

MAPPING HUMAN CORTEX

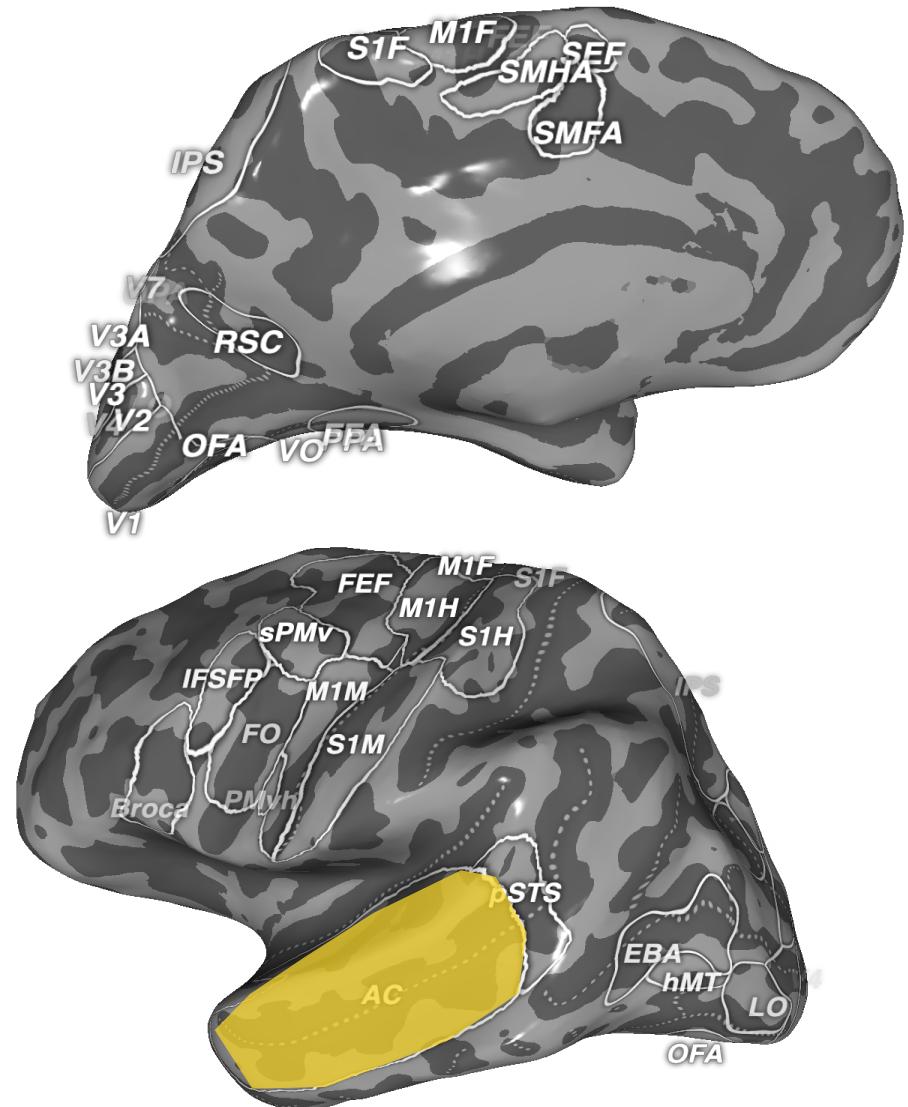
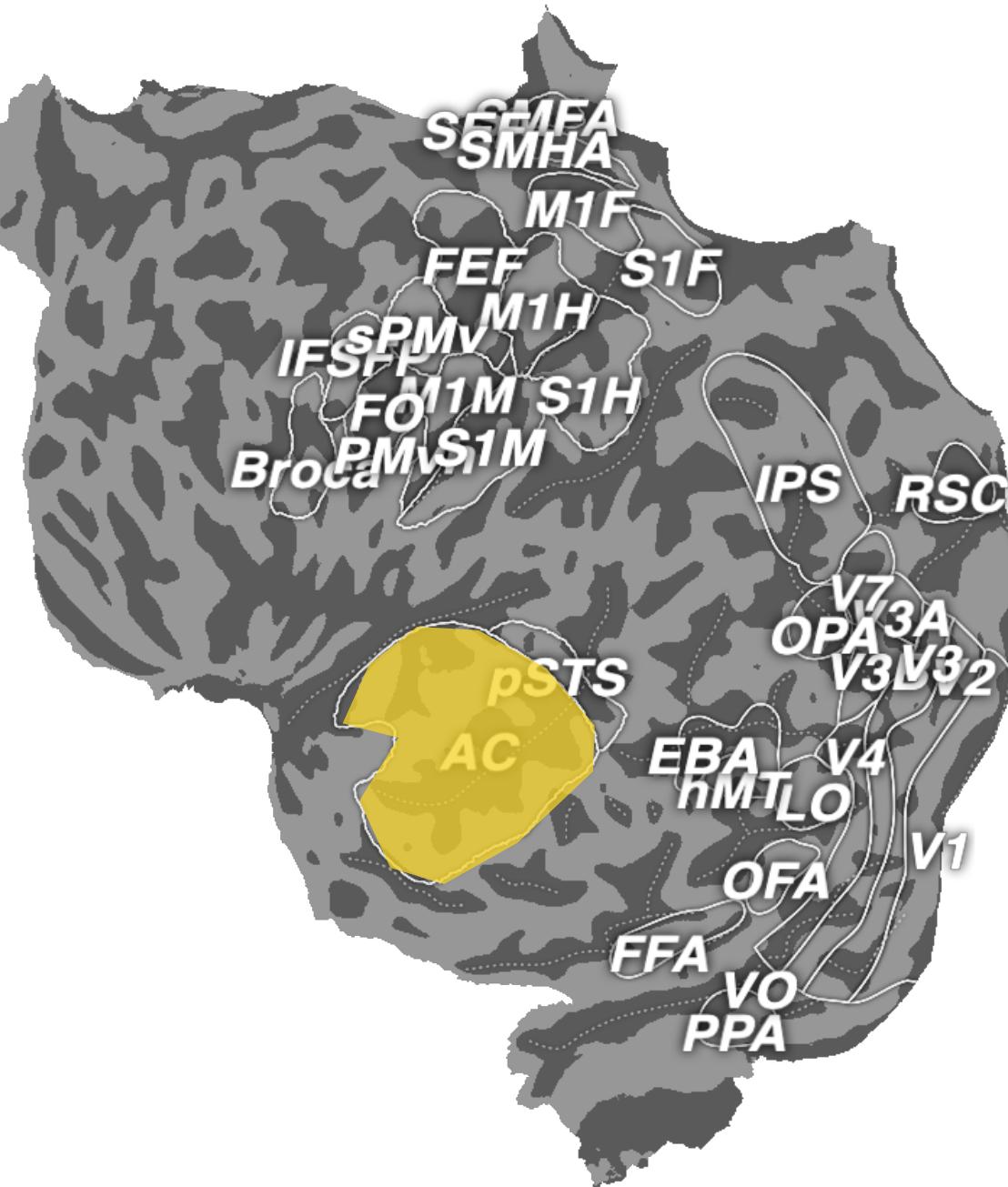
Prof. Alexander Huth

