بسم الله الرحمن الرحیم

علوم شناختی

جلسه ۲۶ (ب)

پردازش اطلاعات بدون آگاهی خودآگاهانه

Information Processing without Conscious Awareness

کاظم فولادی قلعه
دانشکده مهندسی، دانشکدگان فارابی
دانشگاه تهران

http://courses.fouladi.ir/cogsci

PART 3:
APPLICATIONS

Chapter 15:
The Cognitive Science of Consciousness

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Chapter 15.2: Information processing without conscious awareness

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The basic idea

- We can look at the types of information processing and problem-solving that can take place without consciousness and compare them with those that seem to require consciousness.

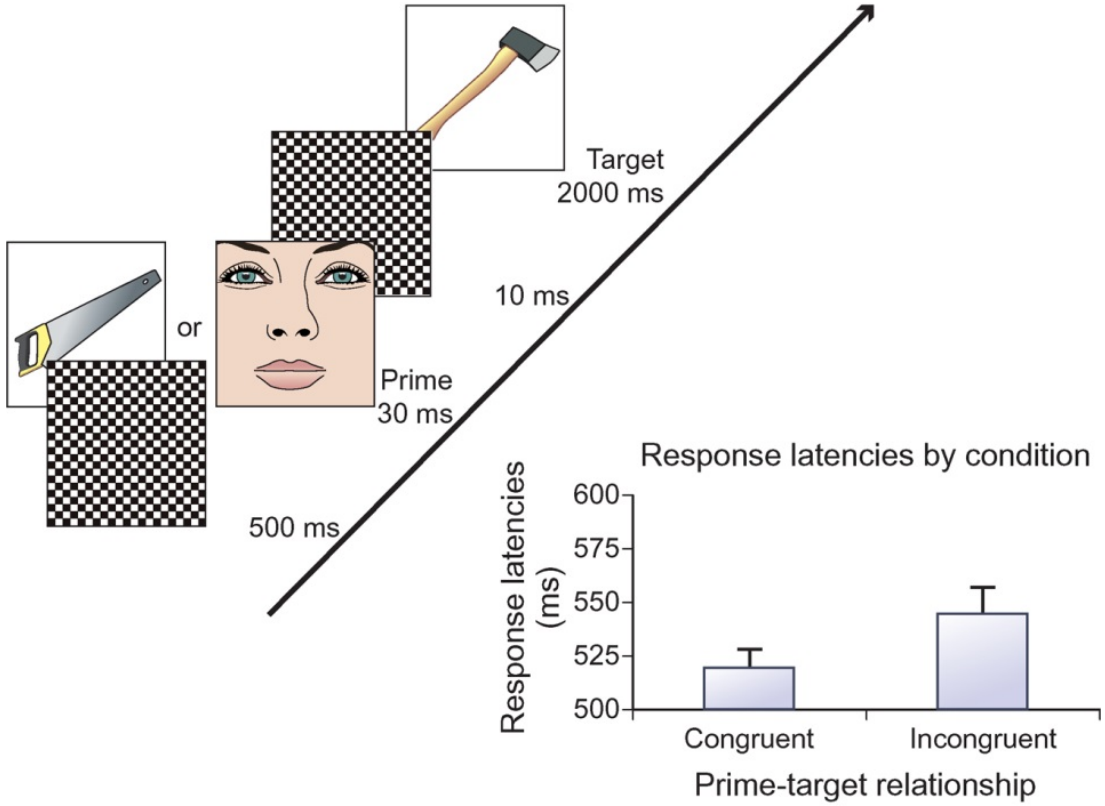
- Two techniques:
  - Priming experiments
  - Double dissociations in cognitive neuropsychology

A typical priming experiment

- Subjects are exposed very briefly to some stimulus, e.g. an image on a screen.
- The time of exposure is short enough that the subjects do not consciously register the stimulus.
- The exposure to the stimulus affects their performance on subsequent tasks, e.g. classification task.

A typical priming experiment

An illustration of a typical priming experiment. The images above the arrow depict the sequence and timing of each stimulus when a tool is the target. The graph shows that people who were presented with a congruent prime were faster to identify the target than people who were presented with an incongruent prime.



Typical experiment

- Subjects are asked to categorize the target as either a face or a tool.

- Two different types of prime

  - **Congruent with the target:**
    if the target is a tool, the prime is another tool.

