History of Neurology

KARL LASHLEY PHD
(1890-1958)
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NEUROLOGY RESIDENT MORNING REPORT
KARL LASHLEY MD
(1890-1958)

- Psychologist and behaviorist
- Leader of Aggregate Views of Brain Approach
- B-Davis, West Virginia
- BA U of WV; then got Masters and taught biology/lab at U of Pitt
- PhD John Hopkins in genetics (1911)
- Faculty at U of Minn, U of Chicago, Harvard
- Main Influence: John Watson @ Hopkins (1914-1917) taught experimental design of behavioral research, maze learning in rats in response to drugs, stimulation, brain damage
- This led Lashley to spend his whole career exploring in learning & experimental design & cortical basis of learning & discrimination
- Leading experimental psychologist of his generation
KARL LASHLEY PHD

- Trained rats to do specific tasks (seeking a food reward) & lesioned specific areas cortex before & after training
- Cortical lesions had specific effects on acquisition and retention of knowledge, but the location of the removed cortex had no effect on the rats' performance
- He conclude that memories are not localized
  - Are widely distributed in cortex
  - He called memories “engrams”
- Cerebral cortex are a whole mediating certain types of learning
Initially he was in search of single locus of memory/engram
  – Could not find it
Developed 2 principles
  – 1. Mass action: rate, efficacy and accuracy of learning depend on the amount of cortex available. The more cortex that is removed, the more learning defects occur
  – 2. Equipotentiality: one part of the cortex can take over the function of another
Book: Brain Mechanisms and Intelligence (1929)
Article: In Search of the Engram (1950)
Lashley’s article: The Cytoarchitecture of the Cerebral Cortex.

Lashley wrote: “the area subdivisions are in large part anatomically meaningless and misleading as to the presumptive functional divisions of the cortex”

The cytoarchitecture of the cerebral cortex J Comp Neurol 1946: 85:223-305

BUT: He was wrong!!!!!
# Localization in Cerebral Cortex vs. Non-Localization

( Aggregate Field View )

<table>
<thead>
<tr>
<th>Aggregate Field Proponents</th>
<th>Localization Proponents</th>
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<tbody>
<tr>
<td>Pierre Flourens (1794-1867)</td>
<td>Paul Broca (1824-1880)</td>
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<td>animal experiment</td>
<td>aphasia left frontal lobe (1861)</td>
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<td>Friedrich Goltz (1834-1902)</td>
<td>Eduard Hitzig (1838-1907) &amp; Fritsch (1838-1927)</td>
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<td>stim human cortex (1871)</td>
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<td>Sir Henry Head (1861-1940)</td>
<td>Carl Wernicke (1848-1905)</td>
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<td>aphasia in patients</td>
<td>aphasia left temporal lobe (1874)</td>
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<td>Kurt Goldstein (1878-1965)</td>
<td>David Ferrier (1843-1928)</td>
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<td></td>
<td>animal experiments (1881)</td>
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<td>stimulated cortex, epilepsy surgery</td>
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<tr>
<td>animal experiments</td>
<td>aphasia &amp; disconnection syndromes in patients.</td>
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<td>Then imaging- (CT/MRI/PET settled the issue- finally</td>
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Why Was Lashley Wrong?

• Mass-lesioned tasks associated to study cortical function is not a good model. The task involves many motor and sensory functions.

• If deprived of one sensory function rat can still learn to run around using another.
Early psychologists investigated thinking by inspecting their own thoughts and the reports of the thoughts of others. The behaviorists rejected this method. Science, they argued, must be based on data that everyone can agree on, something reliable and objectively measurable. This means abandoning talk and reports of thoughts, and concentrating on simple behaviors. Rather than rely on subjective impressions, behaviorists conducted experiments in which the inputs (stimuli) were controlled and the outputs (responses) were measured. They hoped that from these experiments the relationship between the two could be inferred, with no need to worry about the intervening black box of the mind. For example, a rat in a cage would get a food reward every third time it pressed a lever. By recording the number of times it pressed the lever, over time you could get an objective record of its rate of learning. Like this example, the most famous findings of behaviorism are about fundamental learning mechanisms that describe how associations with stimuli and responses are learnt due to repetition or reward. The emphasis on simple behaviors allowed the behaviorists to develop theories that applied to non-human animals as well as humans.