4.7.2021

HOMEWORKS

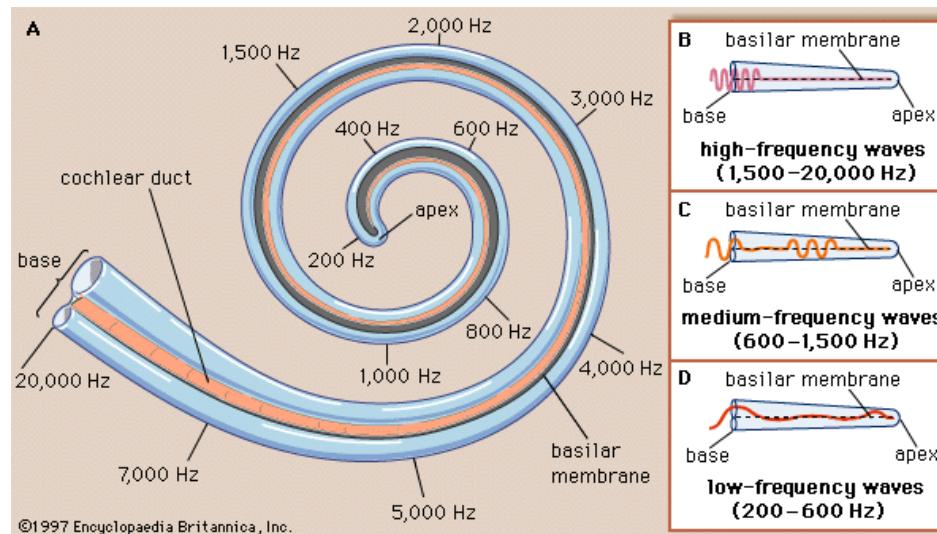
- * **Homework 2** (visual ctx.) was due TODAY!
- * **Homework 3** (covering the somato-motor systems) will be posted before next class

AUDITORY CORTEX



TONOTOPY

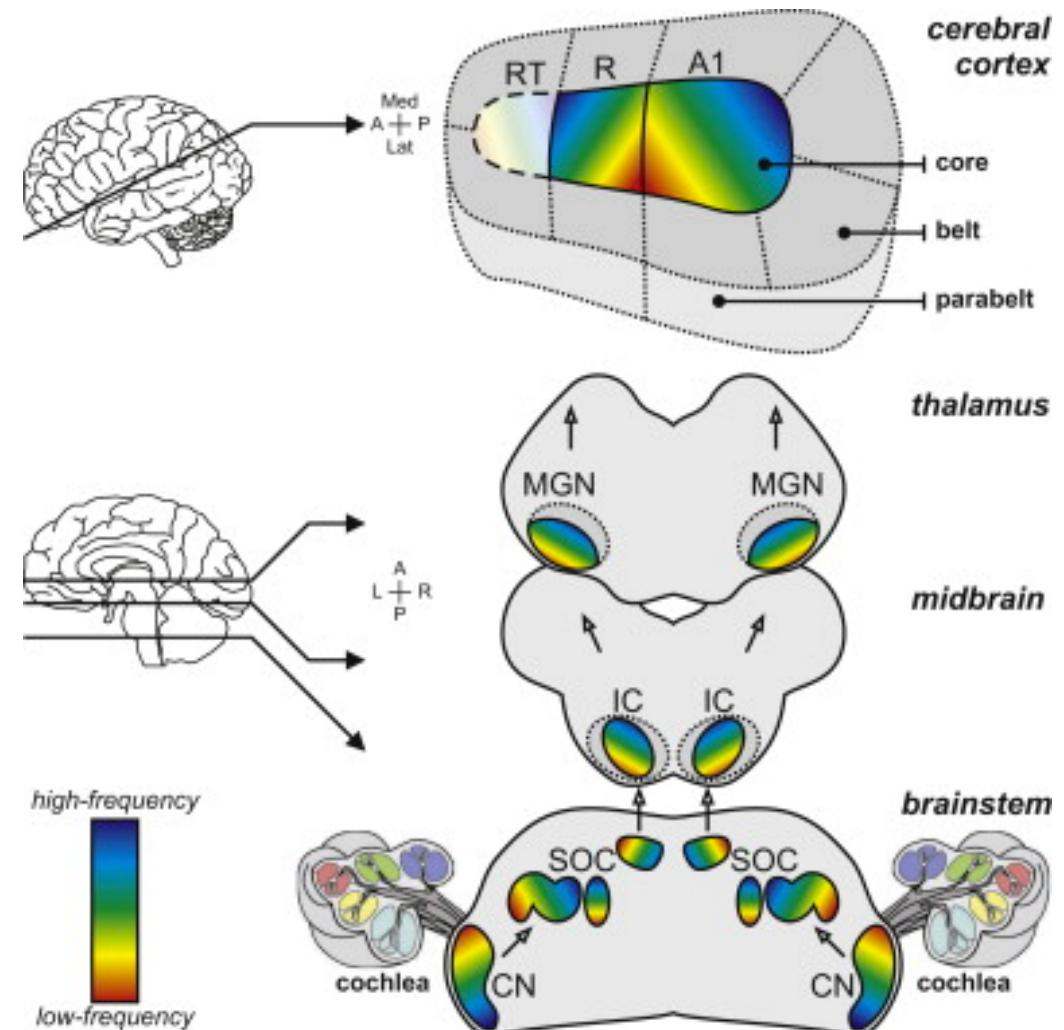
- * In auditory cortex we have **tonotopy**: different neurons respond selectively to different frequencies of sound
- * This follows from the *cochlea*, our hearing organ



