather than a sequence of two different sounds (e.g. "hotshot /hatʃat/")
 - It's less critical for English, but it's good practice
-

There is no l in team

There's ^{an} ~~no~~ /i/ in team
/tɪm/

Words don't have one IPA 'equivalent'

- You're always transcribing somebody else saying them
 - There is no such thing as an automatic IPA "translator", and there never could be
 - ChatGPT is mid at this too
 - Some dictionaries give you IPA, but badly
 - ... and we can totally tell if you used that
-

Some symbols don't mean what they do in English

- /y/ : High front rounded vowel
 - /j/ : Voiced palatal approximant (as in 'Yes')
 - /r/ : Voiced alveolar trill (the Spanish 'rolled R')
 - /ɹ/ : English 'r' sound (as in 'red')
-

... by this point, you're likely wondering...

- **Why the heck are we learning about the IPA!?!?**
-

The boring answers

- It makes you think about how you talk *and* what you're saying
 - It prepares you for future linguistics classes which will use it
 - You can work for an airport announcing names!
-

1) Because your writing system probably sucks

- “They thoroughly and roughly wrought the boughs in the borough, through and through”
 - /ðej θəʁəli ɪ ɹʌfli ɹat ðə bawz ɪn ðə bəʁəʊ θɹu ɪ θɹu/
-

2) Because it's useful to be able to write things down, even when you don't know the word(s)

- (/r:ˈlɪɡma/)
-

3) Because you don't always have a writing system to use.

- Seriously, many languages don't have one
-

4) To train your brain to hear differences more easily

- /θ/ or /ð/
-

5) To capture individual variations in speech

- Is it “sick”, or /tɪk/?
-

6) To capture dialect differences in speech

RP (British English) vs. Mainstream US English

- /əˈluminəm/ vs. /aljuˈminium/
 - /gəˈɹɑː/ vs. /ˈɡeɹɑː/
-



-
- “Sell your iron to Walter Zion”
 - /sɛl jəʊ aɪrən tə wɔltəɹ zəjən/
 - /sɛl jə aɪən tə wɔltə zəjən/
-

Oh, Boston

- park the car in harvard yard
 - /pɑ:k ðə kɑː ɪn hɑːvərd jɑːd/
 - /pɑ:k ðə kɑ: ɪn hævəd jɑ:d/
-

7) To impress/scare people at parties/bars

8) To write down things that aren’t otherwise writeable

/lɛdʒɪbɪrɛkwɑ/

- “He does a lot of work for /lɛdʒɪbɪrɛkwɑ/ rights”
 - LGBTQIA(+), in the OED now as “legebetiquios”
-

Transcriber’s Delight

- “I said a hip, hop, the hibble, the hibble to the hip hip hop and you don’t stop the rocking to the bang bang boogie say up jump the boogie to the rhythm of the boogie the beat”
- [ɑsɛðə hɪp hɒp ðəhɪbɪ ðə hɪbɪ təðə hɪp hɪp hɒpʰɑːdʒɪ daʊn stɒp ðə ɹakɪŋ tʰəðə beɪŋ beɪŋ buːɡi seɪ ʔʌp dʒʌmp ðə buːɡi tʰəðə ɹɪðm ʌ ðʌ buːɡɪðə biːt]

0:00 / 0:16

Would you like fries with this example?

- [a.sɛ.ra.he.ha.hə.he.ehɛ.βe.tu.ð̥a.hɛ.ð̥e.ð̥e.se.vi.ju.no.ma.ma.ha.vi.æn.ð̥ə.bu.ɣi.æn.ð̥ə.bwi.li.li.bi]
- From 'The Ketchup Song' by Las Ketchup

0:00 / 0:07

A Disturbing Example

- [owaʔaʔaʔaʔ]
- From Disturbed's 'Down with the Sickness'

0:00 / 0:05

"Scatman" by Scatman John

0:00 / 0:07

[skapəɾabadubilidurebapɾ
duriurəbapɾɯndɛvΛmvətɛv
ɛtɛgəɾə(??)vɛɲuəbəvɛɲuəb
əvɛɲuəbəvɛɲgəʔugɛɾirudo]

0:00 / 0:11



- /br::: skibiri d̥om d̥om d̥obijesies skibiri d̥abl̥dm ni ni/

Source (<https://www.youtube.com/watch?v=tzD9OxAHtzU>).

