

# Signal Processing: From Language to Tinnitus

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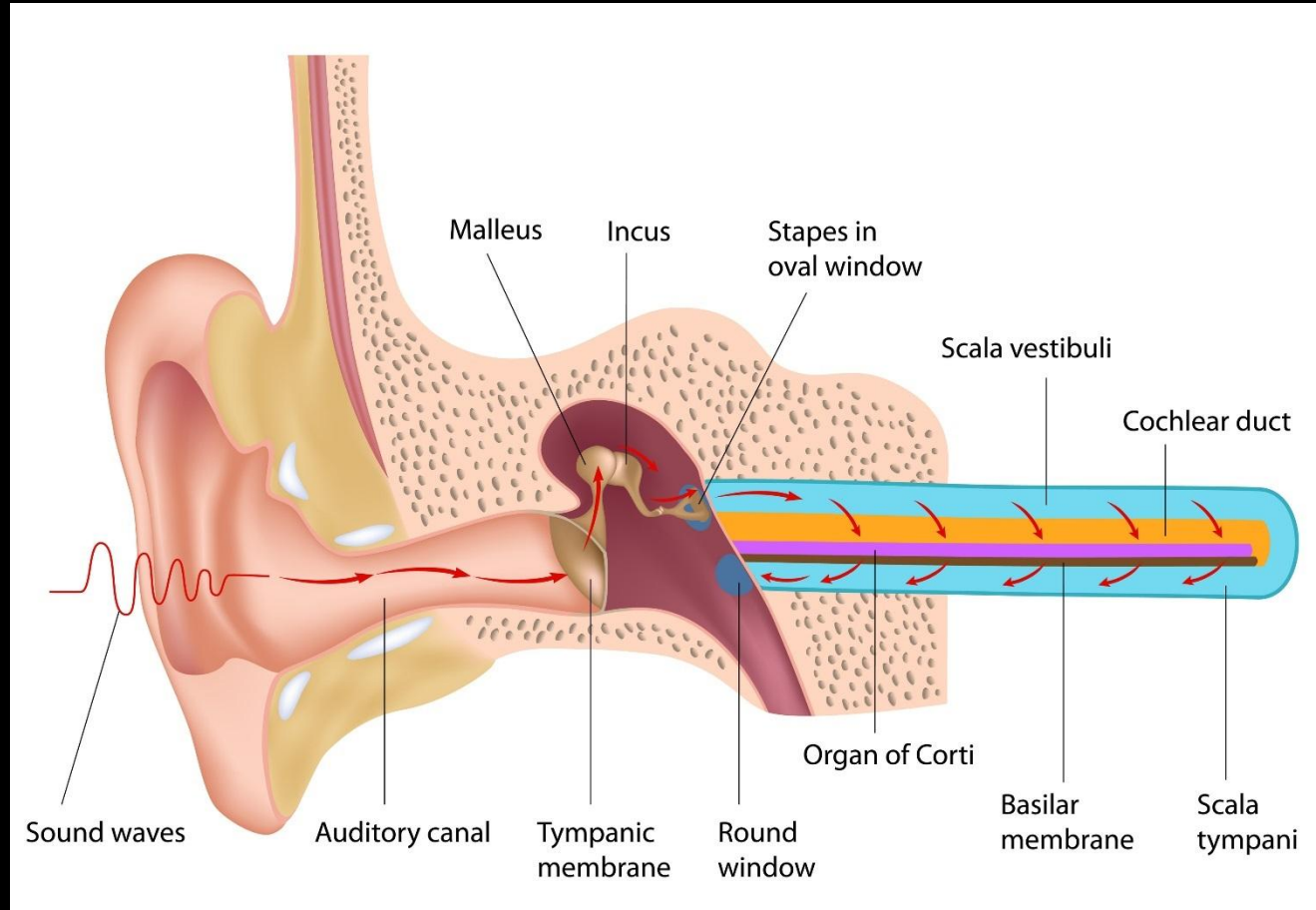
11762 Jollyville Rd