TONOTOPY

- * **Tonotopy**

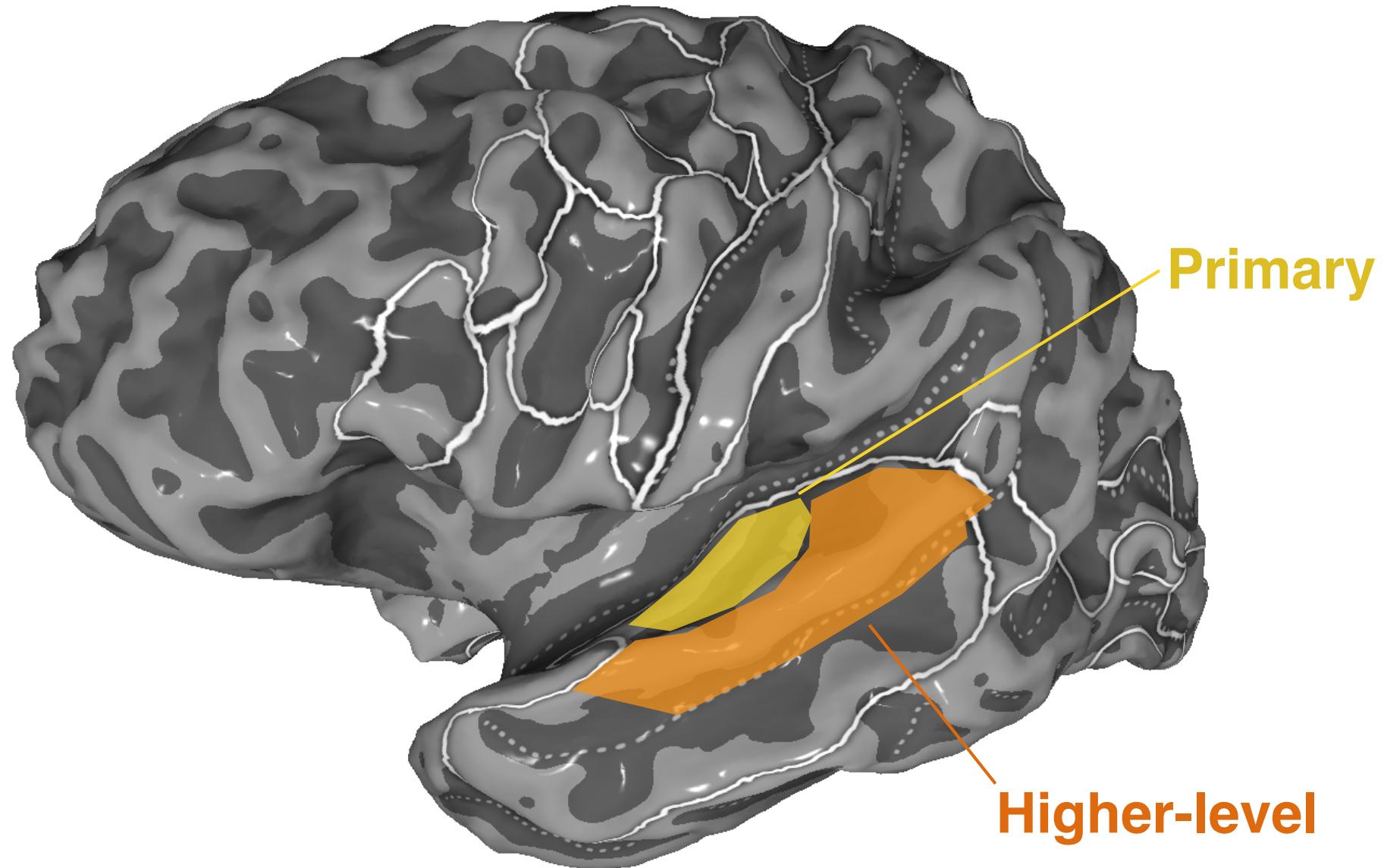
appears at every
level of the
auditory system
(not just cochlea
and cortex)



AUDITORY SUBDIVISIONS

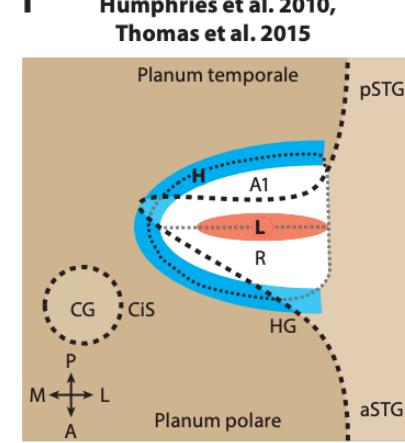
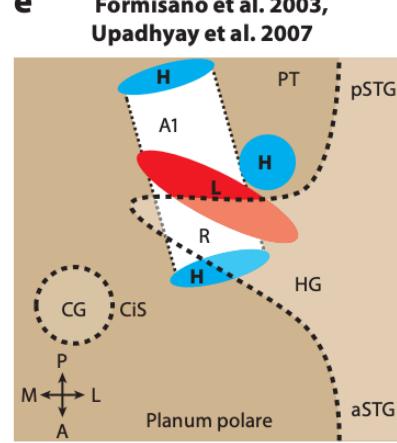
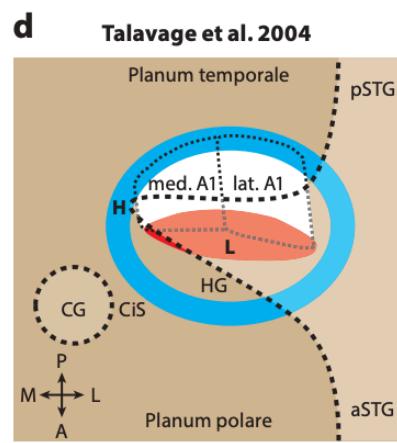
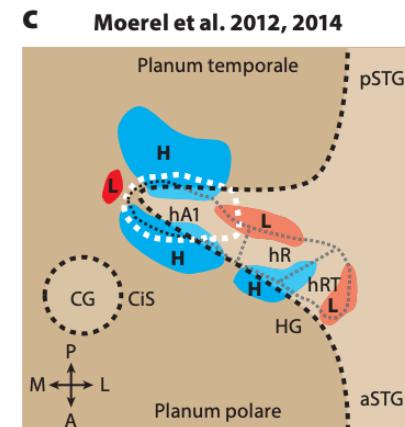
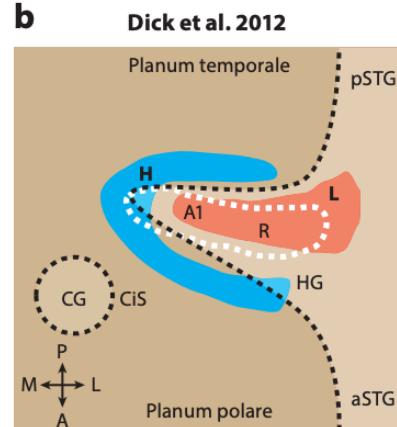
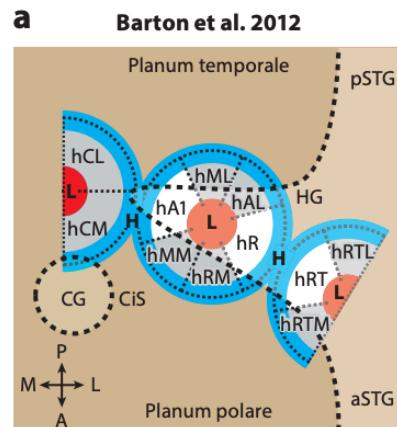
- * Unlike others we've talked about, the auditory system in humans is **not** very well mapped
- * Still, there is general agreement that:
 - * **Primary auditory cortex** (A1+R+RT) on Heschl's gyrus is the first stage of cortical processing
 - * **Higher auditory cortex** in STG, STS contains later stages of processing

