Key Dates

- TH Apr 6 Unit 21
- TU Apr 11 Unit 22; Biological Perspective Assignment
- TH Apr 13 Begin Psychological Perspectives, Unit IIIB and 23; Term Paper Step 3 (*only if Step 2 approved*)
- TU Apr 18 Unit 24; Psychological Perspective Assignment

Learning Outcomes

- By the end of this class, you should be able to:
  - Explain the importance of neurotransmitters and identify some that are emphasized in psychopathology
  - Explain why we need to be careful when considering the concept of “chemical imbalance”
  - Distinguish between the exposure and susceptibility models of linking brain disorder to alcohol use disorder
  - Identify pre-natal and environmental factors that might represent biological causes in intellectual deficiency

Goal: To identify the extent to which different aspects of brain structure and brain processes might offer explanations for different forms of psychopathology

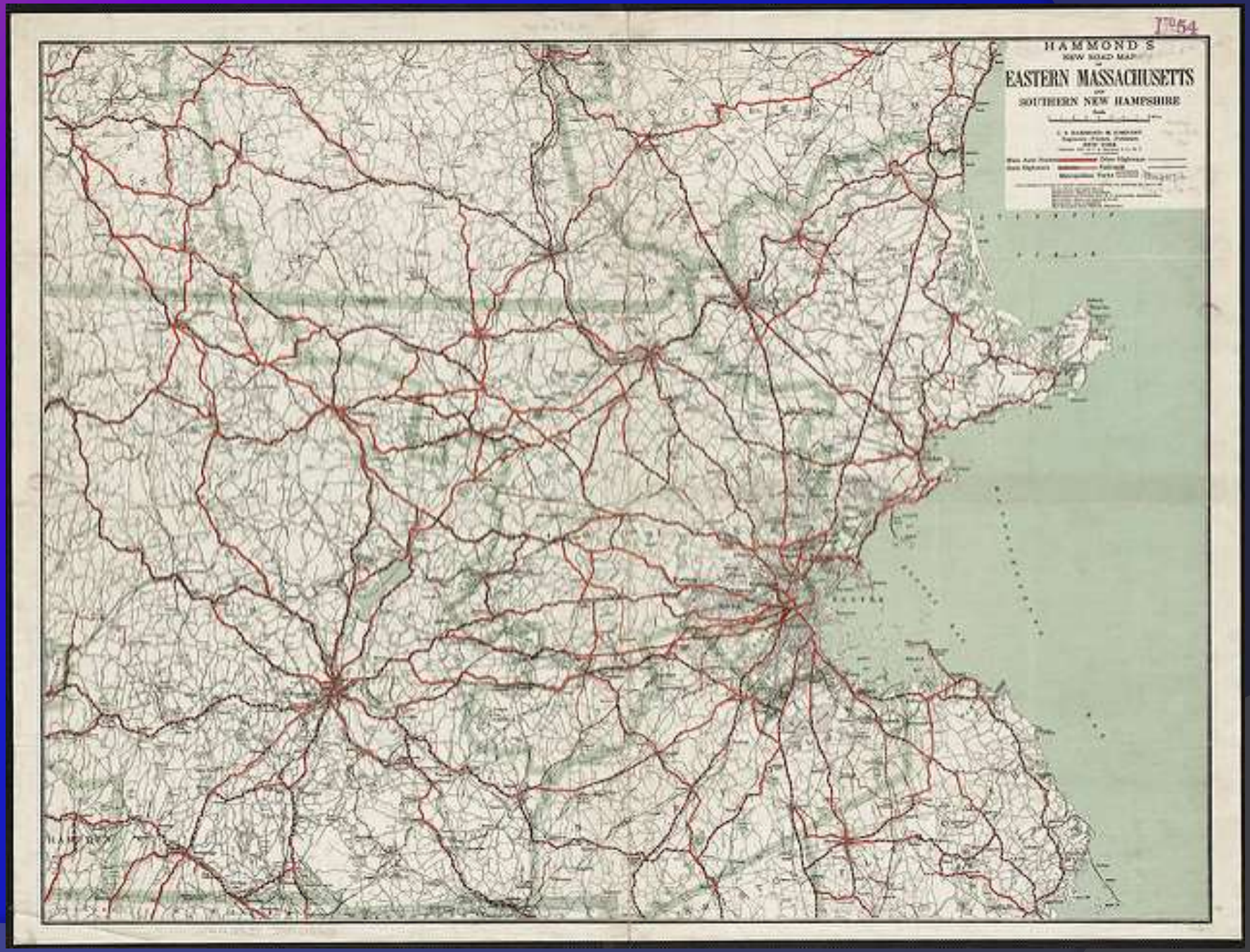
UNIT 21: NEUROANATOMY AND NEUROCHEMISTRY