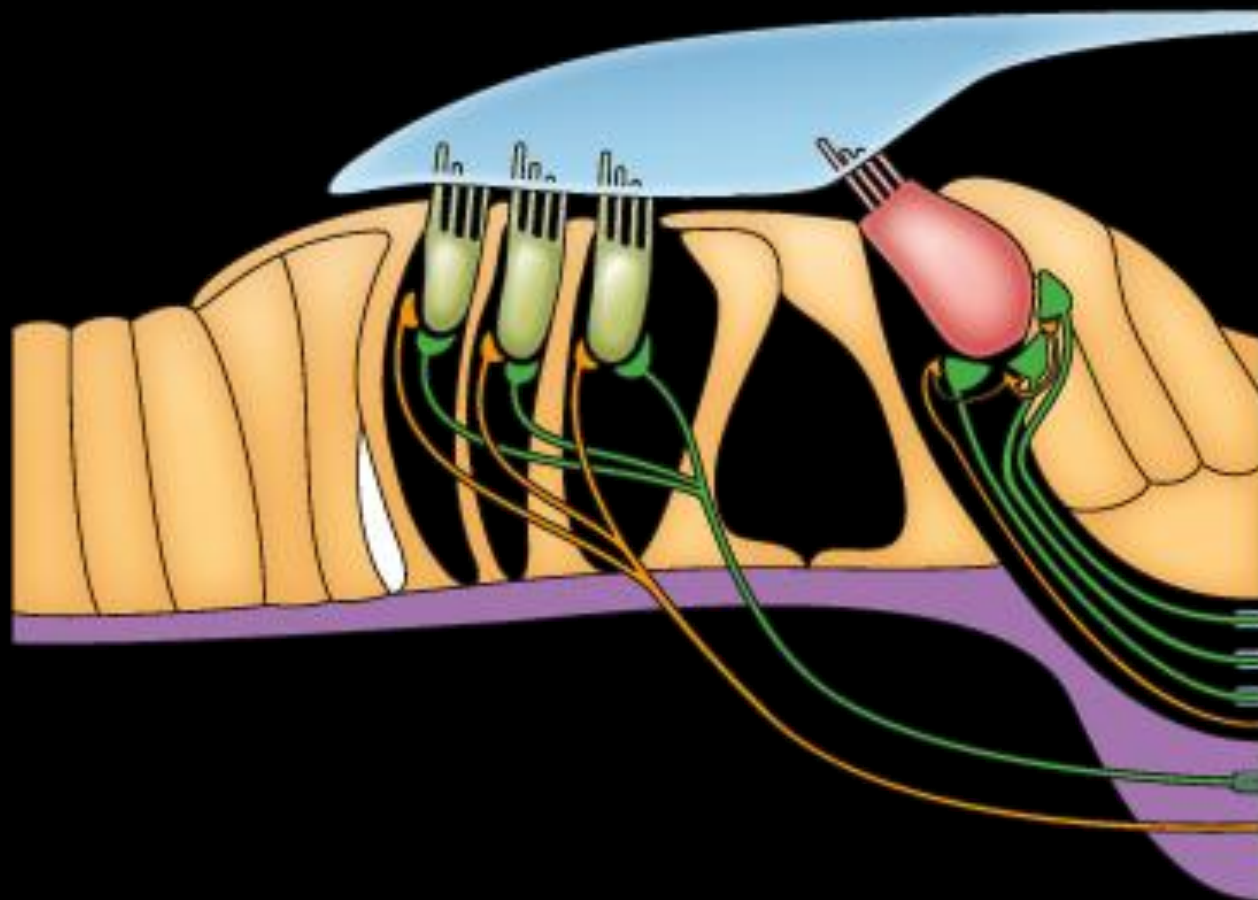
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