AUDITORY SUBDIVISIONS



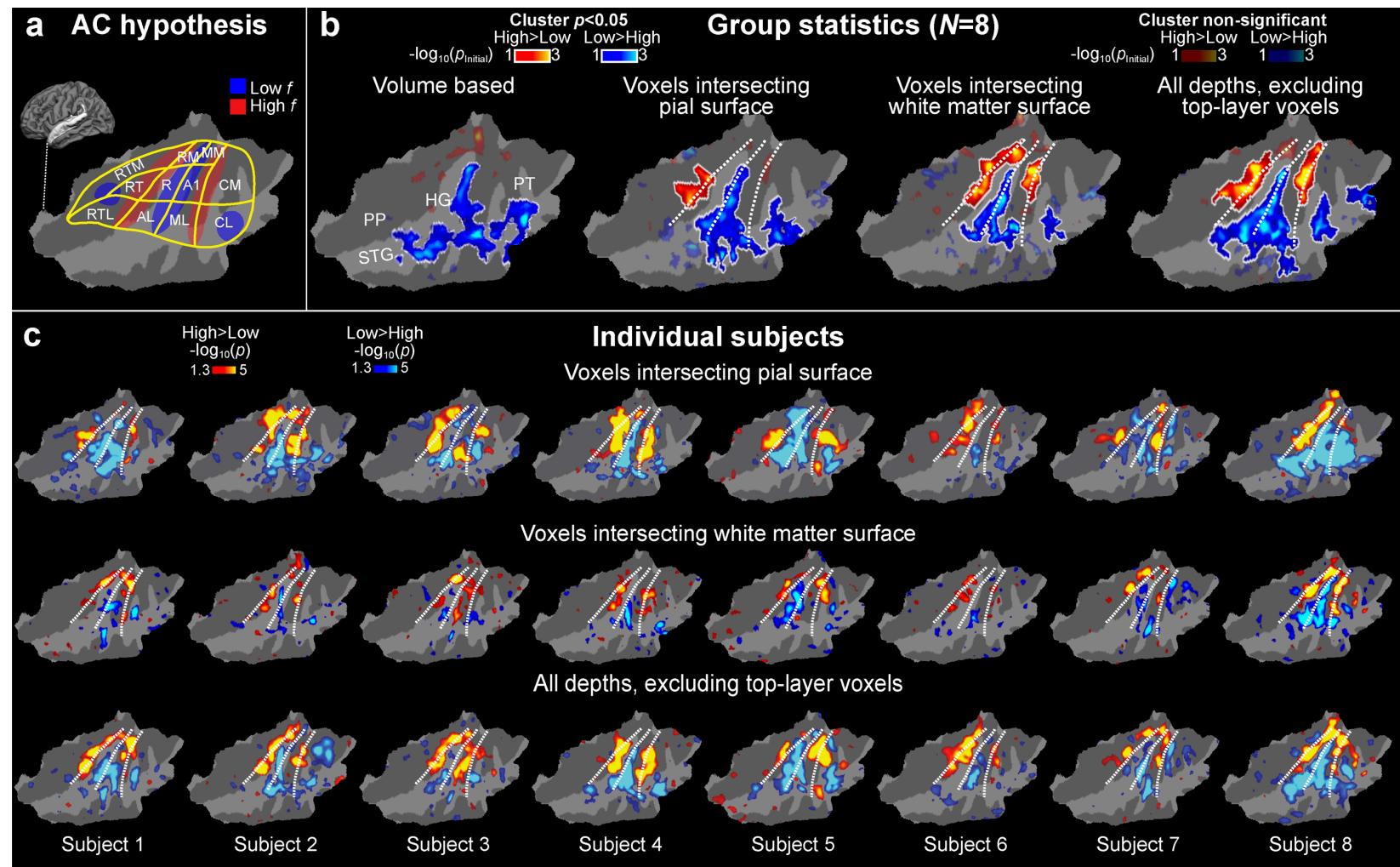
TONOTOPIC MAPS

- * How many? Where? Very unclear!



Brewer & Barton (2016)

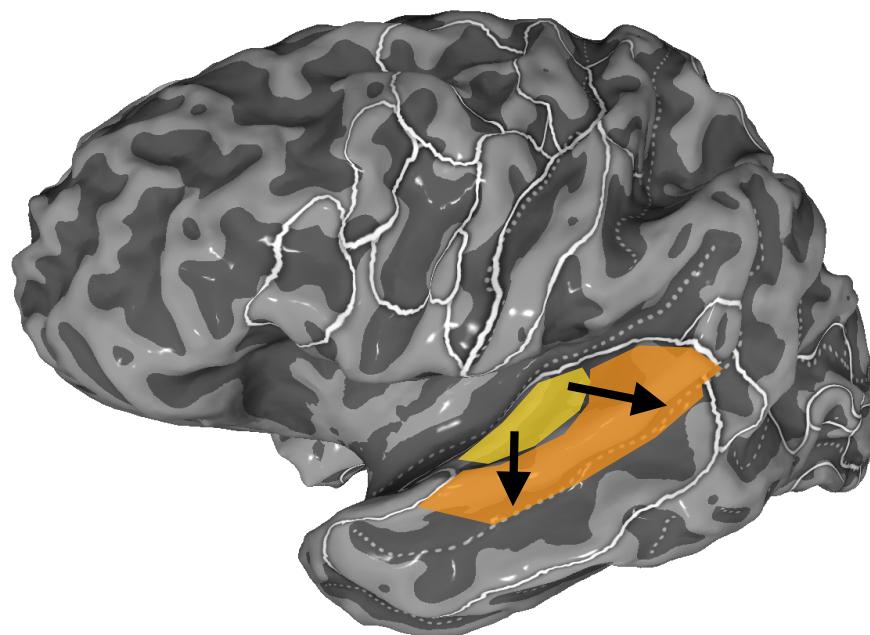
TONOTOPIC MAPS



Ahveninen et al. (2016)

