

Lecture 3 - Metaphor

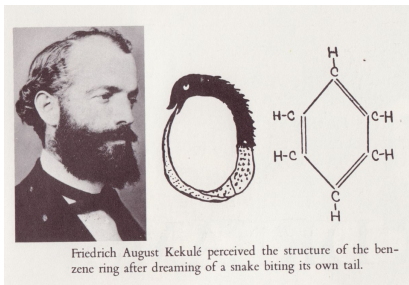
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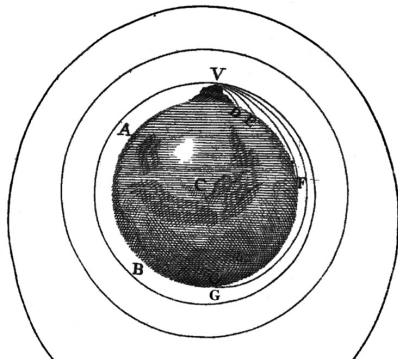
Readings:

- George Lakoff and Mark Johnson *Metaphors we Live By*, 2nd edition (afterword), 2003.
- Keith J. Holyoak and Paul Thagard *Mental Leaps*, MIT Press, 1995.

Analogy in Science



- Benzene is a snake
(Kekulé 1865)



- Planets are projectiles
(Newton 1687)
(the mountain would be 800km high)

transferral of skills and knowledge



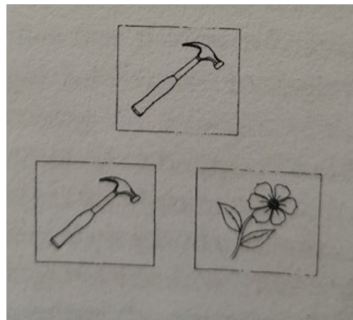
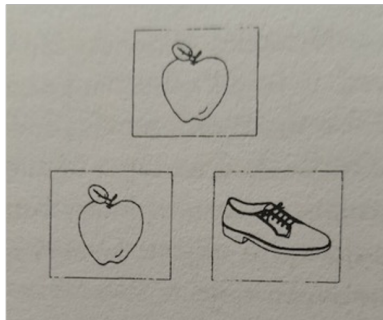
- A plane is a bird:
needs wings, etc



- A mind is a computer:
needs symbols, etc

Transferring Skills: the basics

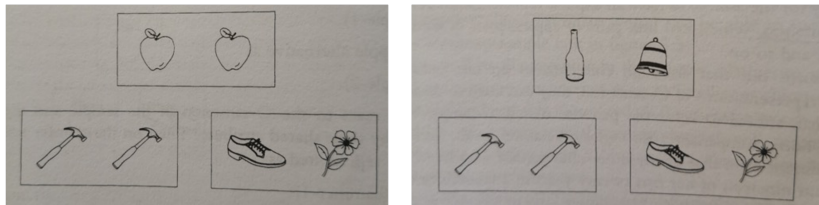
Match to Sample (Holyoak and Thagard, *Mental Leaps*, 1996)



- The simplest type, similarity
- which picture on the bottom matches the one on the top?
- Humans, Chimps, Monkeys and Pigeons can all solve this problem

Transferring Skills: the basics

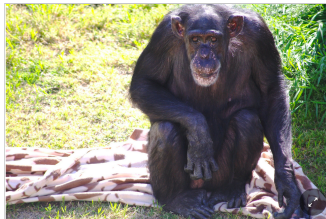
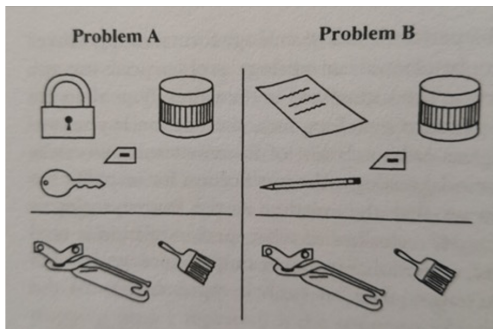
Matching Relations (Holyoak and Thagard, *Mental Leaps*, 1996)



- Matching relations (left: same; right: different)
- Humans, Chimps, Monkeys can solve this problem
- Pigeons cannot

Transferring Skills: the basics

Matching functions (Holyoak and Thagard, *Mental Leaps*, 1996)

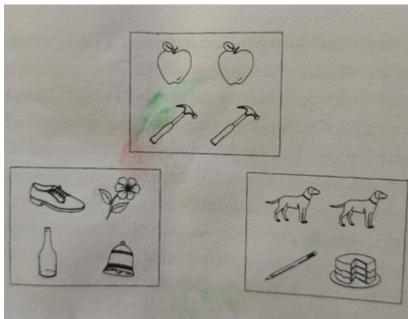


Sarah, among the most studied of chimpanzees, was born in Africa and lived in Missouri, California and Pennsylvania since the mid-1960s. Amy Puzos/Chimp Haven

