بسم الله الرحمن الرحیم

علوم شناختی

جلسه ۲۷ (ب)

فضای کاری سراسری
نظریه‌ی خودآگاهی

The Global Workspace Theory of Consciousness

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http://courses.fouladi.ir/cogsci

PART 3:
APPLICATIONS

Chapter 15:
The Cognitive Science of Consciousness

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Chapter 15.5: The global workspace theory of consciousness

Dehaene et al., 2001

They propose the global workspace theory as the best way of making sense of the basic functional benefits of consciousness within a framework set by some widely accepted assumptions about the architecture of the mind.

Three functions of consciousness

- The intentional control of action
- Durable and explicit information maintenance
- The ability to plan new tasks through combining mental operations in novel ways

Two theoretical postulates

- The modularity theory
- The theory that attention makes information available to the global workspace

Modularity

- Two key features of modularity:
  - Domain-specific
  - Informationally encapsulated
- There are tasks that are domain-general.
- The global workspace is domain-general information processing.

Modularity and consciousness

- Dehaena and Naccache suggest that the distinction between the conscious and non-conscious minds maps onto the distinction between modular processing and non-modular processing.

- Consciousness is restricted to information within the global workspace.

Attention

- Attention functions as a gate-keeper, allowing the results of modular information processing to enter the global workspace.

- Attention is a filter
  - Screening out unnecessary information, as in the cocktail party effect

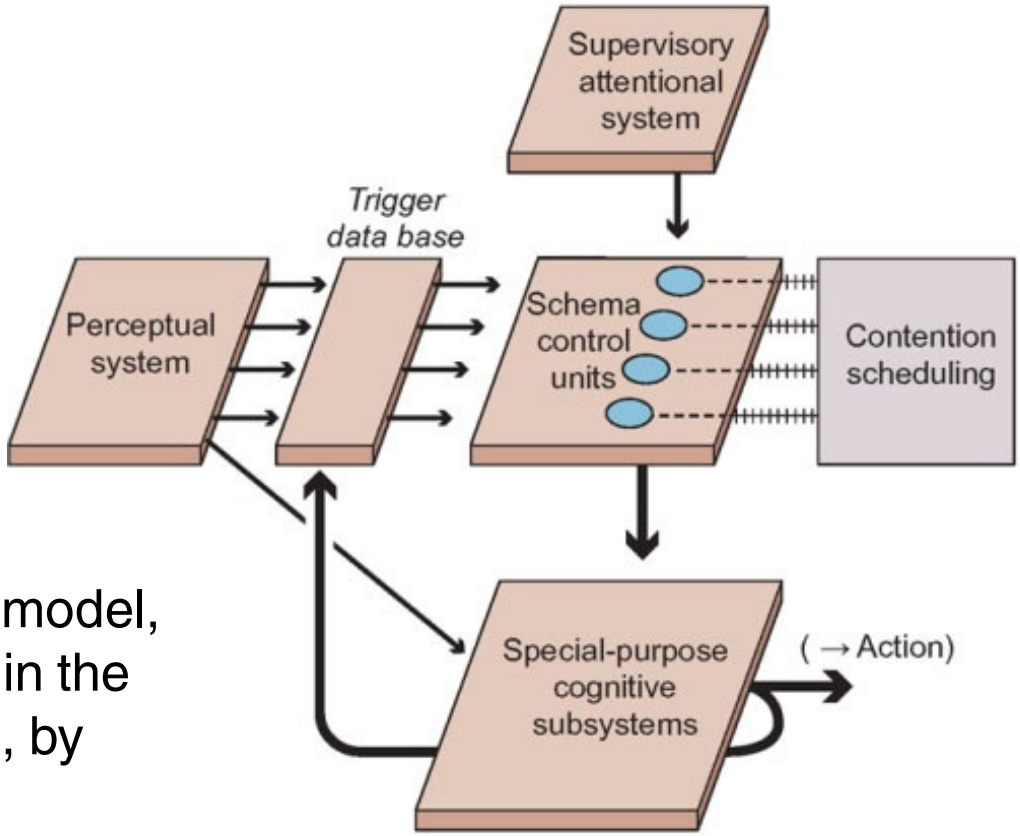
- Attention is an amplifier
  - Allowing information that would otherwise have been unconscious to become available to consciousness

Three versions of the global workspace theory

- The Norman and Shallice 1980 model
- The Baars 1989 model
- The global neuronal workspace model (GNW, Dehaena, Kerszberg, and Changeus, 2011)

