

The image features two large, thick black L-shaped brackets. One is positioned in the top-left corner, and the other is in the bottom-right corner, framing the central text.

SCIENCE RESEARCH INTERNSHIP

Yasmin Alamdeen

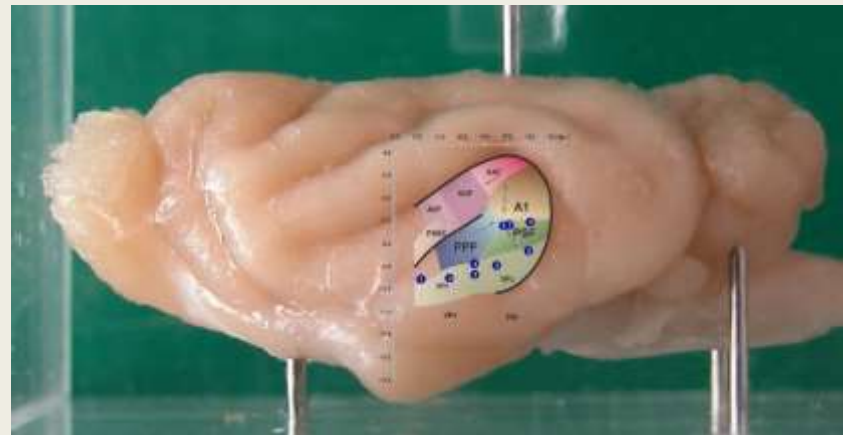
My Internship

- University of Maryland Neural Systems Lab with Dr. Jonathan Fritz
 - *Focus: auditory system in ferrets*
- Sequence Discrimination and Auditory Selective Attention*
- AM/tone discrimination



Why Ferrets?

- Individual neural recordings
 - *Electrodes vs. functional neuroimaging*
- Similar hearing range
 - Tuned to lower frequencies
- Presence of sulci (folds)
 - *Sign of more complex brain*



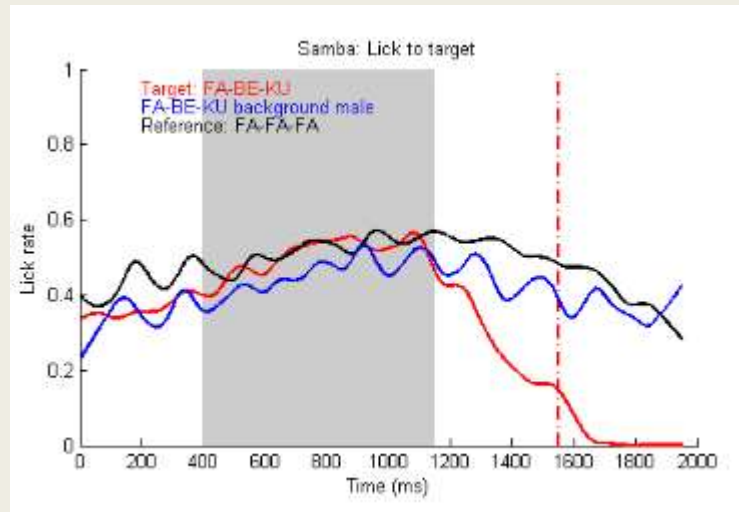
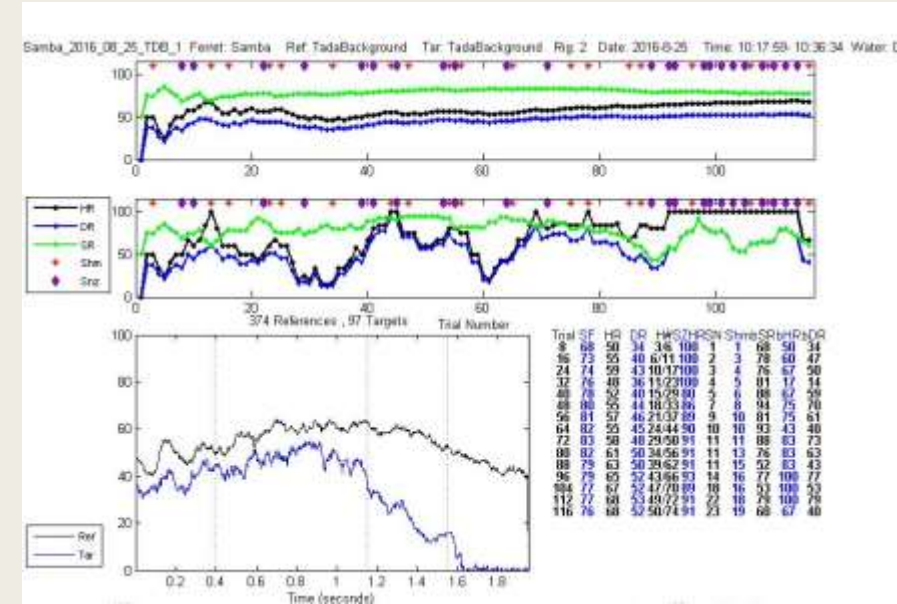
Sound Prioritization