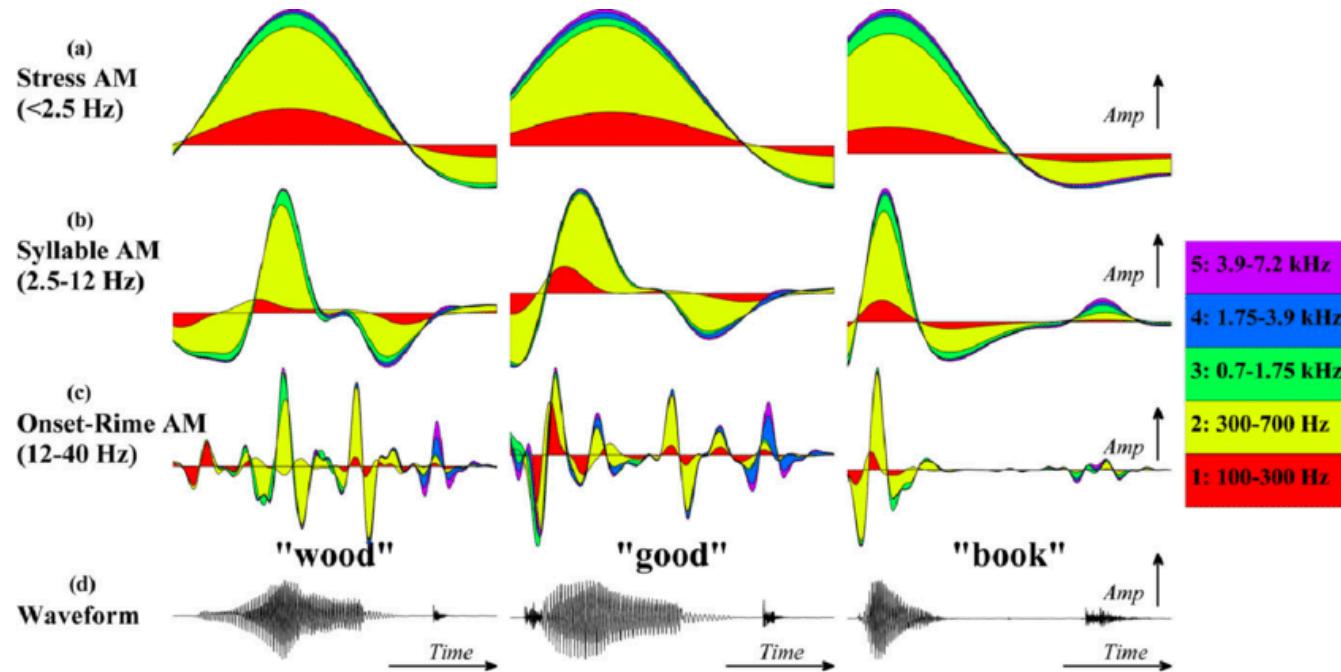
AUDITORY SUBDIVISIONS

- * One thing people agree on is that there is a **complexity gradient**: representations get more complex and selective (for specific types of sounds) from PAC to higher auditory cortex



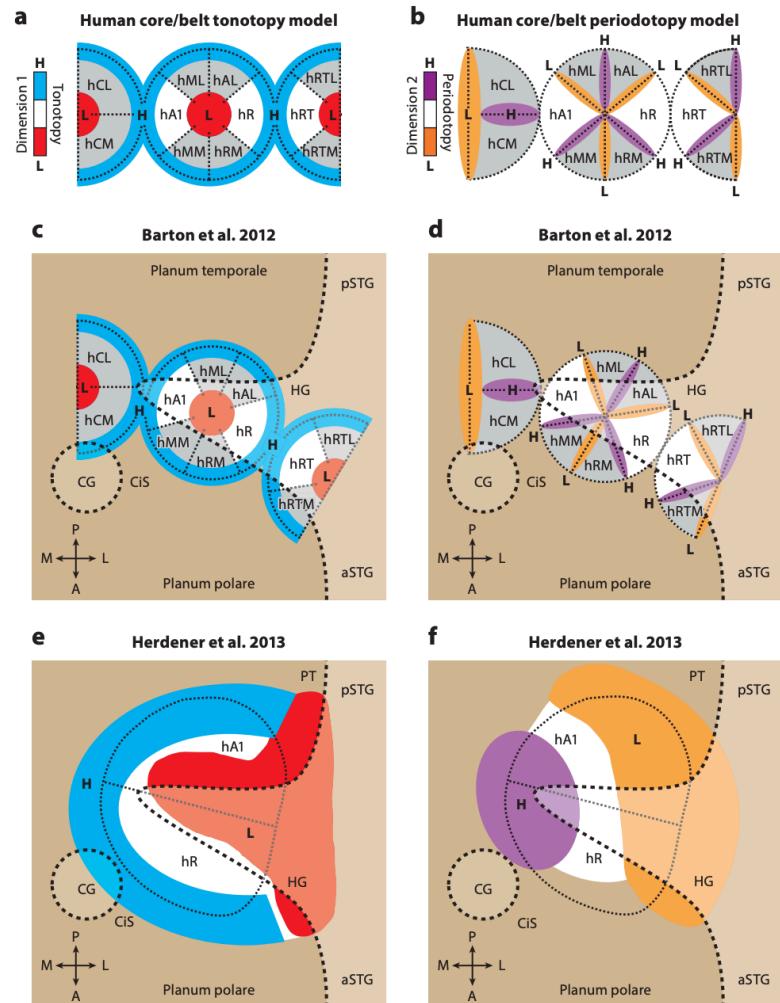
OTHER FEATURES?

- * **Temporal modulation**, or how quickly the sound signal is changing over time, is another feature thought to be important in auditory cortex



OTHER FEATURES?

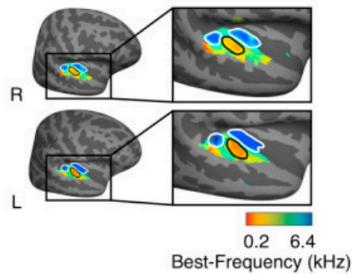
- * **Periodotopy**
refers to the
smooth mapping
of temporal
modulation
selectivity across
cortex



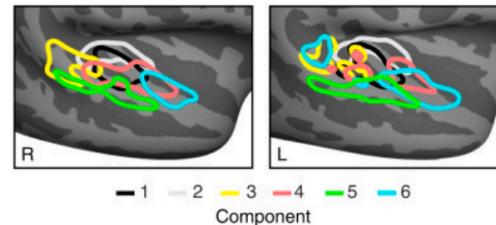
Brewer & Barton (2016)

OTHER FEATURES?