The Norman and Shallice 1980 model

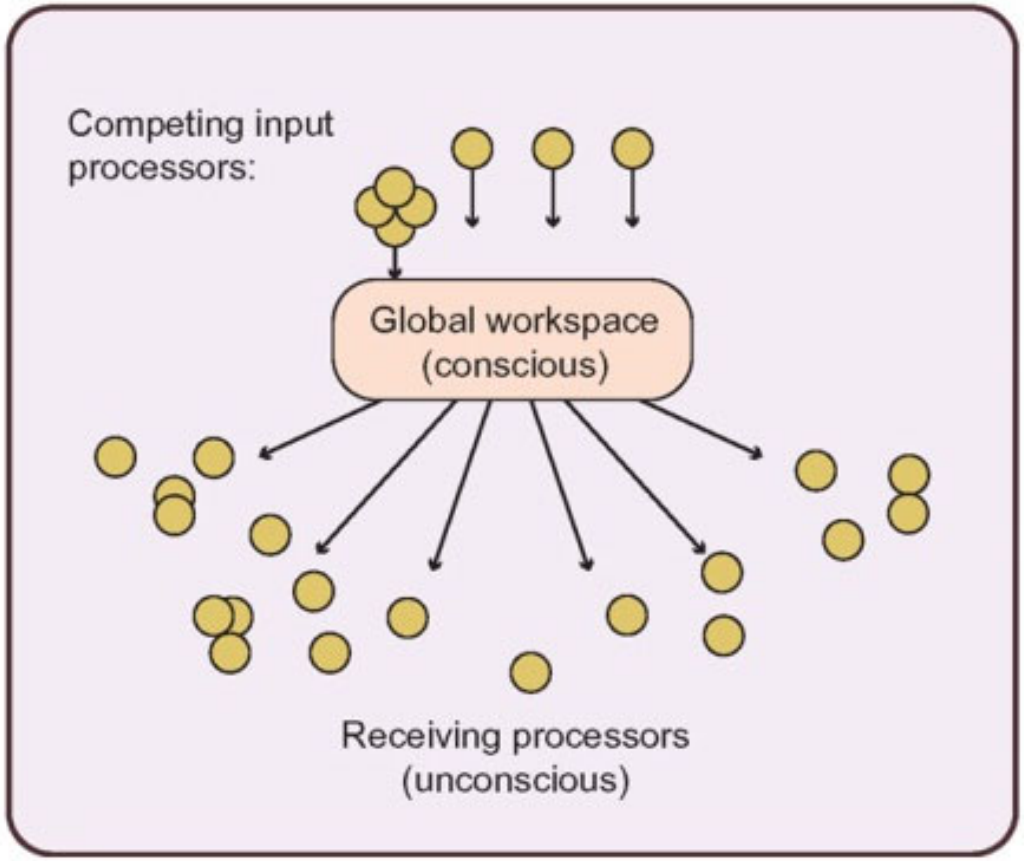
In the Norman and Shallice 1980 model, conscious processing is involved in the supervisory attentional regulation, by prefrontal cortices, of lower-level sensorimotor chains.



Norman and Shallice 1980

The Baars 1989 model

According to Baars 1988, conscious access occurs once information gains access to a global workspace, which broadcasts it to many other processors.