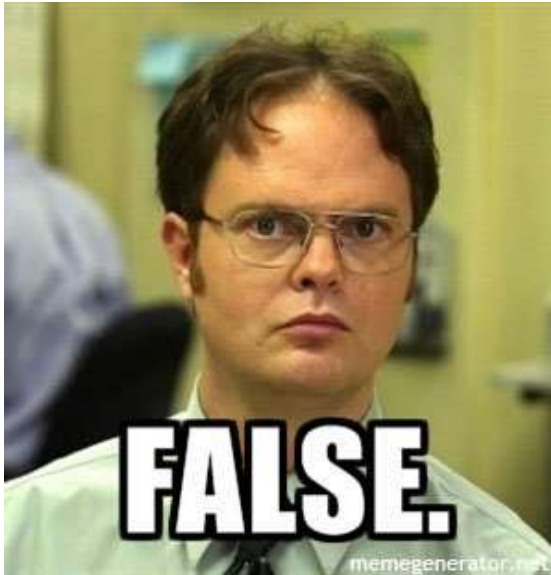
(If you don't know what that was, ask your younger relatives)

So, that's why you're learning the IPA

- ... and that's everything you need to know to complete the homework and test
-

There's one misconception I want to address

“People in Africa speak only with clicks”



Clicks in Africa

- Clicks are used extensively in Khoisan languages
 - (spoken by ~400,000 people)
- They've also been borrowed into Zulu and Xhosa, both Bantu languages (within Niger-congo)
 - (~17.6 million speakers)
- This means that only ~1% of Africans speak a language where there are clicks
- All of these languages have lots of non-click sounds!

San

Khoisan - Namibia

0:00 / 1:30

Original Source: 'Khoisan Click Language' by Xurxo Mariño (<https://www.youtube.com/watch?v=W6WO5XabD-s>)



“I could never do that!”

- Yes, you can.
-

Anybody can pronounce any language!

Speech organs are universal

- There is not a meaningful difference between your vocal tract and a San speaker's
 - Small differences may exist (<https://doi.org/10.1093/jole/lzx004>), but the effect size is small
 - The only meaningful difference between humans is practice!
 - It's easier if you learn the language at a younger age
 - There are no sounds English speakers “just can't produce”, *with practice*.
-

... but that doesn't mean it's easy

- Make a Voiceless Velar Fricative /x/ (as in “Chanukkah”, “Challah”, “Bach”)
- Make a voiced alveolar trill /r/ (the Spanish Rolled R)
- Make a voiceless palatal fricative (ç) (as in an angry cat)
- Make a voiceless alveolar lateral fricative (ɬ) (as in “nahuatl”)
- Make a /!/ click between two vowels (/a!a/)

IPA Conclusion

- The IPA is a great resource
 - Do the interactive tutorial for HW1 to learn more about how it works
 - Remember, you're writing down *what was actually said*, and your writing system doesn't help with that!
-

It's always hard to figure out what to include in a LIGN 101

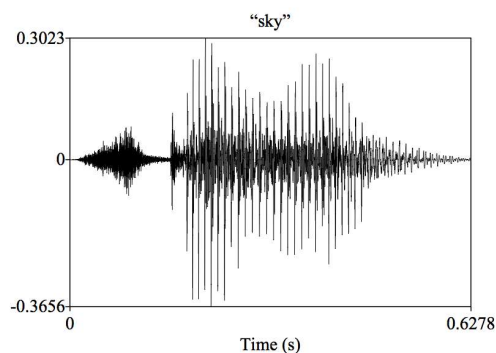
- We normally don't talk about speech perception in such a course, but...
 - ***“Screw it, I’m talking about speech perception!”***
-

Speech Perception is impossibly hard

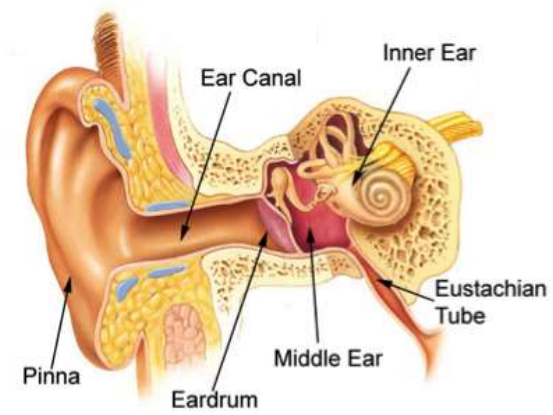
Speech is flapping bits of meat around in your head and throat while you expel air.

- **Speech perception is turning the resulting vibrations in the air back into language**
-

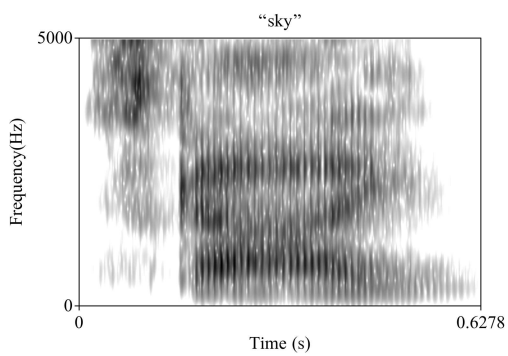
So, what do these vibrations look like?



How do humans pick them up?



Then what?



Then what?



“Oh, he’s talking about that thing up there!”



“Wait. You can’t do that. You skipped a step. Go back.”