- Matching functional relations
- left: key is to lock as X is to tin of food?
- right: pen is to paper as X is to can of paint?
- Humans can solve this problem easily
- One chimp (Sarah): only non-human animal to do so
- Monkeys and Pigeons cannot do it

Transferring Skills: the basics

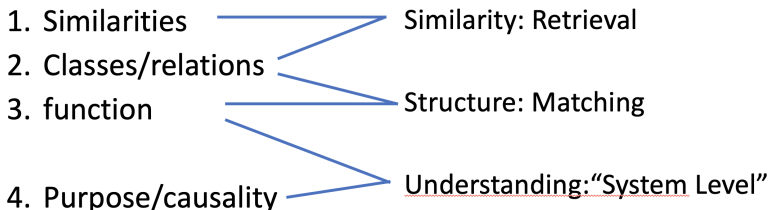
Matching relations over relations (Holyoak and Thagard, *Mental Leaps*, 1996)



(ignore smudge)

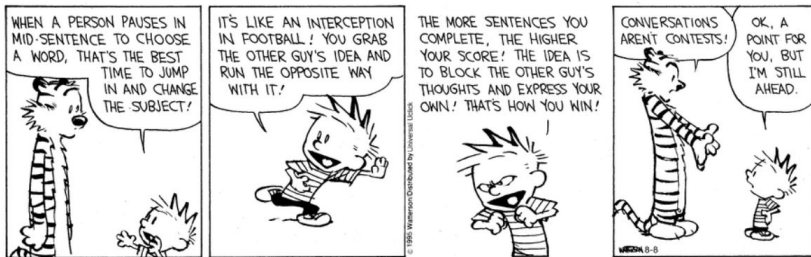
- “system level”
- Matching relations between relations (above: same-ness)
- Humans can solve this problem
- no other animal can

Levels of Analogy



- More complex levels of abstraction: broader categories of meaning that can be transferred
- machine learning: does not tackle "system" level analogy
- merge logic and probability? – limited success
- first order (relational) reinforcement learning may be one way to accomplish "system" level transfer learning,
- can it be done without any symbolic representations?
- involves understanding similarities in relations between relations (of categories of things) using only sparse reward signal

Metaphor: conversations are Contests



Metaphor



"The squeaky wheel gets the grease"

Metaphor



"Im gonna be under the wire"



Metonym



"The ham sandwich wants his check"

- Alices's birthday is **close to** Easter
- Food prices **rose**
- Bob and Alice are **on the rocks**
- Waterloo is a **half hour from** Guelph
- Hank is going **flat out**
- I've got **new wheels** – also a synecdoche
- A's theory is a **cow with no milk**
- The **crown** will **not stand** for this trespass
- The **pen** is mightier than the **sword**

Metaphor:

- connects things **across domains**
- explains the **complex, unique** in terms of the **simple, universal**
- explains the **qualitative** in terms of the **quantitative**

Metonym:

- connects things **within a domain**
- explains things of the **same complexity**
- explains the **quantitative** in terms of the **quantitative**
- explains the **qualitative** in terms of the **qualitative**

The heart of metaphor is inference. (Lakoff & Johnson, p244)

- inferences in sensory domains used to draw inferences about subjective domains
- sensory domains: space, objects – perceptible
- subjective domains: justice, love – imperceptible
- subjective behavioural choices are based on those inferences,
- so the metaphors matter
- as in any mathematical theory: it is meaningless without an interpretation

Historical Fallacies

- metaphor is words, not concepts
- metaphor is based on similarity
- all concepts are literal
- rational thought is not shaped by brains and bodies

all these statements have been disproved

conversations: **contests** or **journeys**?



- because they **feel** the same - either antagonistic, or collaborative
- **feeling/emotion** is what underlies the metaphor, what connects the two concepts together
- **innovation** and novelty are built through metaphorical thought
- **economic growth** is based on innovation

therefore, **economic growth is emotional**

Do the same for **love is a journey** vs. **love is a battlefield**

Primary Metaphor

- based on emotional states (e.g. warmth)
- e.g. affection is warmth
- *"she warmed my heart"*
- complex metaphors built from the primary metaphors
- inferences: **structural** and **enacted**
- structural: who is doing what to who?
"France fell into a recession and Germany pulled it out"
- enacted: *"John fell in the ditch and Harry pulled him out"*

- metaphorical language used constantly by **politicians**
- political beliefs **structured by metaphor**
- Conservative: **strict father**
 - ▶ independence
 - ▶ self-worth
- Liberal: **nurturing parent**
 - ▶ nurture
 - ▶ care
 - ▶
- constructing emotional metaphors **that work** is critical in politics
- the metaphorical framing of science may be a big part of data analytics and machine learning

- Values
- Kahneman Chapters 1-3
- optional: Bales, Mercier and Sperber, Schwartz, etc.