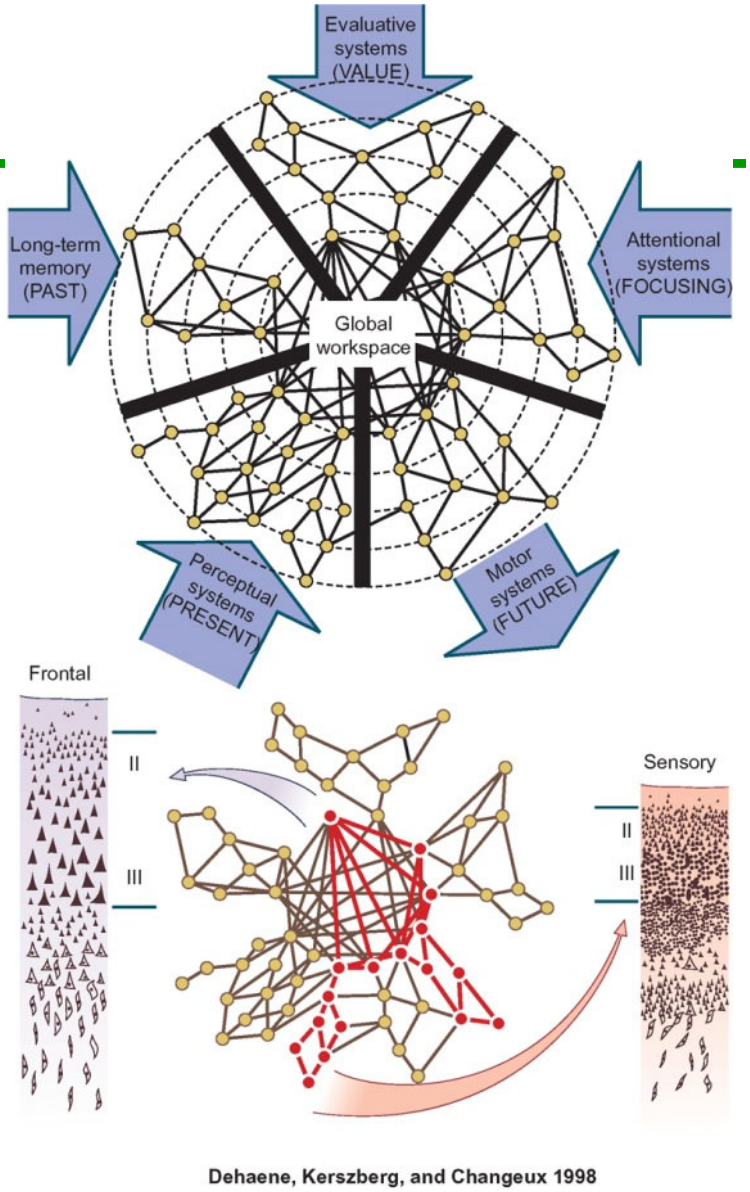
Baars 1988

The GNW model

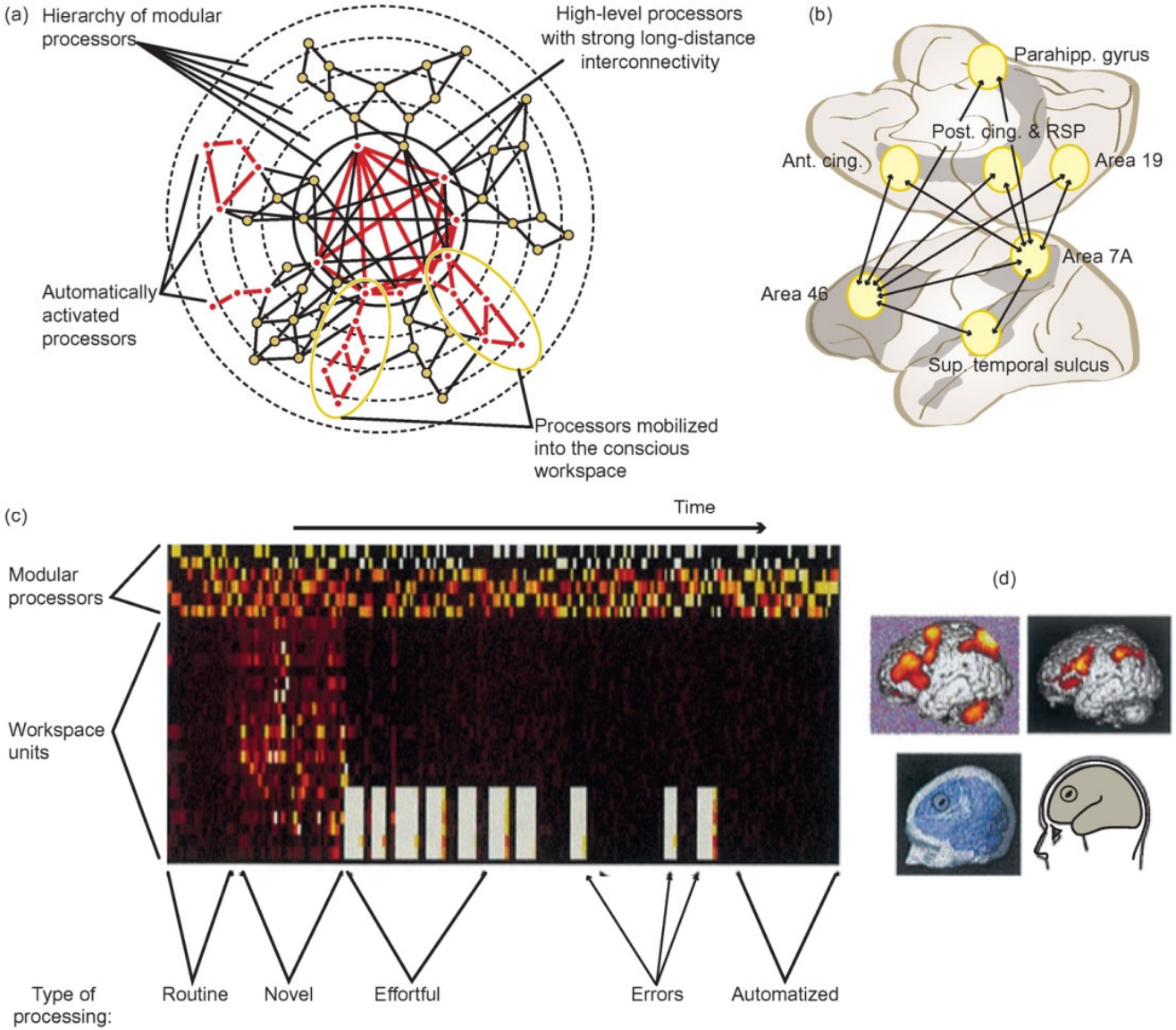
The global neuronal workspace (GNW) hypothesis proposes that associative perceptual, motor, attention, memory, and value areas interconnect to form a higher-level unified space where information is broadly shared and broadcasted back to lower-level processors.

