Bridge UnderGraduate Science (BUGS) Program

Mapping Neural Activity Across the Sleeping Zebrafish Brain

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Studying Sleep

Sleep:

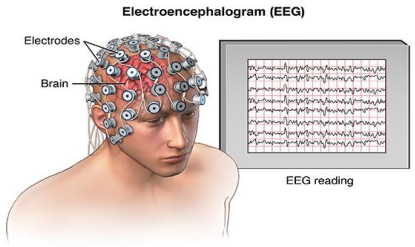
- Vital process present in most animals
- Complex
- Active and open field of research

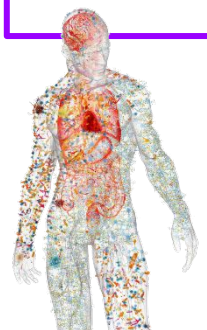
HUMAN NEUROIMAGING

Low spatial resolution methods:

EEG, fMRI, PET

Difficult for subjects to sleep

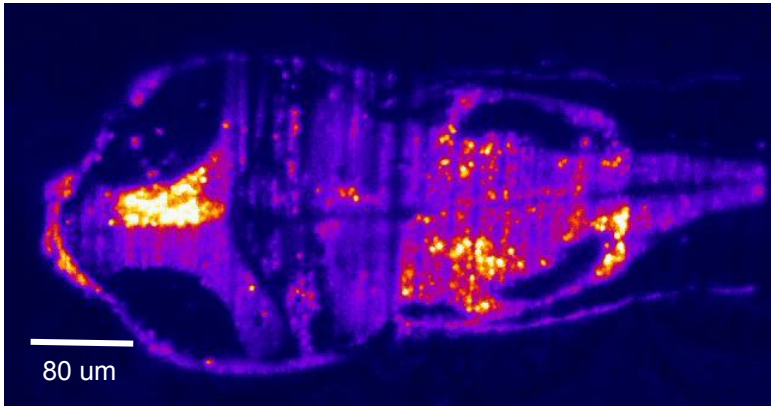




ZEBRAFISH NEUROIMAGING

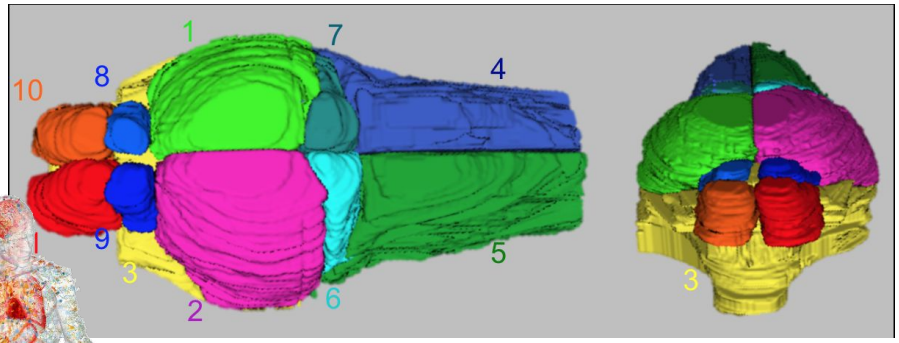
Full-Brain functional imaging of with single cell resolution (in vivo)

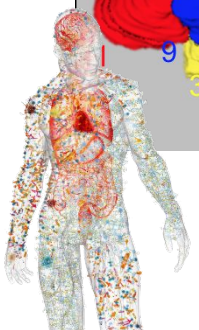
GECI - genetically encoded calcium indicators