Neuroanatomy and Neurochemistry

- The human brain
  - If genetics play a role, it is most likely through genetic influences on the brain
  - Brain sits on spinal column
  - It consists of:
    - Hindbrain (brain stem), which controls basic physiological processes
    - Midbrain, which controls sleeping and waking
    - Forebrain, the source of all "higher" functions and mental abilities
  - The forebrain includes the cerebral cortex, divided front to back into two hemispheres, and containing multiple lobes

Neuroanatomy and Neurochemistry

- Neurotransmission
  - The nervous system contains 100 billion or more nerve cells, or neurons
  - The system functions through the transmission of impulses along the complex pathways linking neurons
  - Different pathways control or enable different functions
  - The process is electrochemical and depends on specialized chemicals known as neurotransmitters


HAMMOND'S
NEW ROAD MAP
OF
EASTERN MASSACHUSETTS
AND
SOUTHERN NEW HAMPSHIRE

Neuroanatomy and Neurochemistry

- Neurotransmitters
  - More than 100 neurotransmitters have been identified: serotonin, norepinephrine (also known as adrenalin), dopamine, etc.
- Different neural pathways depend on different neurotransmitters
- Psychopathologists focus on both neuroanatomy and neurochemistry to search for possible causal factors

Neuroanatomy and Neurochemistry

- Emotional psychopathology: Fear, anxiety, and obsession
  - Panic disorder might be linked to factors involving the neurotransmitter gamma-aminobutyric acid (GABA), which inhibits anxiety
  - Abnormalities in the amygdala might create excessive sensitivity in the brain‘s “fear network”
  - Male-female variations in hypothalamic-pituitary-adrenal axis activity that connects to stress reactions might explain the gender differences seen for most anxiety disorders
  - Brain scans have sometimes revealed differences between people with and without OCD in the orbital frontal cortex related to the dampening of anxiety

Neuroanatomy and Neurochemistry

- Emotional psychopathology: Depression and mania
  - A major focus of current research:
    - “Chemical imbalance” often assumed as cause
    - Widespread use of medications in treatment
    - But no specific test can pinpoint any such imbalance
  - Research often focuses on “depression” in general, which might obscure factors specific to specific types
  - Monoamine hypothesis: disturbances in dopamine, serotonin, and/or norepinephrine
  - Stress, depression, and the role of the stress hormone cortisol and the HPA axis
  - But what is the connection to the symptoms?

Neuroanatomy and Neurochemistry

- Other possibilities for depression
  - Female hormones and gender differences
  - Neuroimaging often shows anomalies in brain (e.g., prefrontal cortex, limbic system)
  - Studies also show anomalies in sleep-wake cycles (e.g., quicker onset, longer duration of REM sleep)
- But for all these possibilities, how do we distinguish cause from effect?
- And again, what is the connection to actual symptoms?

Neuroanatomy and Neurochemistry

- Behavioral psychopathology
  - The view of alcoholism (alcohol use disorder) as disease, with loss of control as crucial sign
  - Exposure vs. susceptibility (i.e., are alcoholics/addicts “born” or “made”?)
  - The brain’s “reward pathways” and addiction to a psychoactive substance
  - Chronic consumption might produce depletion of normal neurotransmitter activity, leading to dependence on psychoactive substance

Neuroanatomy and Neurochemistry

- Cognitive psychopathology: Schizophrenia
  - Often assumed to be some form of “brain disease,” with heavy emphasis on value of medication treatment
  - The dopamine hypothesis: excessive activity in dopamine pathways
  - Enlarged ventricles
  - Possible links to pre-natal viral infections or peri-natal obstetric complications

Neuroanatomy and Neurochemistry

- Cognitive psychopathology: Intellectual disability
  - Many forms appear to be tied to abnormalities in brain development, occurring pre- or post-natal:
    - Trisomy 21 (Downs)
    - Fetal alcohol syndrome (leading preventable cause)
    - Mother's viral infections or poor diets
    - Lead poisoning

Neuroanatomy and Neurochemistry

- Cognitive psychopathology: Autism spectrum disorder and ADHD
  - Both are listed as “neurodevelopmental,” with assumption that brain is somehow involved
  - No specific abnormality has yet been consistently reported
  - So why such dramatic increases in reported cases in past 25 years?
    - Possible environmental toxin?
    - But no evidence for role of vaccines in ASD
    - And major controversy about whether ADHD is a neurological disease, and overdiagnosed

Neuroanatomy and Neurochemistry

- Health-related psychopathology
  - Possible variations in pain sensitivity and/or cortical pain processing is somatic symptom disorders
  - Possible role of sex hormones in sexual desire and arousal disorders, which definitely become more common with age
  - Neurocognitive disorders are, by definition, assumed to be tied to the brain