

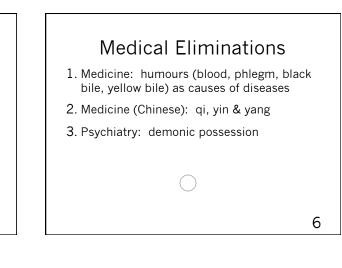
## **Eliminative Explanation**

- 2. Plausible answer: they are not.
- 3. Therefore, eliminate the concept of immortality from scientific explanation.



- 1. Physics: Aristotelian aether, luminiferous aether, Descartes' vortex
- 2. Astrology: stars influence events
- 3. Alchemy: transmutation of metals
- 4. Chemistry: phlogiston, caloric
- 5. Biology: divine creation, vital force

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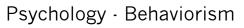


#### Social Science Eliminations

- 1. Race: needed for sociology, medicine?
- 2. Group beliefs, attitudes; collective unconscious?
- 3. Intelligence?
- 4. Class?

## Why Eliminate?

- 1. Initially, the best explanation of facts is theory T1, using concept C. Aristotle's aether holding the stars.
- 2. T2 is developed that provides a better explanation than T1, using other concepts. Copernicus + theory of stars as spheres of gas.
- 3. So we should accept T2, and abandon C.



Agenda 1920s-1950s: eliminate all mental concepts, including representation, inference, consciousness.

Key people: Watson, Clark Hull, B. F. Skinner.

Philosophical grounds: positivist view that science deals only with observations.

Scientific grounds: all behavior can be explained by environmental learning.

So all mental concepts can be eliminated.

#### Behaviorism Failed

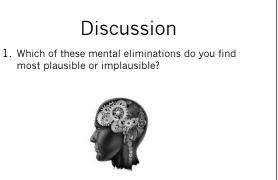
- 1. Even animal behaviors require mental representations, e.g. mental maps (Tolman).
- 2. Language learning and comprehension requires complex grammars (Chomsky).
- 3. Human problem solving requires rules, images, analogies (Simon, Kosslyn, Holyoak, etc.).

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#### **Current Eliminativists**

- 1. Many people vs. soul, immortality 🗸
- 2. Churchlands vs. propositional attitudes 🗸
- 3. Harris & Wegner vs. free will ✔
- 4. Dennett & Metzinger vs. the self X
- 5. Dennett & Rey vs. qualia (qualitative conscious experiences) **X**
- 6. Chemero and radical embodied cognitive science versus mental representation **x**

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# 3-analysis of eliminative explanation

- 1. Exemplars: astrology, alchemy, aether, phlogiston, vital force, creation
- Typical features: concept embedded in a theory that is replaced by a superior one; rejection of old theory and concept
- **3.** Explains: why concepts are abandoned. Explained by: theoretical progress.

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### Observations

- Reduction is not elimination: if consciousness is a brain process, then it exists. Identities are not eliminations. (Thagard 2014, "Explanatory Identities")
- 2. Elimination requires an alternative explanatory theory. Analysis or explication is not enough to eliminate.
- 3. Elimination presupposes successful noneliminating explanations, e.g. narrative, mechanistic, deductive. 14

#### Application to Consciousness

- 1. Behaviorist elimination failed.
- 2. Radical embodied elimination fails.
- **3**. Dennett's Cartesian theatre elimination is ok, but there are more complex explanations of consciousness.

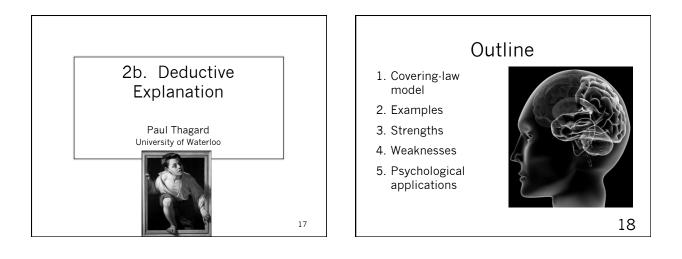
Therefore, consciousness is not eliminated.

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## 2a. Conclusions

- 1. Explanation by elimination marks scientific progress.
- 2. Elimination in psychology is controversial.
- Elimination presupposes other styles of explanation.





## **Deductive Explanation**

Explanation is providing a deduction from general laws.

Example: Why does Daniel have a liver?

Deduction: Because Daniel is human, and all humans have livers.

#### Covering-Law Model (Hempel)

Law 1, law 2 ...

Condition 1, condition 2

-----DEDUCE

Explanandum (what is explained)

Laws and conditions must be true Deductive-nomological

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## D-N Explanation

Explanations provide predictions.

Explanations may be causal, but do not have to be.

Statistical explanation is an approximation to deductive explanation.

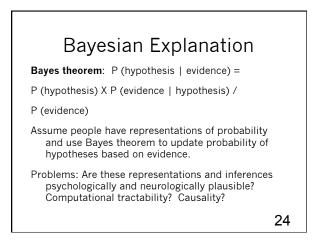
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#### Deductive Explanation in Natural Science

- 1. Physics: use Newton's laws (e.g. f=ma) to predict motion of projectiles. Quantum theory is great for mathematical predictions, e.g. entanglement.
- 2. Chemistry: use equations e.g.  $CH_4 + O_2 \rightarrow CO_2 + H_2O$
- 3. Biology: use Hardy-Weinberg law in population genetics
- 4. Medicine: use statistical laws about infection, e.g. by viruses 22

#### Deductive Explanation in Social Science

- 1. Economics: develop mathematical models to predict effects of economic policies
- 2. Politics: use game theory to predict voting behavior
- 3. Psychology: use Bayesian models to explain inference
- 4. Psychology: explain brain operations as dynamic systems



#### 3-Analysis of Deductive Explanation

1. Exemplars: physics, chemistry, economics

#### 2. Typical features:

- 1. Puzzling facts to be explained
- 2. Explanatory pattern: deduction from laws in mathematical form
- 3. Resulting understanding satisfaction
- **3**. Deductive explanation explains: desire for mathematical patterns

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## Discussion

What examples of deductive explanation can you think of? How available are they for questions you want to answer?

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#### Strengths of Deductive Explanation

- 1. Logically and mathematically rigorous
- 2. Tight connection between explainers and explained: deduction
- Makes inference to the best explanation clear: which theory enables deduction of most facts
- 4. Connects explanation with prediction

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#### Weaknesses of Deductive Explanation

- 1. Deduction is not sufficient for explanation, e.g. flagpole and birth control pills examples.
- 2. Deduction is not tight enough for causal relevance.
- 3. General laws are rarely available in some fields, e.g. biology, medicine, history.
- 4. Statistical probabilities also have relevance problems: correlation is not causality.

### Improving Deductive Explanation

- 1. Restrict to domains like physics where mathematical laws are available.
- 2. Incorporate causal relations, e.g. via mechanisms.
- 3. Integrate laws and deductions into narrative explanations, e.g. of evolution.

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#### Application to Consciousness

- 1. Tononi: consciousness is a mathematical quantity: information integration.
- 2. Being conscious is having some of this quantity.
- **3.** Problems: mathematical, computational; cell phones are conscious.

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## 2b. Conclusions

- 1. Deductive explanations are important in physics and other mathematical sciences.
- 2. But biology etc. require other styles of explanation.
- 3. Problems remain about relevance and causality.