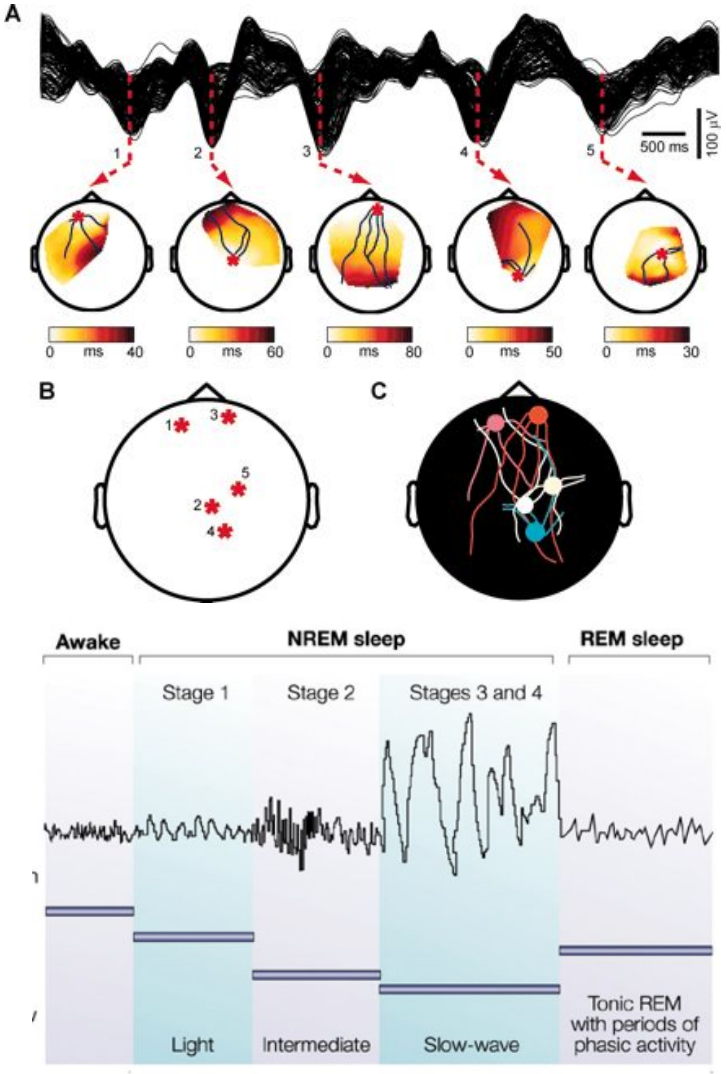


Traveling Wave Activation

- Slow waves and a traveling effect
- Propagation across the cortex
- Can we identify similar migrating activity and trace it beyond the cortex in the zebrafish?