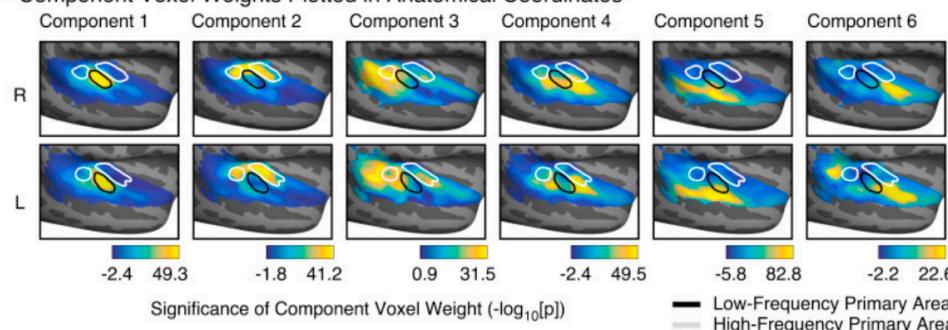
A Tonotopy Measured with Pure Tones



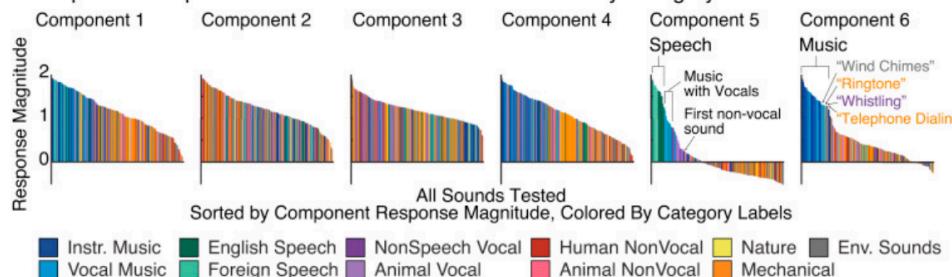
C Summary Map: Outlines of Regions with High Weight