  - **Incongruent with the target:**
    if the target is a face, the prime is a tool.

The results

- The experiment measures the response latency

- There is a significant priming effect for congruent prime-target pairs.

Interpretation of the results

- The priming effect appears to show that the information processing required to carry out basic categorization can take place non-consciously.

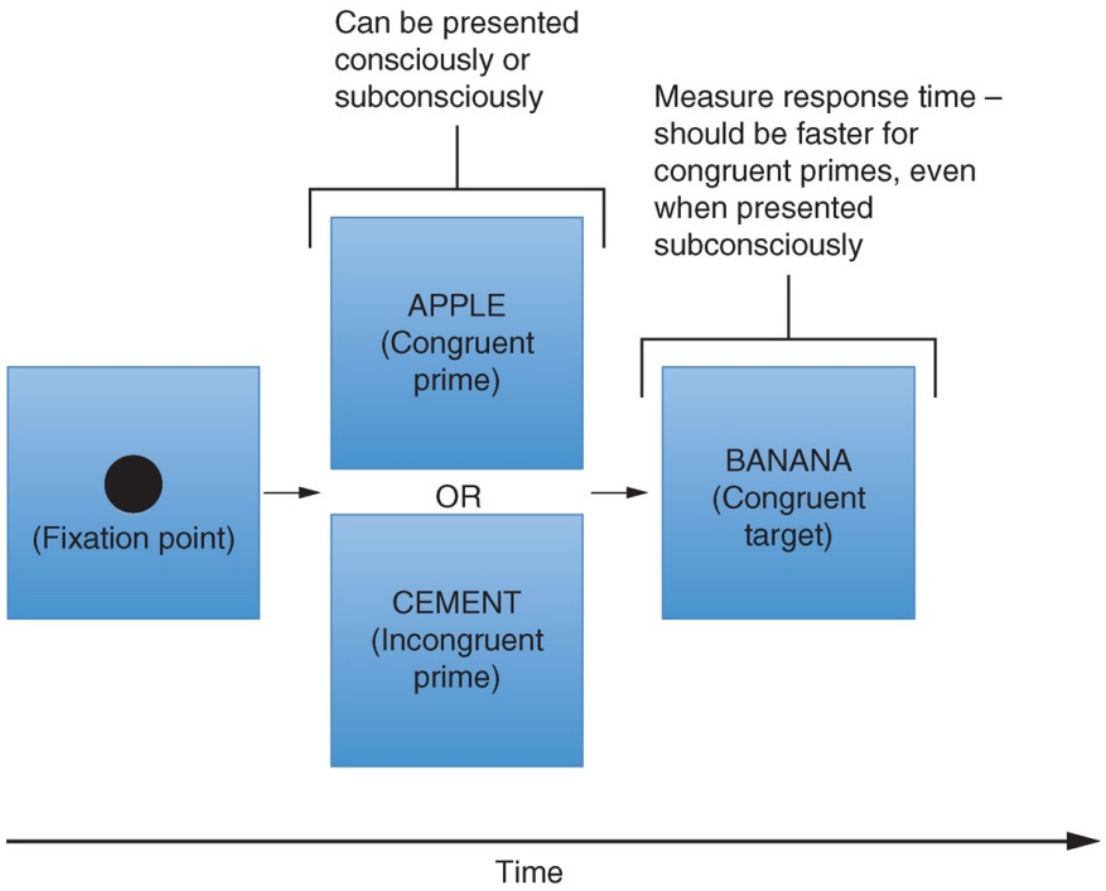
- The processing time for correctly classifying a congruent target is less than for a non-congruent target because the subject is already thinking non-consciously about the relevant category.

Semantic priming

- A response to a target (e.g., dog) is faster when it is preceded by a semantically related prime (e.g., cat) compared to an unrelated prime (e.g., car).

- Semantic priming is important because it seems to show that there can be information processing that is both non-modular and non-conscious.

A Typical Semantic Priming Experiment



There are many variations. Sometimes the words are presented in different languages, as discussed in the main text, and sometimes the semantic congruence varies for the target instead of the prime. Participants can be asked to hit a button simply when they see the target word or make some more difficult judgment about the word (e.g., whether it is in fact a word).