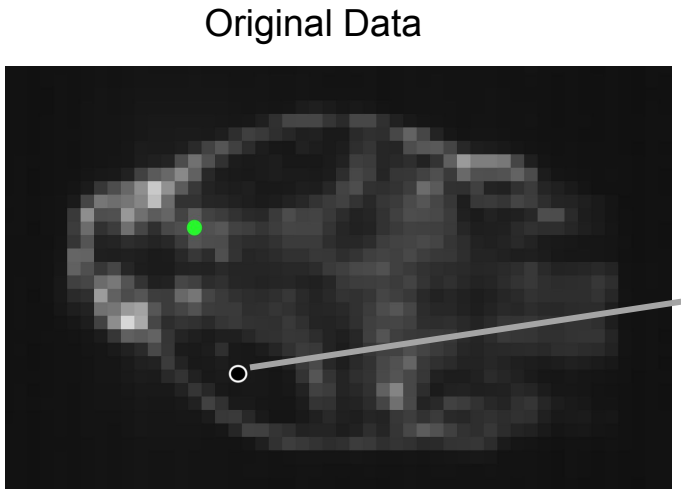


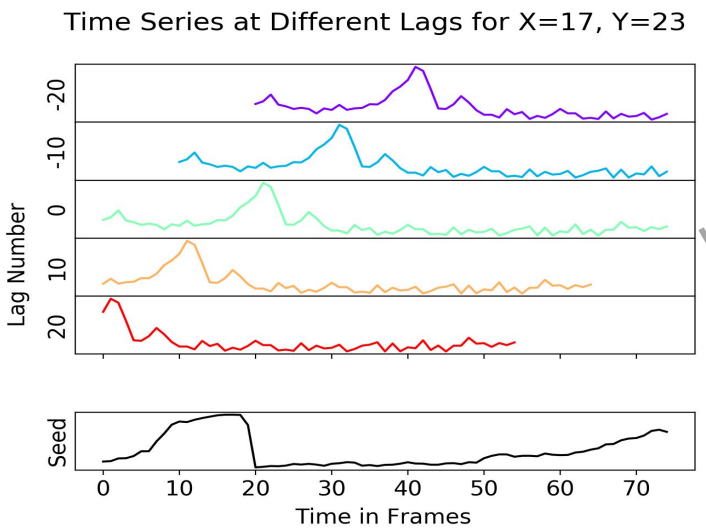


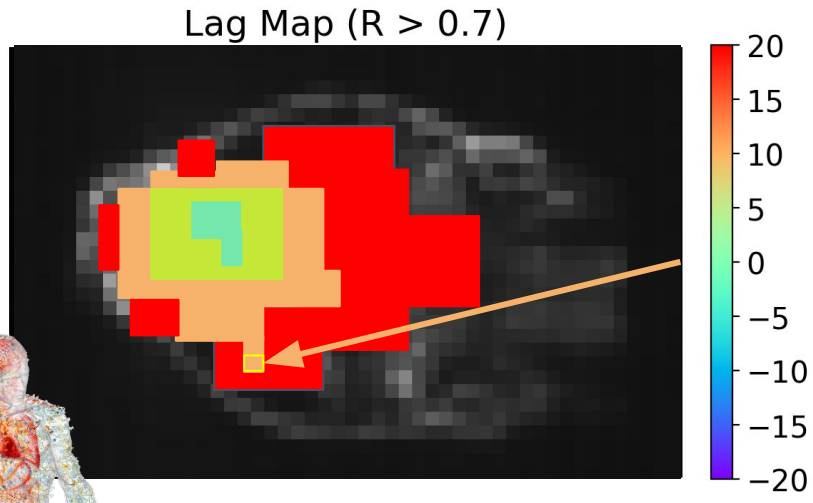


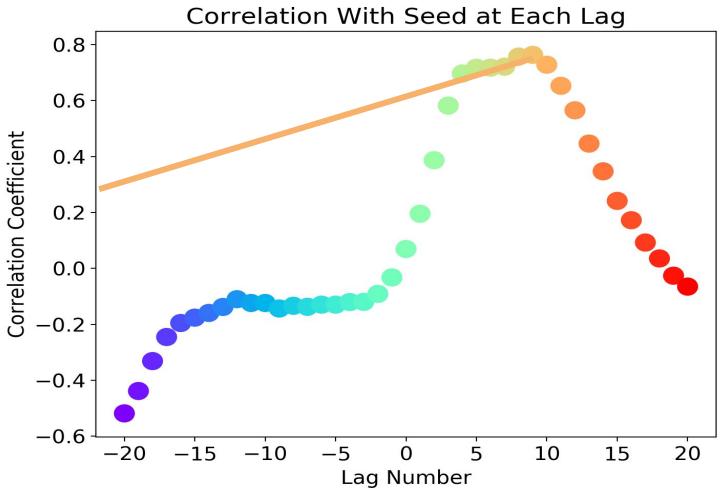
Massimini, 'The Sleep Slow Oscillation as a Traveling Wave', Journal of Neuroscience

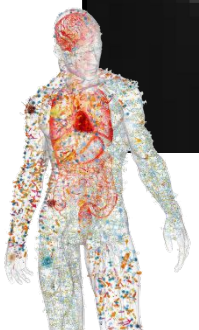
Lagged Correlation - Finding Paths of Activity



