INTRODUCTION TO MEG
WHO ARE WE?

LINGUISTS – STUDY LANGUAGE

PSYCHOLOGISTS – STUDY BEHAVIOR

NEUROSCIENTISTS – STUDY THE BRAIN
HOW CAN WE STUDY BRAIN ACTIVITY?

INVASIVE METHODS

NON-INVASIVE METHODS
Why Do We Need Multiple Methods?

fMRI  MEG
MRI  EEG
WHAT IS FASTER?

BLOOD FLOW OR ELECTRICITY
MRI AND FMRI MEASURES
BLOOD OXYGEN

• FIRST, MEASURE NORMAL BLOOD FLOW

• THEN, MEASURE BLOOD FLOW DURING THE EXPERIMENTAL TASK

• SUBTRACT TO FIND THE DIFFERENCE

• GREAT AT WHERE BRAIN ACTIVITY WAS HAPPENING; POOR AT WHEN.

WHY? BECAUSE CELLS NEED OXYGEN WHEN DOING WORK!
EEG MEASURES ELECTRIC CURRENTS

• DO THE SAME SUBTRACTION AS WITH FMRI, BUT WITH ELECTRICAL CURRENTS

• GREAT AT WHEN BRAIN ACTIVITY WAS HAPPENING

• POOR AT WHERE, BECAUSE EEG CAN ONLY MEASURES BRAIN ACTIVITY NEAR THE SURFACE OF THE BRAIN...

• ...AND ELECTRICAL SIGNALS GETS DISTORTED BY SKULL, SKIN, HAIR, AND MOVEMENTS.

WHY? BECAUSE BRAIN CELLS WORK BY COMMUNICATING WITH EACH OTHER WITH ELECTRICAL SIGNALS!
MEG MEASURES MAGNETIC FIELDS

- GREAT AT *WHEN* BRAIN ACTIVITY WAS HAPPENING
- OK AT *WHERE*, ONLY IF THE REGION IS NEAR THE SURFACE, BECAUSE...
- SIGNAL IS *NOT* DISTORTED BY PASSING THROUGH THE BODY!
- SIGNAL CAN BE DISTORTED BY METAL IN THE CHAMBER, ETC.

WHY? BECAUSE ELECTRICAL CURRENT GENERATE MAGNETIC FIELDS!
WHERE DOES THE ELECTRIC CURRENT COME FROM?