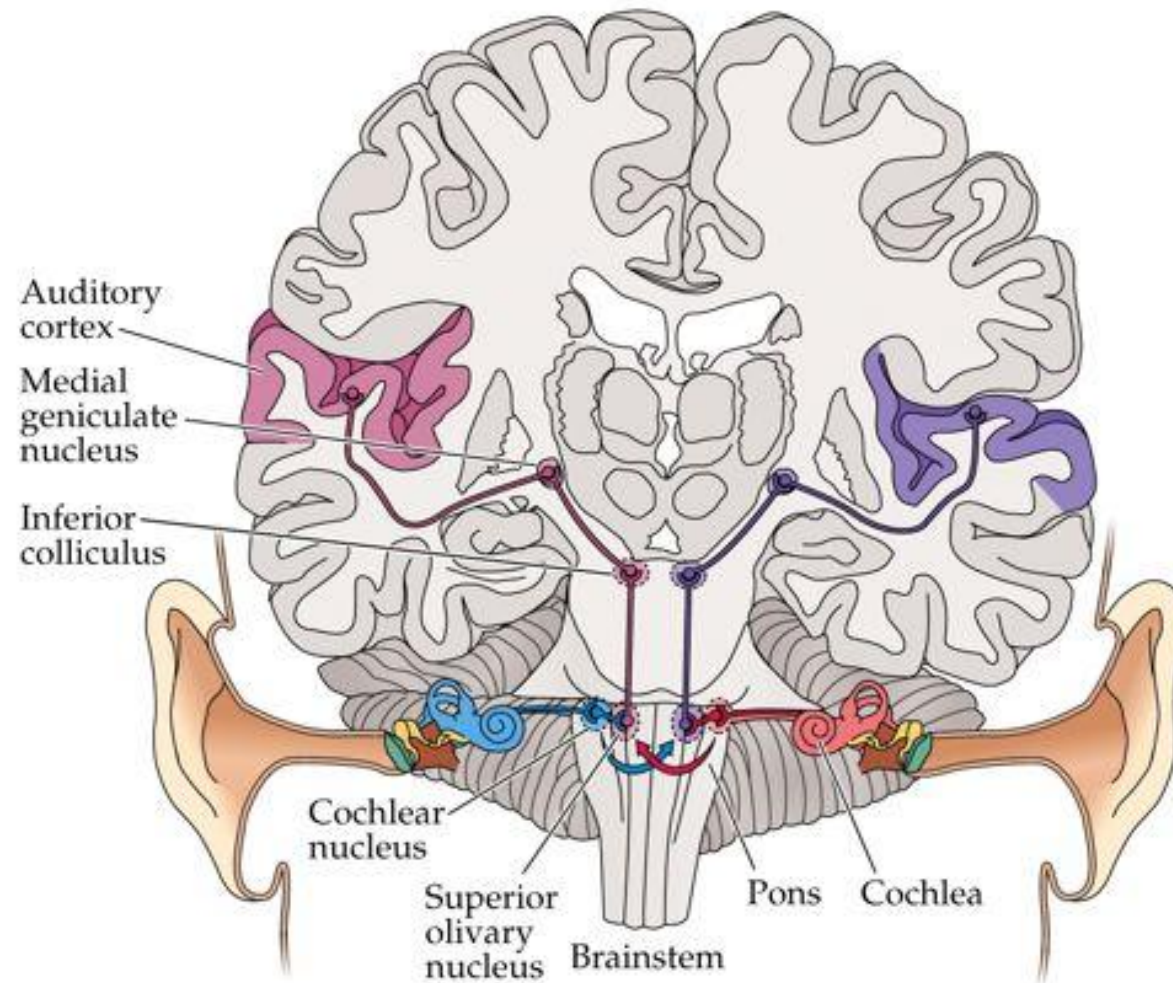