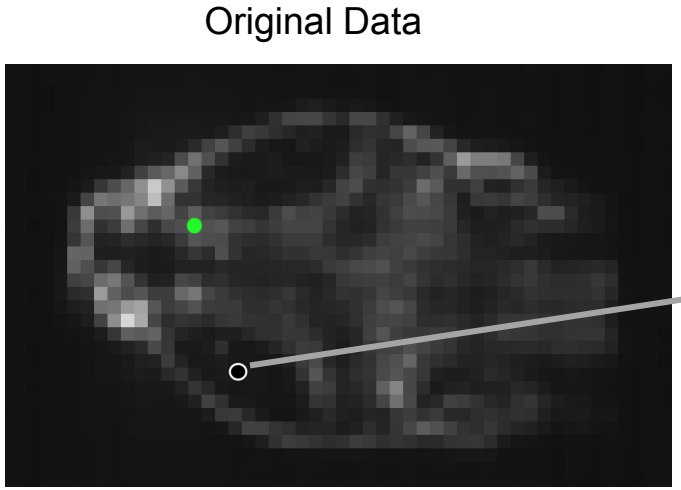


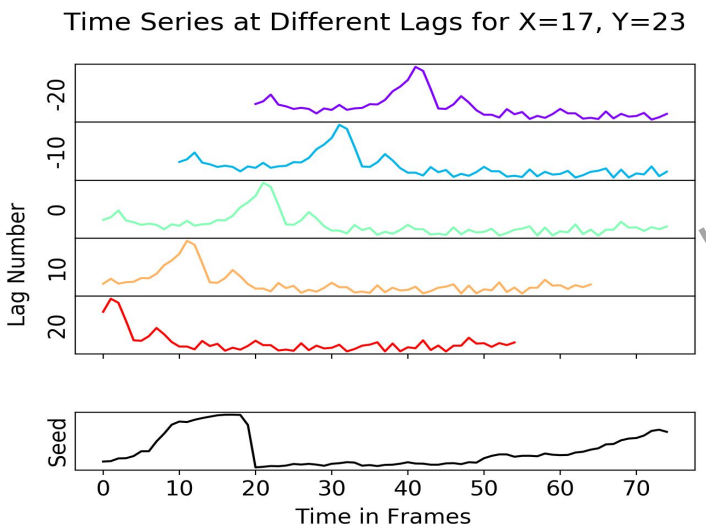


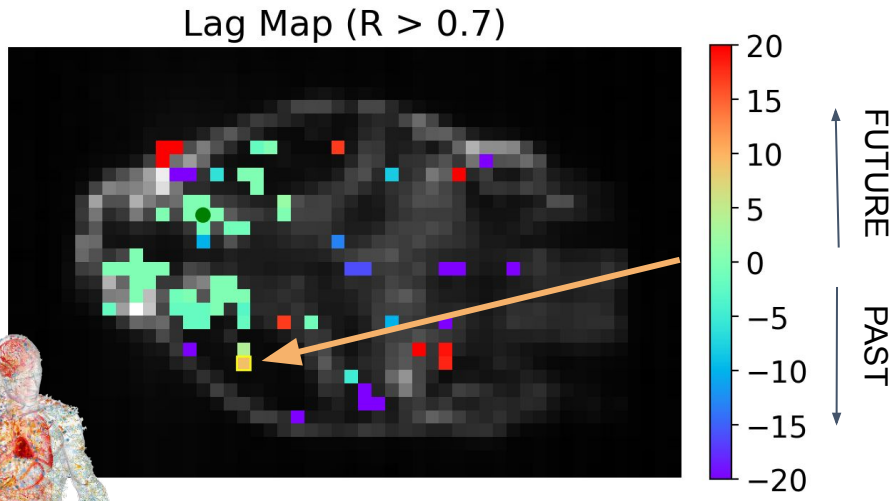


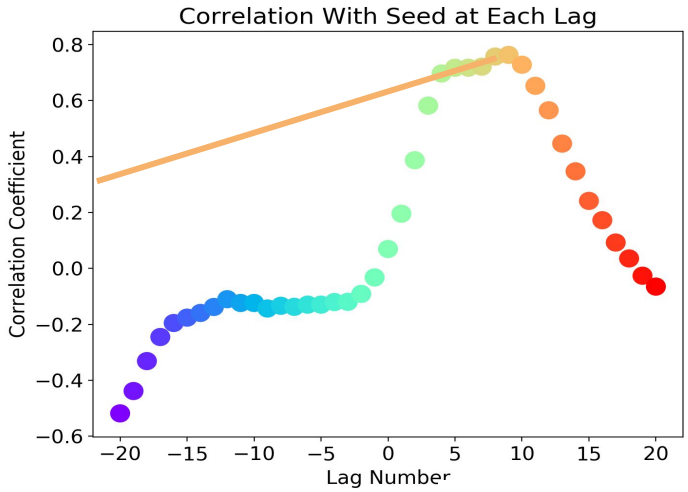


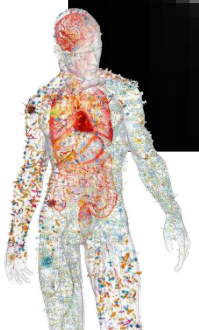
Lagged Correlation - Finding Paths of Activity