Double dissociation

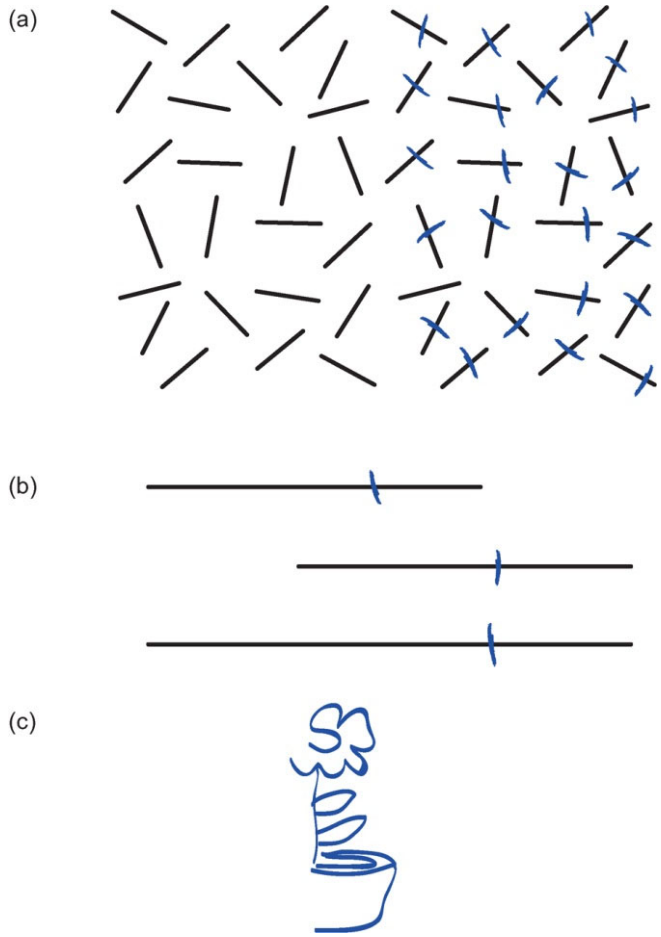
- **Dissociation:** if in one type of brain damage we see ability A functioning normally while ability B is severely impaired, then we can infer that in some sense A and B are dissociated from each other.

- **Double dissociation:** in one disorder we have ability A functioning normally with B significantly impaired, while in a second disorder we have ability B functioning normally with A significantly impaired.

Unilateral spatial neglect

- Defining feature: patients lack awareness of sensory events on the contralesional side of space (on the opposite side of the world to the side of the brain that is damaged).

Unilateral spatial neglect: Example



(a) Unilateral neglect patients typically fail to mark the lines on the contralesional side of a sheet of paper.

(b) Patients are asked to bisect each line. Their markings are typically skewed to the right, as if they do not see the leftmost segment.

(c) Patients are either asked to draw something from memory or to copy anther illustration placed in front of them. In both cases they tend to omit parts on the contralesional side.

Blindsight

- Patients report little to no awareness in one side of their visual field.

- They have scotoma, i.e., a region of very diminished visual acuity that does not occupy the whole visual field.

Common feature

Both blindsight and unilateral spatial neglect patients have surprising residual visual functioning despite reporting a more or less complete lack of visual awareness.

Experimental design

- Nonverbal forced choice tests: patients are forced to guess in situations where they feel that they have no basis to make a judgment or to perform an action.

