Hourly 1 learning objectives

Hourly 1 Learning Objectives Introduction To Cognitive Neuroscience Reading: Gazzaniga et al. Chpt 1 Learning objectives: * Define the term Cognitive Neuroscience * Describe the contributions of the following scientists/physicians to our understanding of the brain: Rene Descartes, Thomas Willis, Paul Broca, Carl Wernicke, Gustav Fritsch & Eduard Hitzig, Korbinian Brodmann, Santiago Ramon y Cajal; Camillo Golgi. * Describe the contributions of the following scientists to our understanding of the mind and behavior: Edward Thorndike, Ivan Pavlov, B. F. Skinner, Noam Chomsky. * Describe the clinical and anatomical evidence that supports the hypothesis that different areas of the brain mediate different functions Cells of the Nervous System Reading: Gazzaniga et al. Chpt 2 Learning objectives: * Describe the 2 main types of cells in the nervous system * Describe the resting potential and how it is maintained * Describe how the action potential is generated and propagated throughout the cell * Describe the relative and absolute refractory periods * Explain how myelin increases the action potential conduction velocity * Explain how axon diameter affects the action potential conduction velocity * Explain why axons can regenerate in the peripheral nervous system by not the central nervous system * Explain how local anesthetics work * Explain how myelin contributes to the symptoms of multiple sclerosis * Describe how an action potential in the pre-synaptic terminal results in the release of neurotransmitter * Describe how a neurotransmitter binding to a receptor in the post-synaptic cell results in a post-synaptic potential. * Compare and contrast metabotrophic and ionotrophic neurotransmitter-receptor interactions * Explain why acetylcholine is excitatory in the central nervous system and inhibitory in the peripheral nervous system * Explain how the actions of neurotransmitters

are terminated * Compare and contrast action potentials and synaptic potentials Neuroanatomy Reading: Gazzaniga et al. Chpt 3 pp. 59-87 Learning objectives: * Describe the terms used to identify direction in the nervous system (anterior, posterior, dorsal, ventral, superior, inferior, medial lateral) * Be able to distinguish the central and peripheral nervous systems * Locate the 4 lobes of the cerebral cortex (frontal, parietal, occipital, temporal) * Identify the major sulci that separate the frontal, parietal, and temporal lobes (central sulcus, Sylvian fissure, saggital sulcus) * Locate the primary sensory (somatosensory, auditory, visual) and motor (primary motor cortex) areas of the cerebral cortex, and describe their main functions * Locate the 3 major regions of the prefrontal cortex: pre-motor, prefrontal (dorsolateral & ventrolateral), and orbitofrontal cortices, and describe their main functions. * Compare and contrast the neocortex, allocortex (archicortex), and mesocortex, and give examples of each. * Locate the limbic cortical areas (orbitofrontal, cingulate, parahippocampal, subcallosal cortices) * Identify the 3 major tracts that connect the left and right hemispheres of the cerebral cortex (corpus callosum, anterior commissure, posterior commissure) * Locate the thalamus and hypothalamus (diencephalon) and describe their main functions * Locate the basal ganglia and describe its main function * Locate the hippocampus and describe its main function * Locate and identify the major subdivisions of the brainstem: diencephalon, midbrain, pons, medulla and describe their main functions * Locate the spinal cord, and describe its main function * Identify the 3 layers of protective tissue that surrounds the brain and spinal cord (dura mater, arachnoid mater, pia mater) * Describe the role of cerebrospinal fluid * Describe where cerebrospinal fluid is found in the brain Research Methods in