B Component Voxel Weights Plotted in Anatomical Coordinates

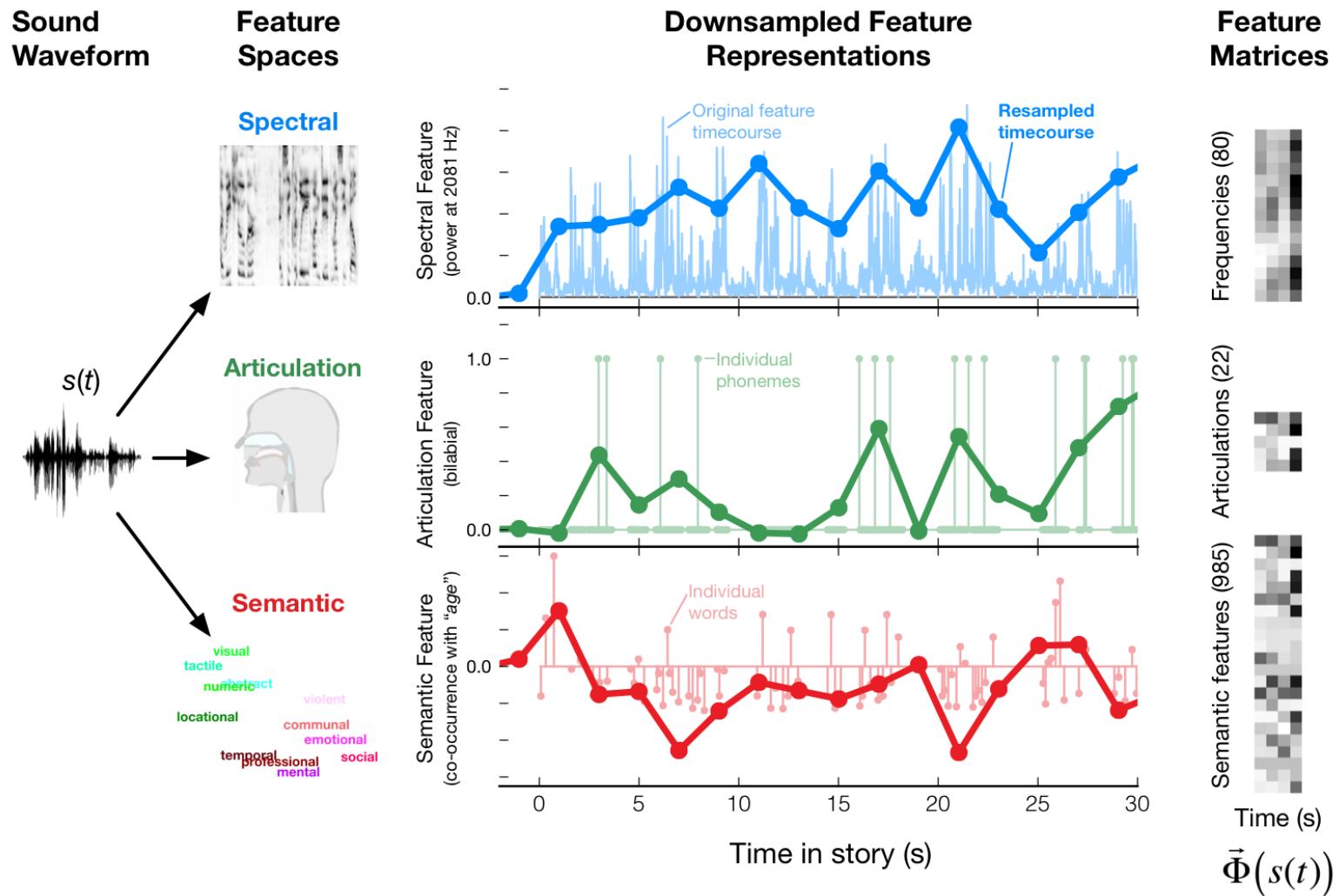


D Component Response Profiles to All 165 Sounds Colored by Category



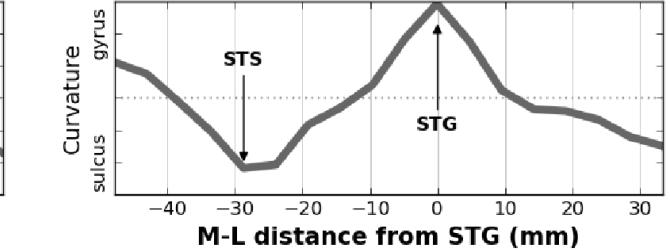
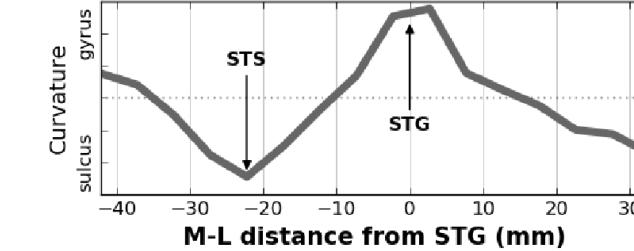
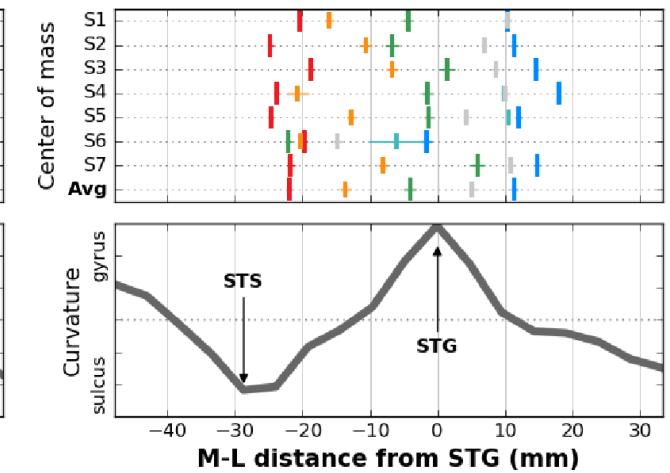
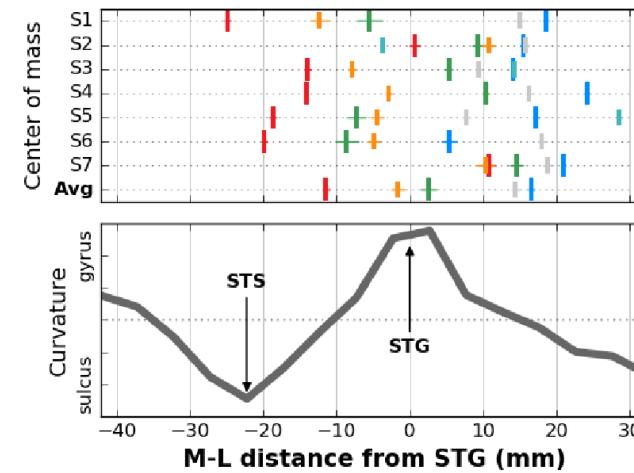
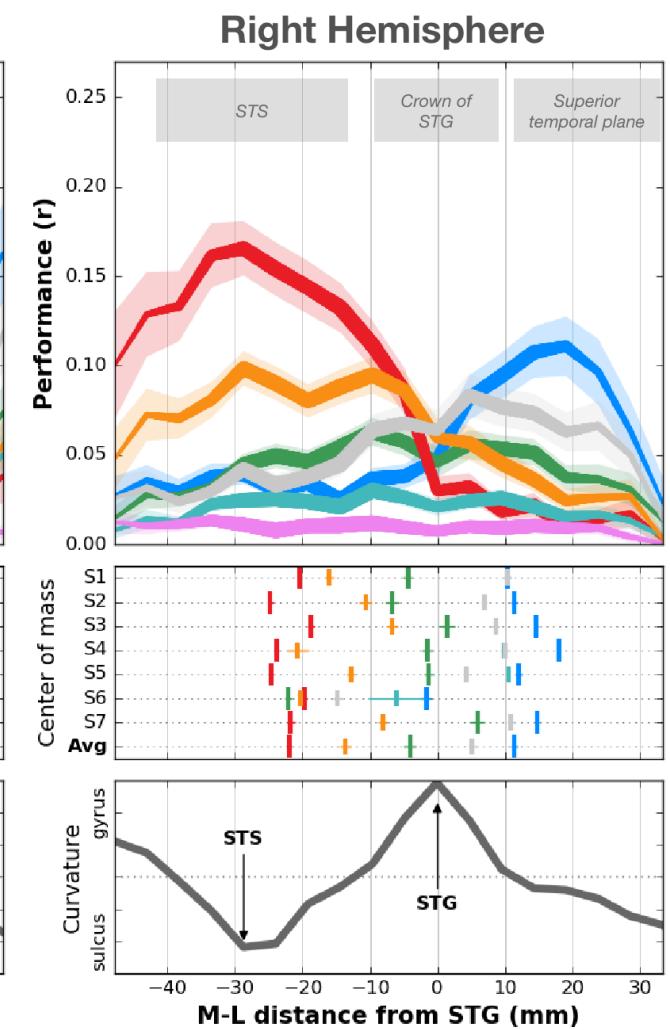
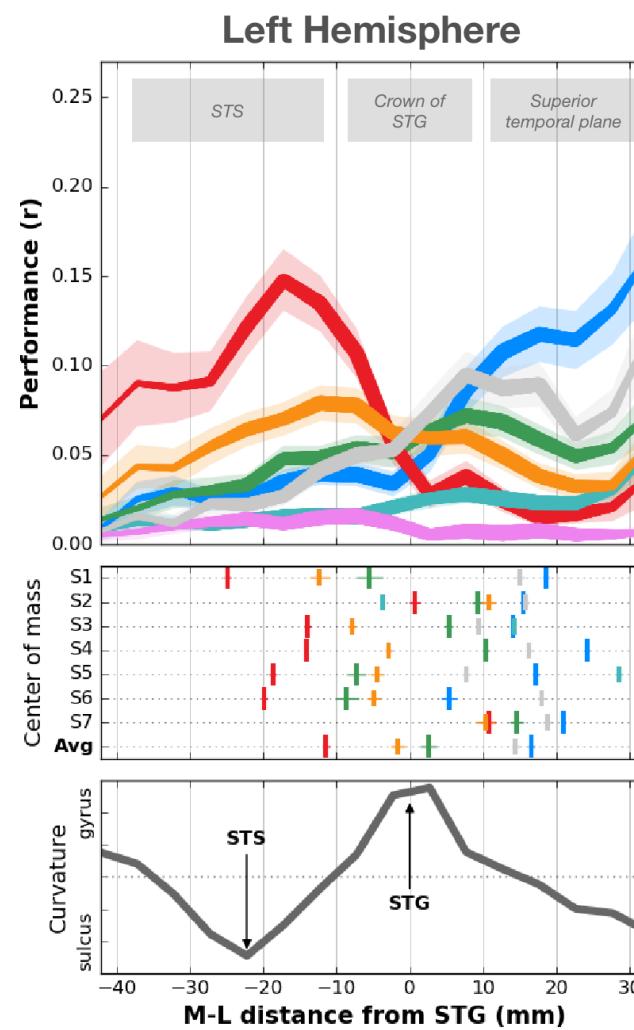
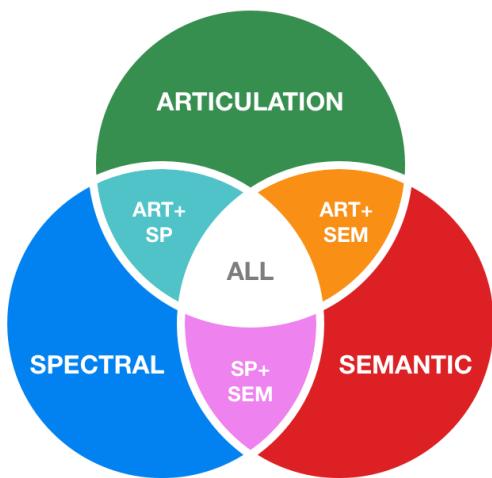
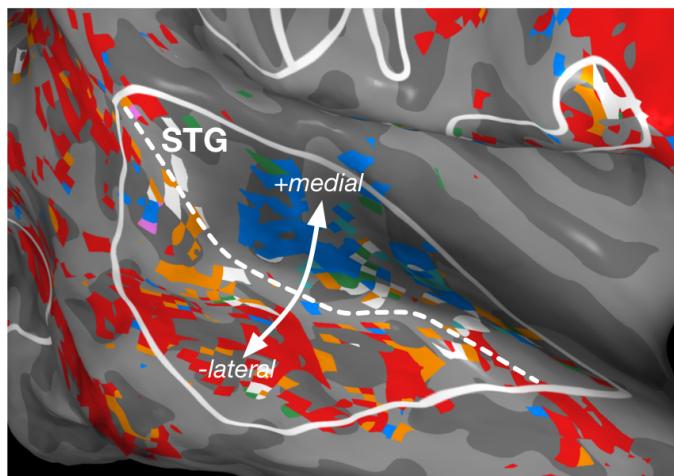
Norman-Haignere et al. (2015)