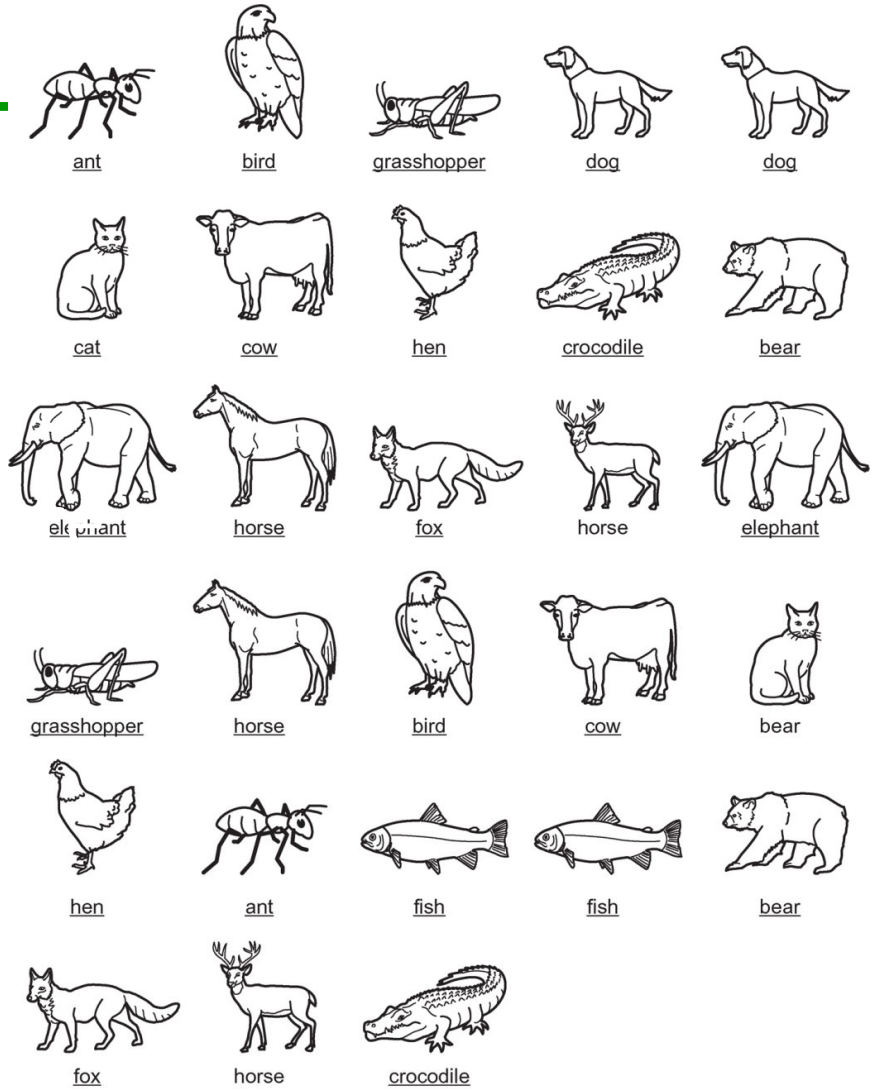
- Blindsight patients perform significantly better than chance, even when they describe themselves as guessing.

Residual abilities of blindsight patient

- Trevethan, Sahraie, and Weiskrantz 2007
- The blindsight patient, D.B., was told that he was being shown a picture of an animal and asked to guess which animal it was.
- D.B. achieved 89 percent accuracy, despite reporting no awareness whatsoever of any of the figures.

D.B.'s responses to pictures of animals presented in his blind field.

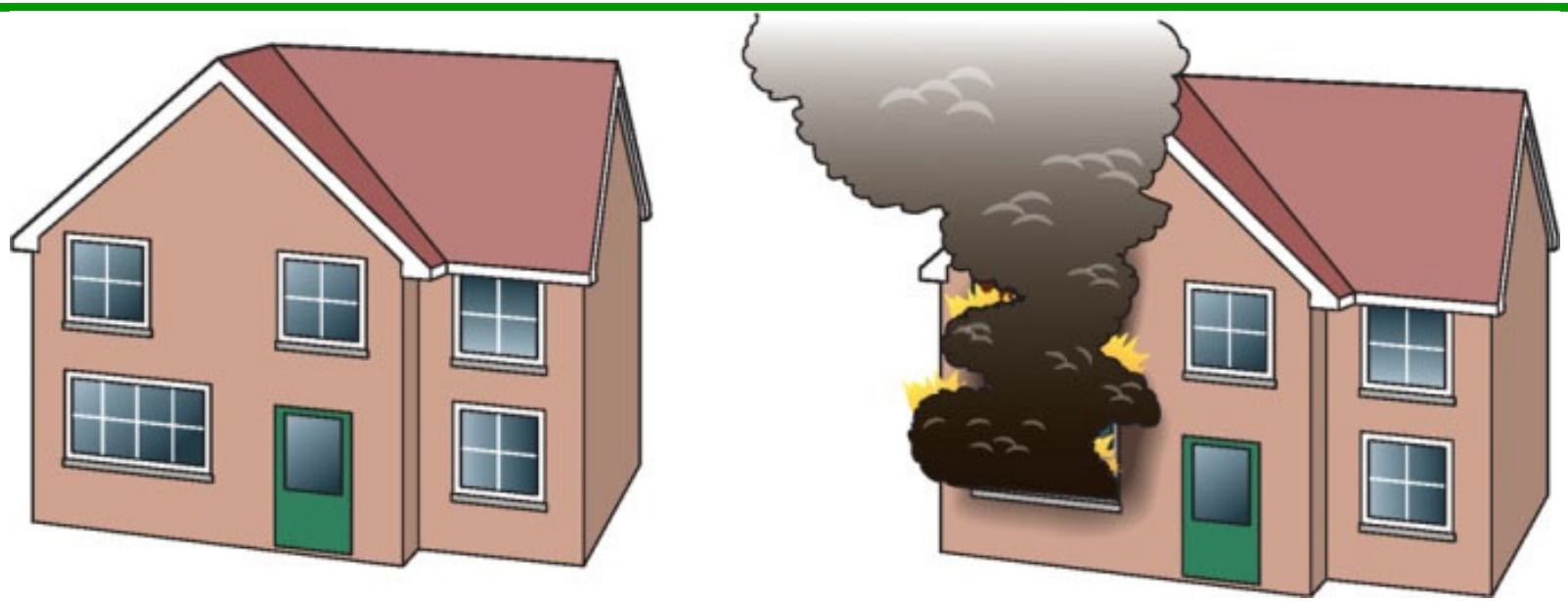
Correct answers are underlined.



