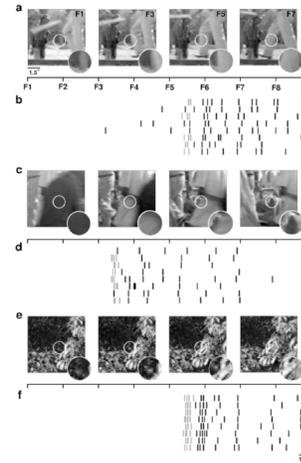


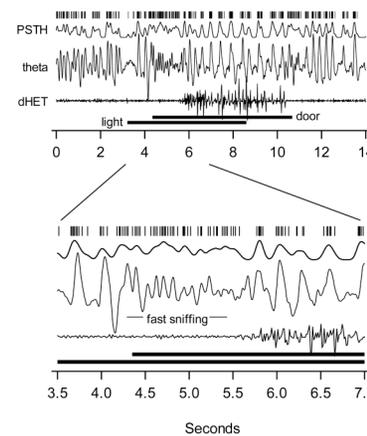
# Modulatory and sensorimotor effects on neural processing of sensory stimuli

- Sensory processing strategies dependent on behavioral state
  - internal modulatory control
  - motor and sampling changes
  - Sensory stimulus effects
- Studies needed
  - Combined motor and sensory recording
  - Unrestrained animals
  - Mechanical and pharmacological manipulation
  - Analysis of data taken simultaneously from multiple sources (EMG, LFP, single unit)



Sensory signal properties determine firing mode and information transfer properties

Lesica et al., J Neurosci 2004



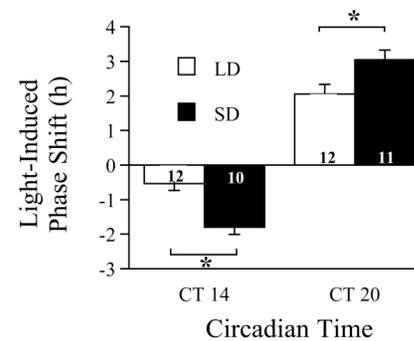
Sensorimotor changes determine firing mode properties and stimulus representation, as well as oscillatory dynamics

Kay & Laurent, Nat Neurosci 1999

Kay, J Integ Neurosci 2003  
Hypothesis in Kay & Sherman, TINS 2007

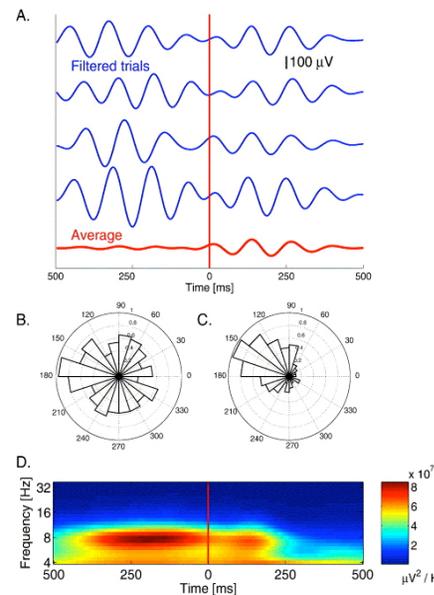
# Dynamics across multiple time scales and multiple systems

- Background: Systems can act on one timescale as a continuous process and on another as a single pulse or as a bias
- Example: Seasonal rhythms and effects on learning, immune response, attention (independent of reproductive system changes)
- Learning and attention effects on sensory processing
  - Hormones (e.g., melatonin signals; hours, weeks)
  - Neuromodulators (seconds, minutes)
  - Synaptic plasticity (minutes, days)
  - Phase resetting in cognitive tasks
- Computational tools
  - PRCs
  - Perturbation analysis



Light pulse (~15 min) shifts phase of circadian clock more robustly in short day than long day animals

Evans et al., Am J Physiol 2004



Theta phase reset after presentation of study item (visual display of consonant) in iEEG from inferior temporal lobe

Rizutto et al., Neuroimage 2006