# How Do We Hear? (Anatomy Lesson)

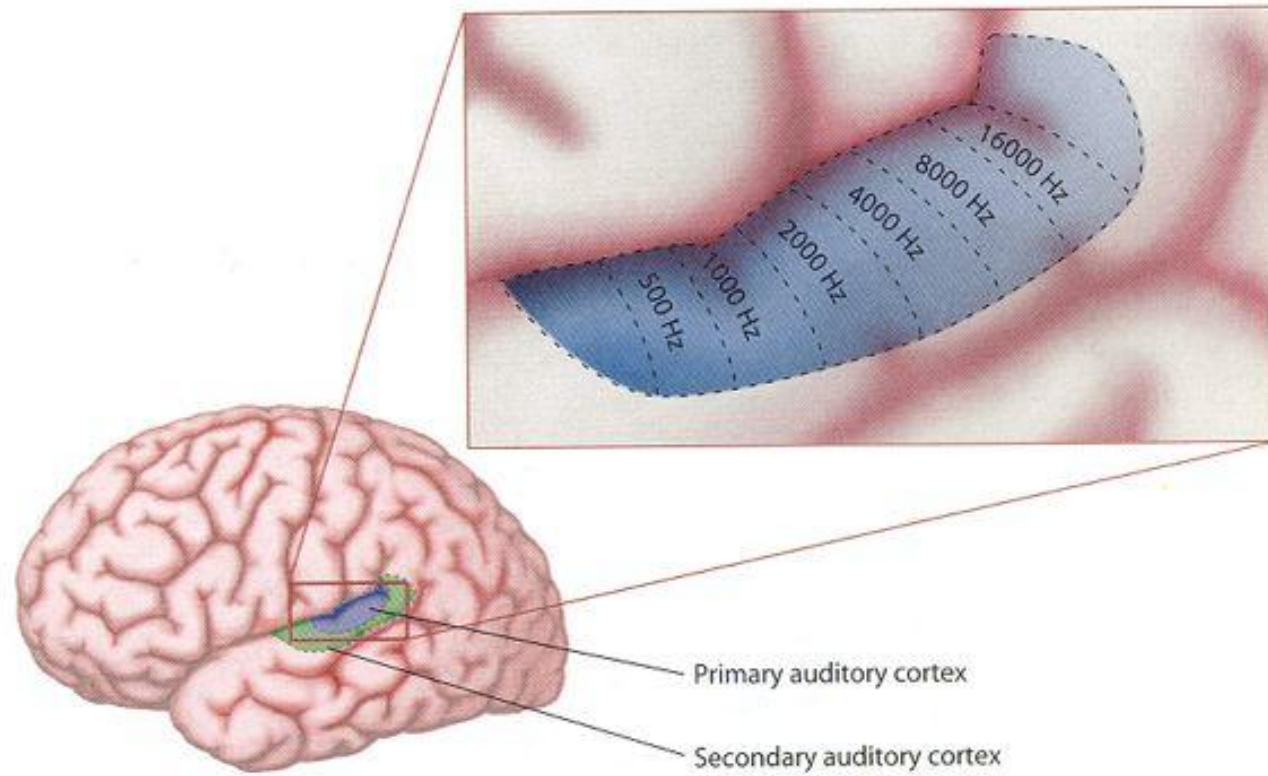




# Ascending auditory pathways



# Cortical tonotopy



# Hearing Loss Statistics

- 360 million people globally with “disabling” hearing loss
  - 328 million are adults
  - 32 million are children

(World Health Organization 2012)

- In the United States:
  - 31.5 million people have hearing loss (10% of population)
  - 1.4 million children (18 or younger)
  - 1/3 of individuals over the age of 60
  - 65% of this population is under 65 yrs
  - Less than 20% of this population is adequately treated
  - Less than 12% of family doctors screen for hearing loss
  - On average, people wait 7-10 yrs to address hearing loss

(Better Hearing Institute)

# What is Auditory Processing?

- Quite simply put, it is how your brain interprets the sounds that are sent from your inner ear (cochlea) to the auditory processing center of the brain (Primary Auditory Cortex or Heschel's Gyrus)
- Abnormalities in auditory processing are NOT the same as hearing loss.

# Signs of Auditory Processing Disorder

- Lack of music appreciation
- Difficulty following conversation on the telephone
- Difficulty following directions
- Difficulty following long conversations
- Difficulty taking notes
- Social issues—difficulty "reading" others/pragmatic communication issues
- Spelling, reading, writing issues
- Organizational problems

# Hearing Loss & Dementia

- Described by Johns Hopkins in 2011 (Lin et al) in a longitudinal study of 639 subjects.
  - All were dementia free during initial evaluation
  - Subset of population with hearing loss
  - As hearing loss increased, severity of dementia correlated

*Arch Neurol.* 2011;68(2):214-220.

- Lin et al (2014) utilized MRI to determine brain shrinkage
  - Significant correlation with hearing loss in older adults and severity of dementia (% brain shrinkage)

“...participants whose hearing was already impaired at the start of the sub-study had accelerated rates of brain atrophy compared to those with normal hearing. Overall, the scientists report, those with impaired hearing lost more than an additional cubic centimeter of brain tissue each year compared with those with normal hearing. Those with impaired hearing also had significantly more shrinkage in particular regions, including the superior, middle and inferior temporal gyri, brain structures responsible for processing sound and speech.”

# Tinnitus