- In animals, novelty detection
 - *Create large response as break in pattern*
 - *Automatic response*
- “Cocktail Party Effect”: focus on one conversation out background noise
 - *Ability to recognize sounds (intentional listening)*
- Want to test ferrets’ ability to prioritize certain sounds and recognize sounds with applied meaning (i.e. negative reward-shock)



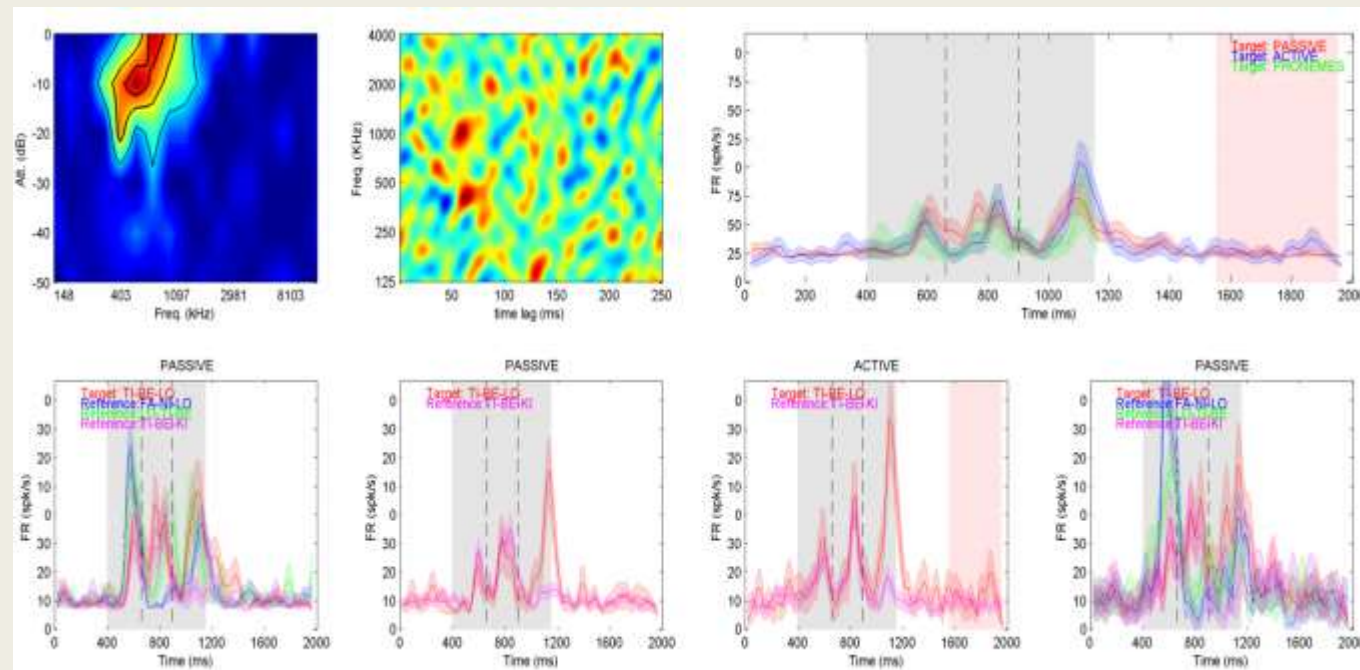
Experiments: Behavior Tasks

- Through a negative reinforcement, GO/no-GO task, test animals' ability to differentiate between two "words" (sequence of 3 syllables)
- First task: Differentiate between reference word (ABX) and target word (ABC) based off meaning assigned by punishment (i.e. shock)
- Second task: Differentiate reference word (AAA) and target word (ABC) while also listening to words in different voice
- The graphs record the number of trials, the lick rate, and number of correct trials, and the ratio of correct trials to incorrect trials.



Experiments: Neurophysiology Recordings

- Recording from isolated neurons in ferret brain while performing task
- Once animals are trained on task, receive surgery where have headcap placed on top of skull and a craniotomy
- During recordings, 4 electrodes are placed in A1 of the brain
- Responses graphed using STRF (spectro-temporal receptive field) and PSTH (peristimulus-time histogram)
- Record neural response of phonemes, reference word, and target word
- Only recordings from sequence detection task



Results

- By testing ferrets' response to words, we hope to test the presence of adaptation and possibly demonstrate a model for language understanding

Sequence Detection:

- Behavior: Animals could differentiate between the reference word and target word based on lick rate difference
- Electrophysiology: Recordings support ability to differentiate based off response to last syllable
- Response suggest presence of adaptation and understanding

Voice Discrimination:

- Can differentiate between female reference and target words
- Easily prioritize female voice over male voice based on response to female target compared to male target
- Responses suggest animal learned to apply meaning to words, but cannot yet tell if adaptation present

