

PHIL/PSYCH 256  
INTRODUCTION TO  
COGNITIVE SCIENCE

Week 6: Images

PLEASE TURN OFF AND PUT AWAY ALL  
ELECTRONIC DEVICES



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## Imagery: Representation

Image: mental representation that is similar to what it represents.

Main example: visual (pictorial) images

Maps, diagrams, pictures

Other: tactile, auditory, motor, olfactory

Key question: does the mind use a single, propositional (verbal) code, or multiple codes?

Kosslyn vs. Pylyshyn. Not just introspection.

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## Imagery: Computational Power

- Vision is far more complex than you realize. Illusions.
- Light on retina to experience of perception requires much processing.



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## Imagery: Computational Power

- Visual operations, e.g. Finke examples.
  - Zoom
  - Scan
  - Rotate
  - Flip
- Use for problem solving. Analogies.
- Learning. Language.

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## Discussion Question

- When do you use imagery? What kinds?
- What kinds of problem are most usefully solved using imagery?



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## Concepts are multimodal

- Concept of car is not just a verbal description, but includes visual and other kinds of representations.



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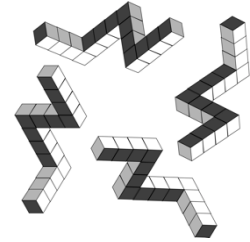
## Key Points

- Thinking is not just verbal, but also use visual images and other kinds of representations.
- Visual images allow different kinds of operations from verbal ones.

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## Psychological Evidence for Imagery

1. Anecdotes: limited.
2. Imagery and skill learning, e.g. sports.
3. Psychological experiments with reaction times: scanning, rotation, gestalt perception.



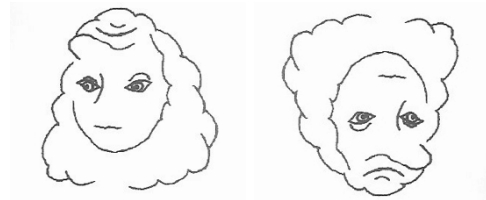
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## Psychological Evidence for Imagery



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## Psychological Evidence for Imagery



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## Neurological Evidence for Imagery

- Mental imagery activates visual areas of the brain: large increases in blood flow to the visual cortex.
- Defects in imagery tend to go with defects in vision. Image generation deficits in some people. Typically have damage in left posterior part of brain.

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## Discussion Question

- Is the psychological evidence for imagery convincing?



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## Key Points in Glasgow

- Computational imagery is the ability to represent, retrieve, and reason about spatial and visual information.
- Nested arrays can be used to represent spatial information.
- Visual information can be represented using occupancy arrays, and manipulated using operations such as rotate, translate, and zoom.
- Computational imagery is useful for cognitive science and AI, and has practical applications, for example in drug design.

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## Key Points

- The case for visual imagery is based on a combination of psychological and neurological experiments.
- Computational modeling of visual imagery is hard.

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