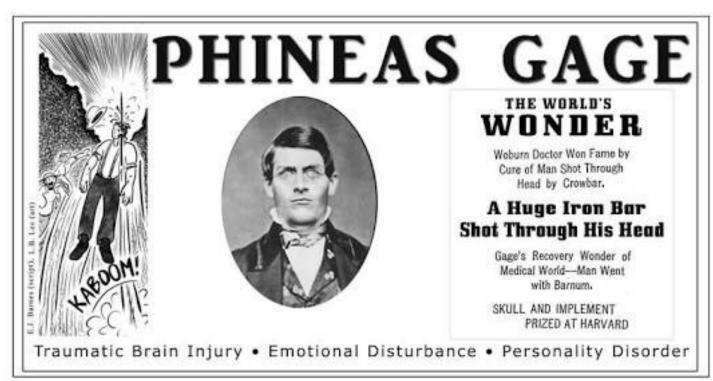
Studying the human brain before we could image it: The deficit-lesion method

Where does our knowledge about the brain mostly come from?

- Animal research
- Techniques used with animals yield powerful data that we cannot ethically collect from humans.
 - Genetic engineering
 - Lesion studies
 - Direct brain recordings from implanted electrodes



- But animals do not have language.
 - The foundations of the neurobiology of language are different from most other branches of cognitive neuroscience.



https://medium.com/@rossfloate/the-terrible-horrible-no-good-treatment-of-phineas-gage-496121282cab



Neurolinguistic research before the invention of brain imaging (in the late 70's)

- 1. Patient suffers stroke (or other unfortunate incident) leading to brain damage
- 2. Patient's (altered) behavior is studied
- 3. Patient dies
- 4. The location of the damage is assessed in a post-mortem analysis
- 5. Hypotheses are developed about the functional contribution of the damaged area on the basis of behavioral data collected in vivo

Problems with this method:

- Slow
- At the time of theorizing (step 5), no more data can be collected.
- One could test hypotheses in the next relevant patient, but it's impossible to know who might be relevant (i.e., exhibit a lesion in the same site) until they're also dead.
 - Plus: there likely will never be another patient with *exactly the same lesion*

The deficit-lesion method for studying brain function

- Examining the behavior of an individual with brain damage in order to form theories about the function of the damaged area.
 - Logic: If the individual cannot do X, then the execution of X must depend on the lesioned area.
- In animal research, the experimenter is in control of the lesion location (since the experimenter creates it). Consequently, for animals, the deficit-lesion method can be the basis of a systematic research program.
- But language is a uniquely human capacity.
- For humans, the lesions are given by nature, so a targeted investigation of a particular region is much harder with the deficit lesion method.

The deficit-lesion method for studying brain function

- Since language is a uniquely human capability, the history of the cognitive neuroscience of language is deeply rooted in deficit-lesion studies.
- Language problems as a result of brain damage: **APHASIA**.
- Study of aphasic patients: APHASIOLOGY.