What I Did

- Animal Care
 - *Feeding/weighing*
- Training
 - *Behavior tasks*
- Observation
 - *Surgery*
 - *Electrophysiology*
- Classes
 - *NIH*
 - *Lectures/Research*



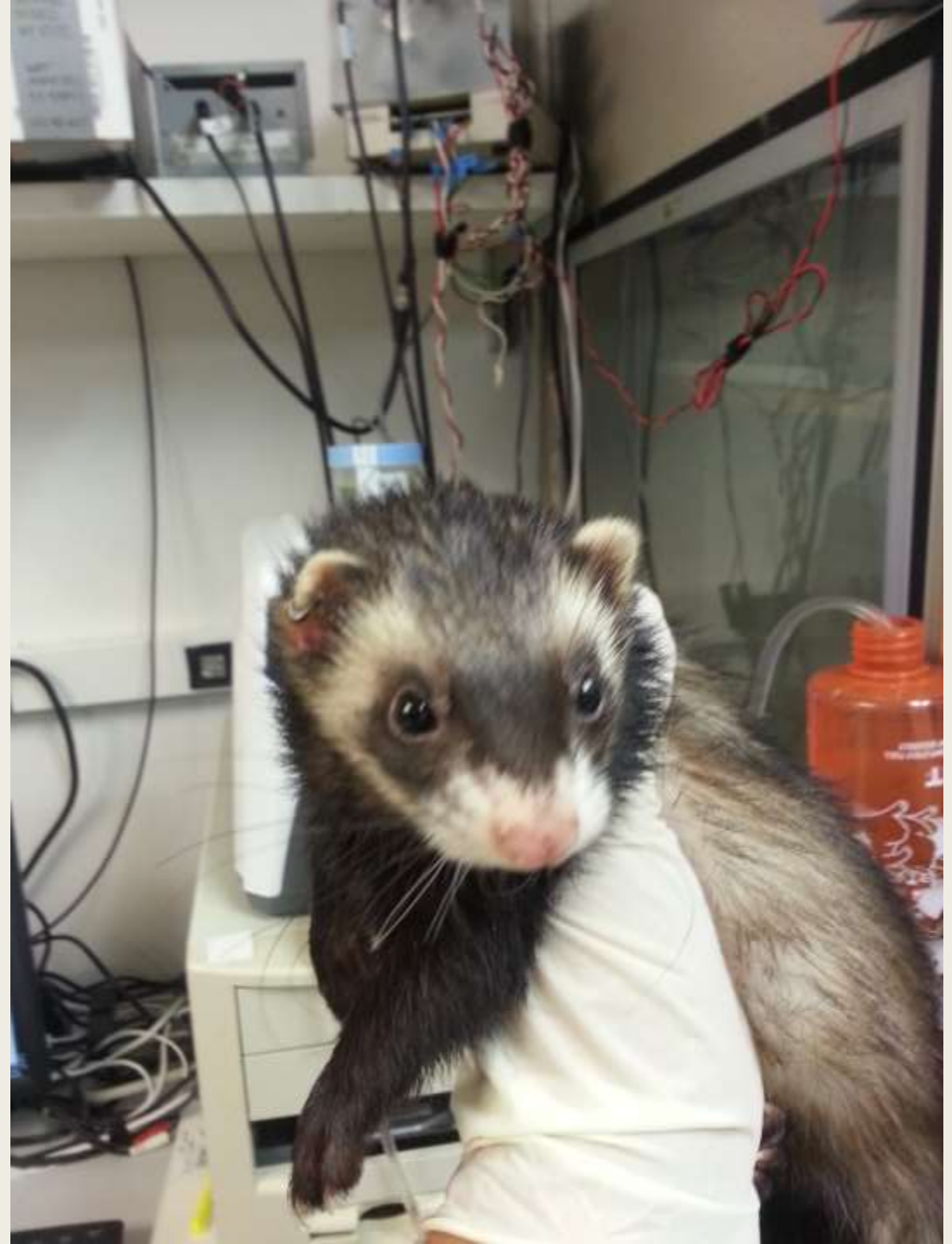
Ethics of Animal Experiments

- Animals have helped bring about many advances in research
 - *Sometimes have to be sacrificed*
- Labs are required to treat animals well
 - *Must have facilities/staff to care for animals*
 - *Before an experiment, a lab must ensure animals are safe/healthy*
 - *Research experiments are only approved once research is deemed necessary and not cruel to animals and that only the fewest number of animals for data collection are used*
- At the end of the day, in research, you should only do what you are comfortable with



Advice

- Always ask questions
 - *Never be afraid to ask for help*
- It's okay to make mistakes
- Make friends; be social
- Take every opportunity to learn
- Be enthusiastic!



The image features two large, thick black L-shaped brackets. One is positioned in the top-left corner, and the other is in the bottom-right corner. They are oriented towards each other, framing the central text.

THANKS FOR LISTENING!