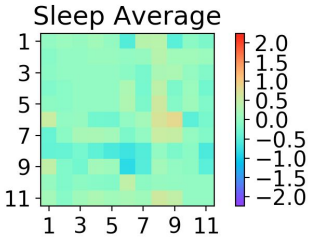


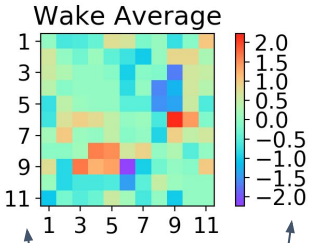


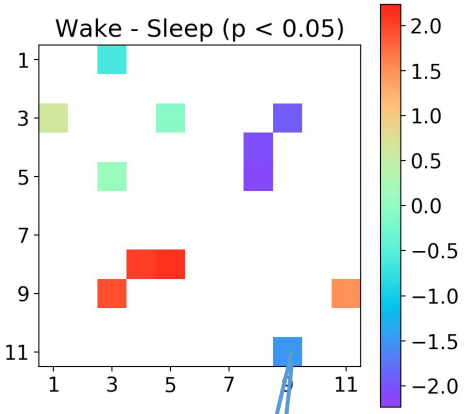


ROI Lag Time Differences

FISH 1



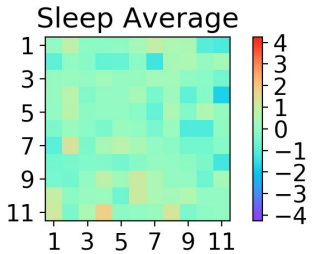


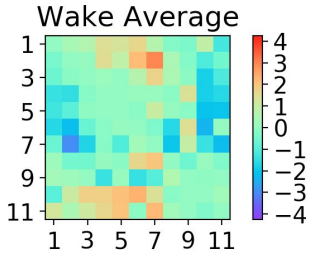


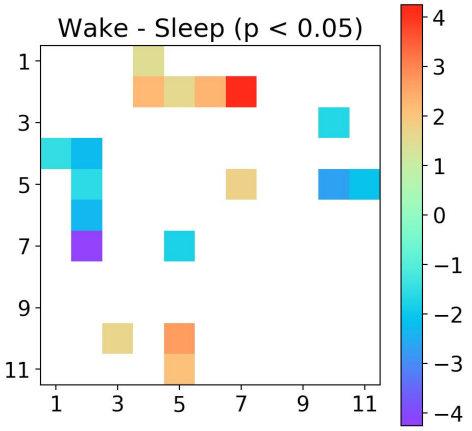
11 ROIs

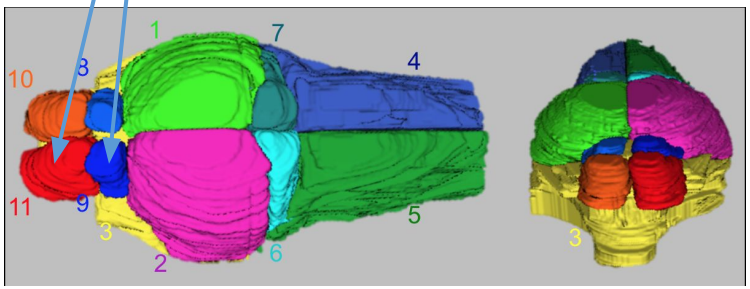
Lag (in Frames)