Residual abilities of spatial neglect patient

- Marshall and Halligan 1988
- The neglect patient, P.S., was shown two pictures in the diagram – one of a normal house and one of a house on fire.
- Since the flames were on the left-hand side of the picture, P.S. did not report seeing any difference between the two pictures. However, when asked which house she would prefer to live in, she reliably chose the house that was not on fire (9 times out of 11).

An illustration of the two houses presented to P.S.



An illustration of the two houses presented to P.S. The houses are identical, except that one has flames shooting out of its left side. Because P.S. possesses left-side spatial neglect, she reported not being able to see the flames but still consistently selected the other house when asked which house she would prefer to live in.

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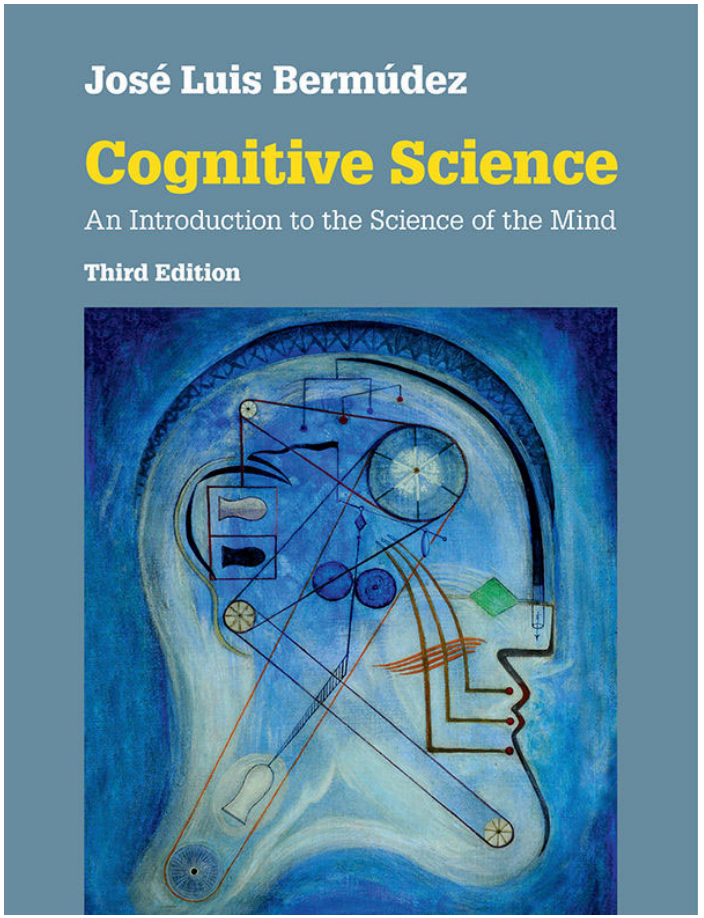
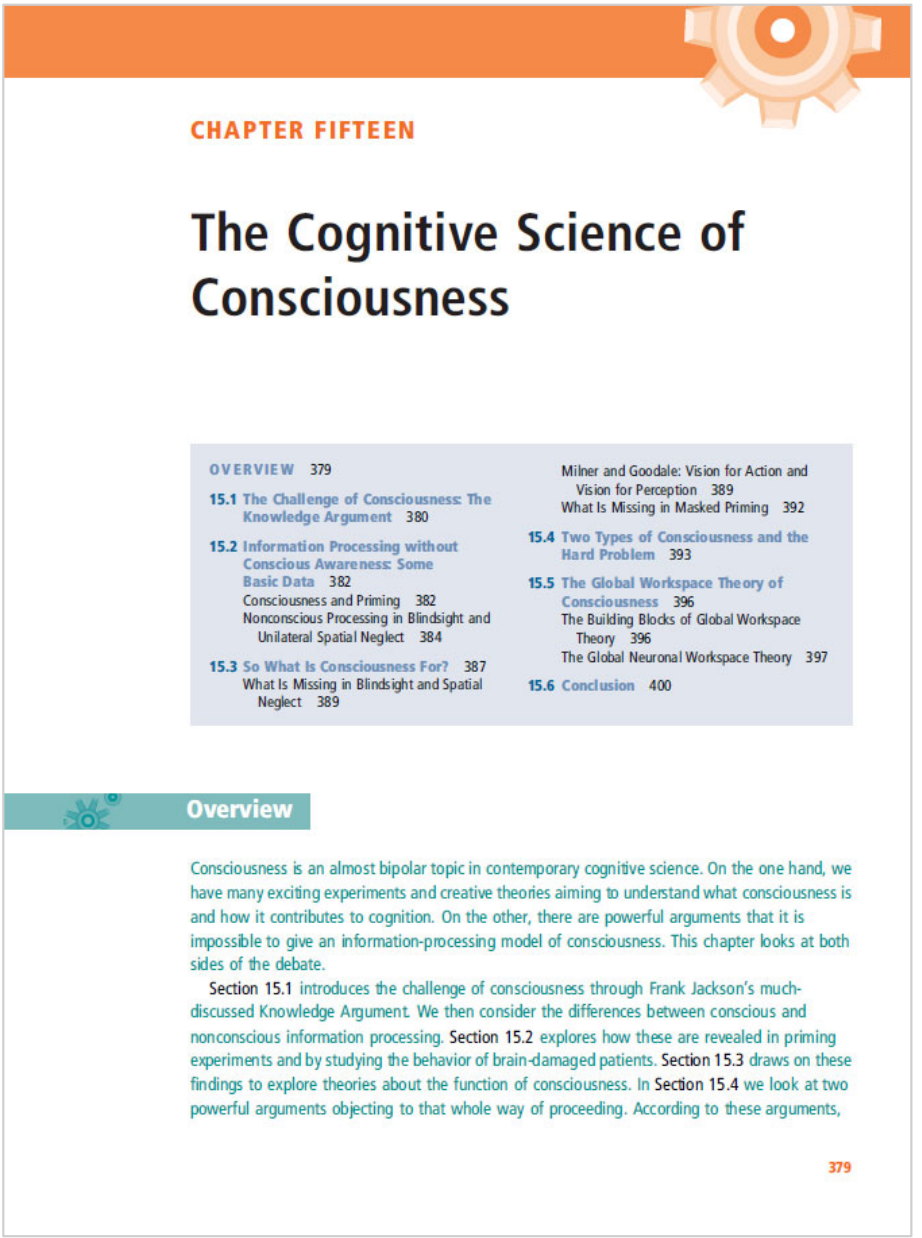


José Luis Bermúdez,
Cognitive Science:
An Introduction to the Science of the Mind,
3rd ed., Cambridge University Press, 2020.
Chapter 15 (Section 15.2)



CHAPTER FIFTEEN

The Cognitive Science of Consciousness

Overview

Consciousness is an almost bipolar topic in contemporary cognitive science. On the one hand, we have many exciting experiments and creative theories aiming to understand what consciousness is and how it contributes to cognition. On the other, there are powerful arguments that it is impossible to give an information-processing model of consciousness. This chapter looks at both sides of the debate.

Section 15.1 introduces the challenge of consciousness through Frank Jackson's much-discussed Knowledge Argument. We then consider the differences between conscious and nonconscious information processing. Section 15.2 explores how these are revealed in priming experiments and by studying the behavior of brain-damaged patients. Section 15.3 draws on these findings to explore theories about the function of consciousness. In Section 15.4 we look at two powerful arguments objecting to that whole way of proceeding. According to these arguments,

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