Cognitive Neuroscience Reading: Gazzaniga et al. Chpt 4 Learning Objectives: * Describe the 2 key cognitive processes underlying most research in Cognitive Neuroscience 1. creation and manipulation of internal representations= using picture, mathematics, verbal 2. converting the representations into actions-> transforming mental representations when sensory signals are connected with stored knowledge in memory * Explain the importance of animal research in cognitive neuroscience observe how behavior is disturbed following a neurological insult, allows researchers to adopt experimental approach, electrochemical processes to measure/manipulate neuronal activity, highly selective in creating lesions and effects of damaged area can be followed. electrophysiological research studies visual cortex activity * Explain the advantages and disadvantages of using clinical brain lesions in humans to study cognitive neuroscience In humans it is naturally occurring, so hard to find effect of just one area of the brain, variability in response to lesion, advantages is seeing what the area of the brain that has been effected " does"--> broca's aphasia patient * Describe the basic principles behind the following techniques, how they are used to study clinical brain lesions in humans, and when appropriate, how they complement one another. * Computed Tomography= 3D images of the brain using xray, measures density of tissues in brain * structural MRI= measures signal associated with H+ particles swinging back (density of H+, magnetic moments) * --> compliment each other in diagnosis * Diffusion Tensor Imaging = track direction of axons in the brain, trace white matter connections * Describe the basic principles behind the following techniques, how they are used to study human brain function, their advantages and disadvantages, and when appropriate how they complement each other *

Transcranial Magnetic Stimulation (TMS) * electroencephalogram(EEG) * event-related potentials(ERP) * Positron Emission Tomography(PET) * functional Magnetic Resonance Imaging. (fMRI) * Describe how computer modeling can be used to study the brain activity underlying cognitive processes and its limitations. Object Recognition Reading: Gazzaniga et al. chpt 5 (pp. 178-188) & chpt 6. Learning Objectives: * Define visual agnosia a deficit in visual object recognition, termed by Freud. In example, it feels like a candle, but smells like a crayon. Used other senses to identify object. Can identify simple geometric shapes & " stimulus features". Apperceptive agnosia= Addociative agnosia= can see object, but don't know what it is. every object is novel object * Describe the structures in the visual pathway (retina, lateral geniculate nucleus, V1, V2, V3, V4, MT, inferior temporal-occcipital cortex and posterior parietal cortex) Retina= where transduction occurs Lateral Geniculate Nucleus- projects to the left primary visual cortex V1= striate cortex, V2= V3= V4= color MT= motion Inferior temporal-occipital cortex= Posterior parietal cortex= * Describe the functions of the dorsal and ventral visual pathways both have bilateral connections via the corpus callosum Dorsal= occipital lobe to parietal, motion and location in space, " where" pathway Ventral= involved in object recognition " what" pathway * Describe the cortical areas involved in the dorsal and ventral visual pathways * Using the wiring of the visual system, describe where in the visual cortex stimuli presented in left visual field go, and likewise for stimuli presented in the right visual field * Compare and contrast parallel and hierarchical processing, giving examples of each in the visual system Parallel= shape, color & motion/location processed by separate groups of neurons. Initially different functions are mediated by different subregions

within an area, then further up the chain areas become specialized. Hierarchical= each stage of processing within a channel adds more complexity to the analysis. * Compare and contrast the functions of the dorsal and ventral pathways dorsal= large contralateral receptive fields, 40% have receptive field in fovea, the rest is in the periphery. most sensitive to abrupt onset or one the is moving ventral= most have receptive fields including the fovea (detailed info). Most ALSO have large contralateral receptive fields, 41% will respond to any stimulus, rest will respond to specific clast, * Compare and contrast the receptive field properties of cells in the dorsal and ventral pathways * Describe the functional imaging data in humans (PET & fMRI) demonstrating the functional differences in the dorsal and ventral pathways * Explain why patients with lesions to the ventral pathway are unable to identify an object but are able to accurately and quickly act upon it (e. g., use a key to open a lock, but cannot identify the key) dissociation between what is accessible to consciousness (visual experience) and what information is available for the motor system to act on, uses parietal cortex, also activates premotor cortex * Describe the cortical area important in being able to act upon an object lateral occipital cortex (lesion in this causes unable to recognize the orientation, but could do the action of putting a card in a slot) dorsal pathways were still in tact