Kevin Otto
Ph.D. Bioengineering, Arizona State University
Assistant Professor, Departments of Biological Sciences and Biomedical Engineering
Research:
• More than 28 million Americans have some form of hearing loss.
• Deafness etiology generally mandates treatment option.
• Treatment options include:
  – Hearing Aids
  – Cochlear Implants
  – Auditory Brainstem Implants
  – Cortical Implants?
• 100,000 patients
• ~100s patients
• Cortical Implants?

Methods: Surgical Preparation
Electrode arrays are chronically implanted into the primary auditory cortex.

Arrays of tungsten microwires.
Silicon-substrate microelectrodes.
Ten 16-channel devices placed side-by-side.

Methods: Behavioral Assessment
Implanted rats are placed in a Skinner Box. Green lever = stimulus present, Red lever = stimulus absent. Animals receive food for correct responses.

Microstimulation Detection Results
• Average responses of 8 testing sessions for 4 different rats
• "Dynamic range" of the microstimulation intensity in this example is ~60 µA.

Microstimulation Discrimination Results
• Rats were tested for either auditory frequency discrimination or discrimination of microstimulation location.
• Performance on an auditory discrimination task is fairly stable over ~20 days.
• The first microstimulation discrimination session was more accurate than any of the previous auditory sessions.

Otto, Rousche and Kipke, Hearing Research 2005