FISH 2

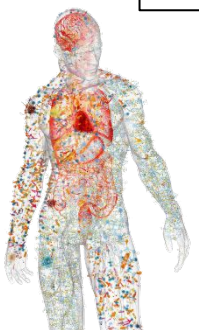


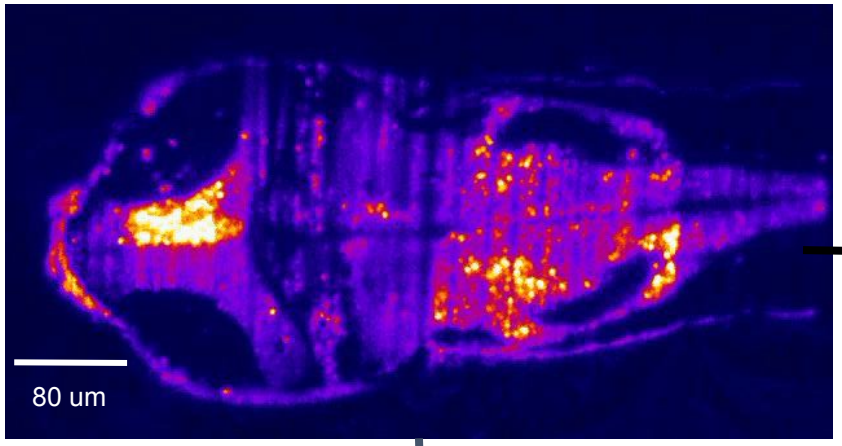


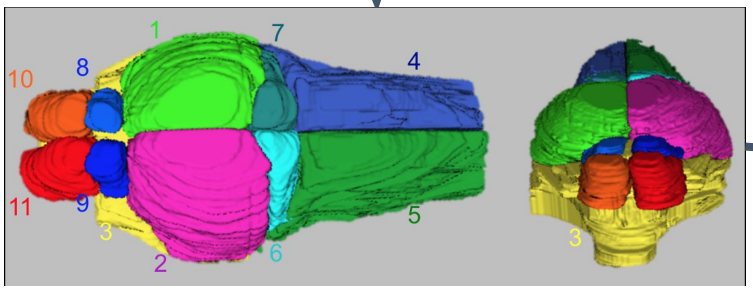


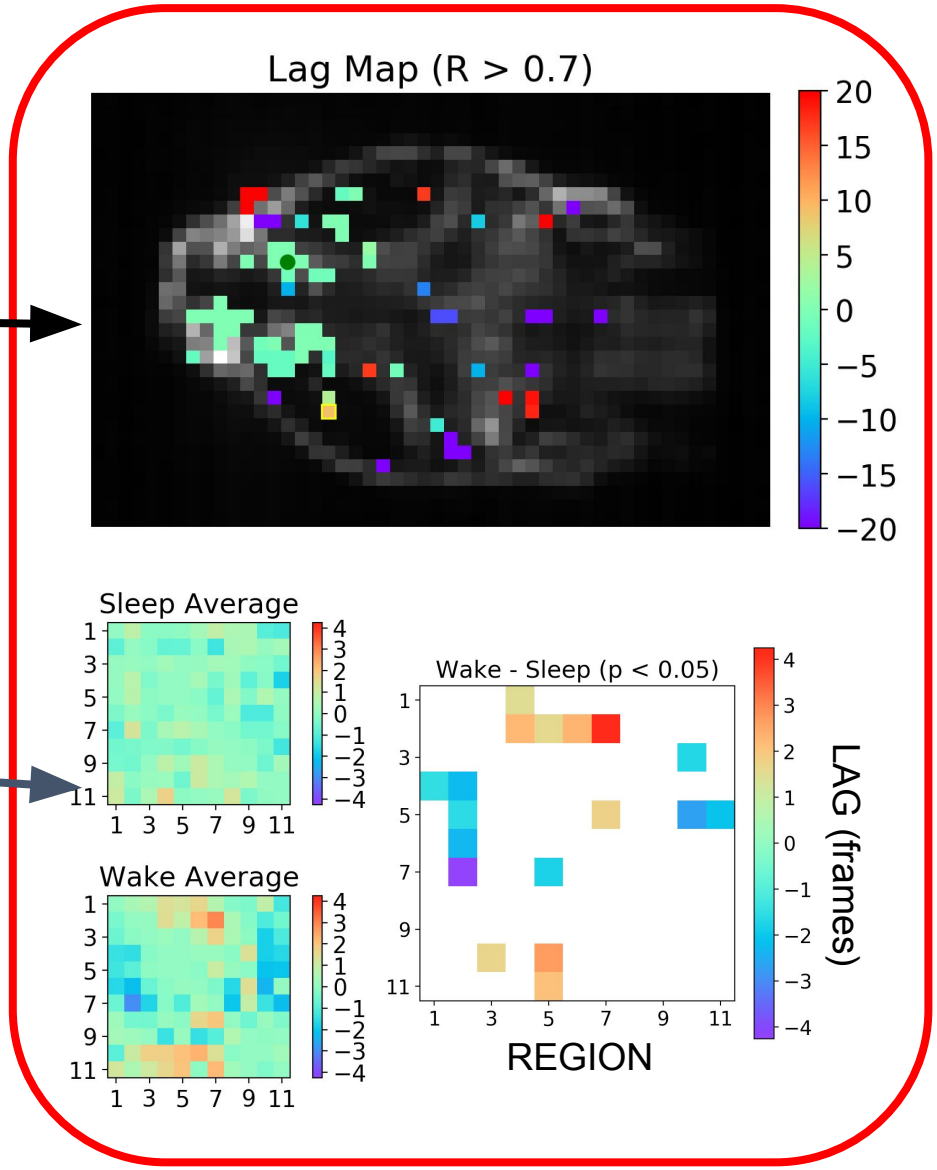


1: R-Midbrain
2: L-Midbrain
3: Ventral Midbrain
4: R-Hindbrain
5: L-Hindbrain
6: L-Cerebelum
7: R-Cerebelum
8: R-Habenula
9: L-Habenula
10: R-Pallium
11: L-Pallium









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Acknowledgements

- The Fraser Lab:
  - Dr. Scott Fraser
  - Dr. Thai Truong
  - Andrey Andreev
  - Anna Nadtochiy
- The USC Bridge Institute:
  - BUGS Program
- Funding:
  - Art and Fran Peskoff