- That step takes years of grad school to understand how little we understand.
-

We’re going to ignore the “how” and focus on the “wow!”

Let’s do some speech perception magic tricks!

Trick #1: Gradient Perception

- When we’re familiar with the categories in a language, that affects our perception strongly
-

Date vs. Debt

Date

Debt

?

0:00 / 0:00

??

0:00 / 0:00

???

0:00 / 0:00

Let's do an experiment!

????

0:00 / 0:04

Gradient Perception

- We use our knowledge of the categories to make strong decisions about which sounds are which
 - ... but they're not always the same decisions as your neighbors!
-

Trick #2: Coda Recovery

bad

ban

0:00 / 0:00

bomb

bob

0:00 / 0:00



duck

dunk

0:00 / 0:00

bob

bomb



We pay attention to tiny details!

bend

/bend/

- ...but there's more to it than the symbols show us!
-

Coarticulation

When we start preparing for the next sound *before it even begins*

- In the word “bend”, we start nasal airflow before the nasal /n/, *during the vowel*
-

bend

/bend/

/bẽnd/

You use coarticulation to hear missing sounds!



Speaking of recovering huge amounts of information...

Trick #3: Fun with Sine Waves

Let's listen to some sounds

0:00 / 0:02

0:00 / 0:02

0:00 / 0:02

###

###
###



This is called “Sine wave speech”, and it’s *really* awesome.

Trick #4: Multi-modal perception

The McGurk Effect (Part 1)

0:00 / 0:03

The McGurk Effect (Part 2)

0:00 / 0:03

They're the same video!

- 🤖
-

Spoken Language is multi-modal!

- The distinction between visual and auditory modalities isn't as cut and dry as many think
-

Trick #5: Hearing Tongues

We may be hearing tongues

- We may be taking acoustics and processing it to build a model of the world

- Then using that model to understand what's happening in the other person's head
 - Which then tells you the phones being produced
 - ... and lets you reconstruct words
-

If speech perception is gestural, then so is gesture perception

- ... and signed language perception is not so different!
-

Trick #6: The Novel Speaker

0:00 / 0:25

(Source) (http://accent.gmu.edu/browse_language.php?function=detail&speakerid=1771)

This is a woman you've never met, and will likely never meet

- She's 28 years old from Monrovia, Liberia
 - She also speaks Liberian Pidgin English
 - You've never seen her face, never conducted a conversation
 - ... **and you still understood her.**
-

I mean, seriously...

- You've probably never heard anybody with a Liberian Pidgin English accent
 - You've probably never even heard anybody from Liberia
 - You had no way of seeing her to judge how large or small her vocal tract was
 - You couldn't rely on gestures or facial movements to help fill in blanks.
 - You had no context to know which words she would or wouldn't say
 - *This is a worst-case scenario for speech perception*
 - ... **but you all didn't care!**
-

We don't seem to care that...

- Every person sounds different
 - Sometimes due to language background or social status
 - Sometimes due to differences in anatomy
 - My vowel in “bet” might be acoustically the same as yours in “bit”
 - No two productions of the same word by the same person are identical
 - ... and in fact...
-

You are your own unique little acoustical snowflake



And yet, nobody gives a damn.

- **We just talk, and it works**



We adjust to speakers/signers in perception all the time! How we adjust to different speakers in production is even the topic of a whole field called Communication Accommodation Theory!

- (Nope, not getting into that here!)

“OK. Making speech is impossibly hard, and understanding speech is impossibly hard.”

- “... but... uh... we’re doing it right now.”

OK, OK. You got me.

Speech is impossibly hard, but we do it anyways

... but that’s only because we’re *really* awesome.

<!--

Our
abil
pro
spe
incl

* W
bits
me
aro
our
hea

* in
pre
intr
pat
and
ser

* w
thir
“try
or
run
out

* w
wal
run
biki
eat

* ..
still
the
me
acr



Our ability to perceive speech is *incredible*

- We're able to pull signals out of the air,
- parse them according to the rules in our minds,
- take advantage of tiny details,
- recover *huge* amounts of lost information,
- and wade through mind-boggling variability
- ... all without even noticing you're doing anything special.



Producing and understanding words is the most complicated thing you will ever do

- ... and you don't even think twice about it.

Understanding Language is Magic

... and you're all wizards



Take LIGN 110 and then 112 to learn more!



Trick #5: Tone Languages

Tone

Changes in pitch during the word change the meaning of the word

Level Tone

“High” vs. “Low” (sometimes “mid” or “rising/falling”)

| |
|-------|
| Zar |
| Nilo- |
| Yes |
| Wo |



Which has the high tone?

A - “Yesterday”

B - “Wound”



0:00 / 0:11

Contour Tones

Pitch patterns change meaning

Mandarin Chinese

Sino-Tibetan - China

妈 麻 马 骂 吗

‘mother bother horse scold QUESTION’ (<https://www.youtube.com/watch?v=orx53ieqEI4>).

Thank you!