See also PDF online from Purves et al.

Method	Pros	Cons
Computational Modeling	● Forces researcher to be explicit about mechanism ● Allows for direct, testable predictions ● Simple but powerful (small changes, big effects; validity of a hypothesis)	● Simplification of Nervous System ● Sometimes at odds with biology (e.g., "all knowing") ● Catastrophic interference ● Relatively narrow (re:, generalization) ● Research sometimes in isolation
Behavior (RT/accuracy/self report/etc.)	● Most simple method & underlies all other methods ● Flexible	● Gives incomplete picture of mechanism ● Only as good as your design
Single Cell Recording (not discussing in class, except Perception paper)	● Records at the level of individual neurons (usually) ● Direct measure of neuronal activity to expt manipulation	● May record extracellularly; unclear then if activity is of single neuron ● Aggregate behavior might be more complicated (e.g., multiunit)
Lesions	● Convergence across humans & animals for particular brain region fxn ● How necessary is a brain region for a particular function	● Don't know if effect isolated to region or its connection to other regions ● Compensatory strategy to minimize effects of lesion ● Difficulty in precision of area affected; hard to generalize ● In animals, training is much more difficult than in humans ● In humans, not under control of expter ● Ethical concerns for animal treatment
Genetic manipulations (optogenetics, epigenetics)	● Identify risk factors for diseases ● Which cognitive fxns are heritable (knockout) ● GxE interactions	● Genes can have many downstream effects, so hard to isolate specific mechanism of action ● Often need a lot of people to make anything of GxE, and knockouts tend to be really specific (less generalizable)
Structural imaging (MRI, CT scans)	● Identify brain regions impacted in disorder, how disorder & healthy individuals vary as a fxn of damage	● Has little to do with a particular experimental manipulation (usually, re: temporal scale), only general abilities
DTI	● Discover the flow of information within the	● Same as structural imaging above

	brain for white matter tracks	
TMS (newer things like tDCS, tACS)	- Can either impair or improve task performance - Researchers are now looking at how stimulation can improve brain fxn - Noninvasive virtual lesion	- Effects of TMS usually brief - Only works for superficial cortical regions - Affects large area, limiting anatomical resolution - Sometimes adverse effects
fMRI	- High spatial resolution underlying the regions impacted by task manipulations - Noninvasive	- Indirect measure of neuronal activity - OK/poor temporal resolution - Not cheap
EEG (ERPs)	- High temporal resolution underlying cognitive processes - Direct measure of neuronal activity on scalp - Cheap, noninvasive	- Poor spatial resolution - Needs a lot of trials to average over
MEG	- Similar to EEG, but affects sulci, not gyri - Less affected by distortions in skull than EEG - Has simpler source estimation	Same problems & benefits as EEG
PET	Figuring out the concentration of particular neuromodulators in the brain (e.g., dopamine)	- Short half life of reagents - Radioactive materials - Expensive - Poor temporal resolution (block designs)
Pharmacological perturbations (not in textbook)	- Drug use on cognitive processes - Experimental control setting, effects monitored	Lack of specificity in the effects (don't know the actual mechanism)