OTHER FEATURES?



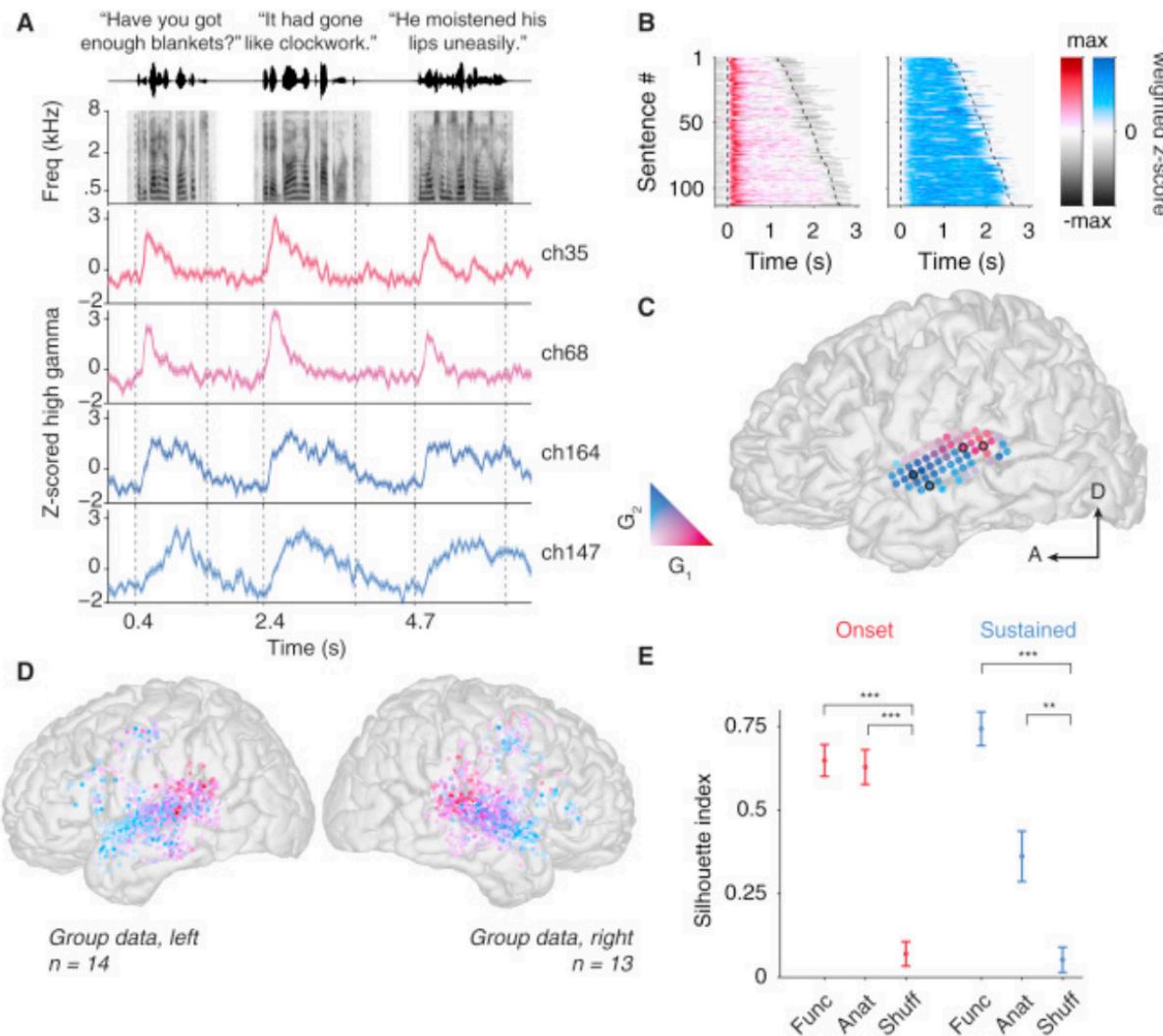
de Heer et al. (2017)

OTHER FEATURES?



de Heer et al. (2017)

OTHER FEATURES?



Hamilton et al. (2018)

UNTIL

NEXT

TIME