The GNW is characterized by its massive connectivity, made possible by thick layers II/III with large pyramidal cells sending longdistance cortico-cortical axons, particularly dense in prefrontal cortex.

(From Dehaene and Changeux 2011)



Dehaene, Kerszberg, and Changeux 1998



The neural substrates of the global workspace. (a) Hierarchy of connections between different processors in the brain. Note the strong long-distance connections possessed by the higher levels. (b) Proposed anatomical substrate of the global workspace. This includes a network linking the dorsolateral prefrontal, parietal, temporal, and anterior cingulate areas with other subcortical regions (RSP = retrosplenial region). (c) Neural dynamics of the global workspace, derived from a neural simulation of the model shown in (a). The activation levels of various processor units (top lines) and workspace units (bottom lines) are shown as a function of time. (d) Different parts of the global workspace network activated by different tasks, including generation of a novel sequence of random numbers, effortful arithmetic, and error processing. (From Dehaene and Naccache 2001)

The GNW model

- The figure shows the distributed nature of the global neuronal workspace.

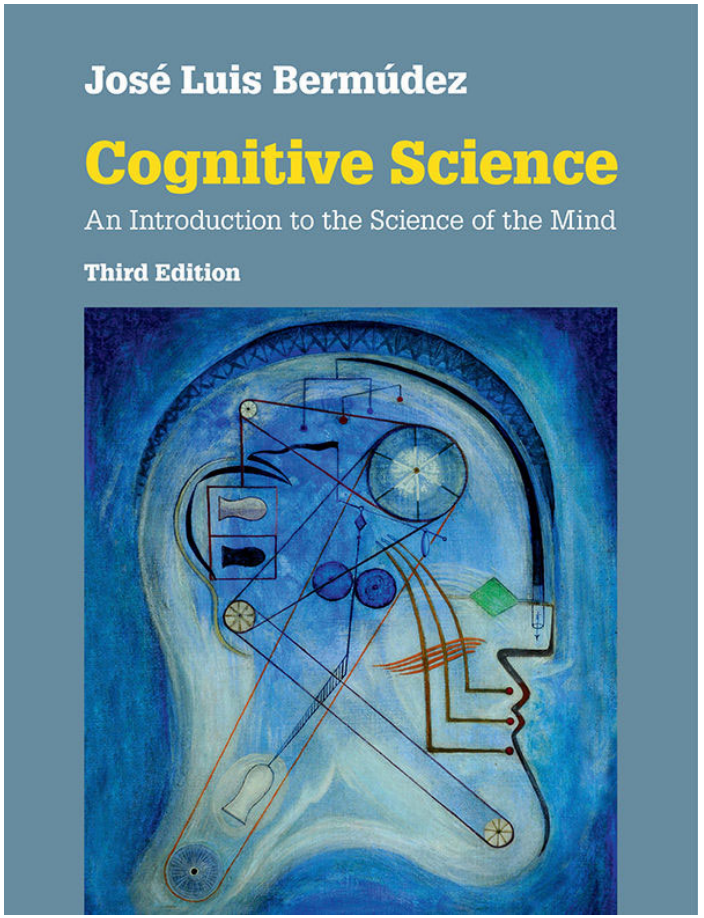
- The authors see the modular part of the mind as composed of many interconnecting modules that feed into each other in a hierarchical manner.

The GNW model (cont.)

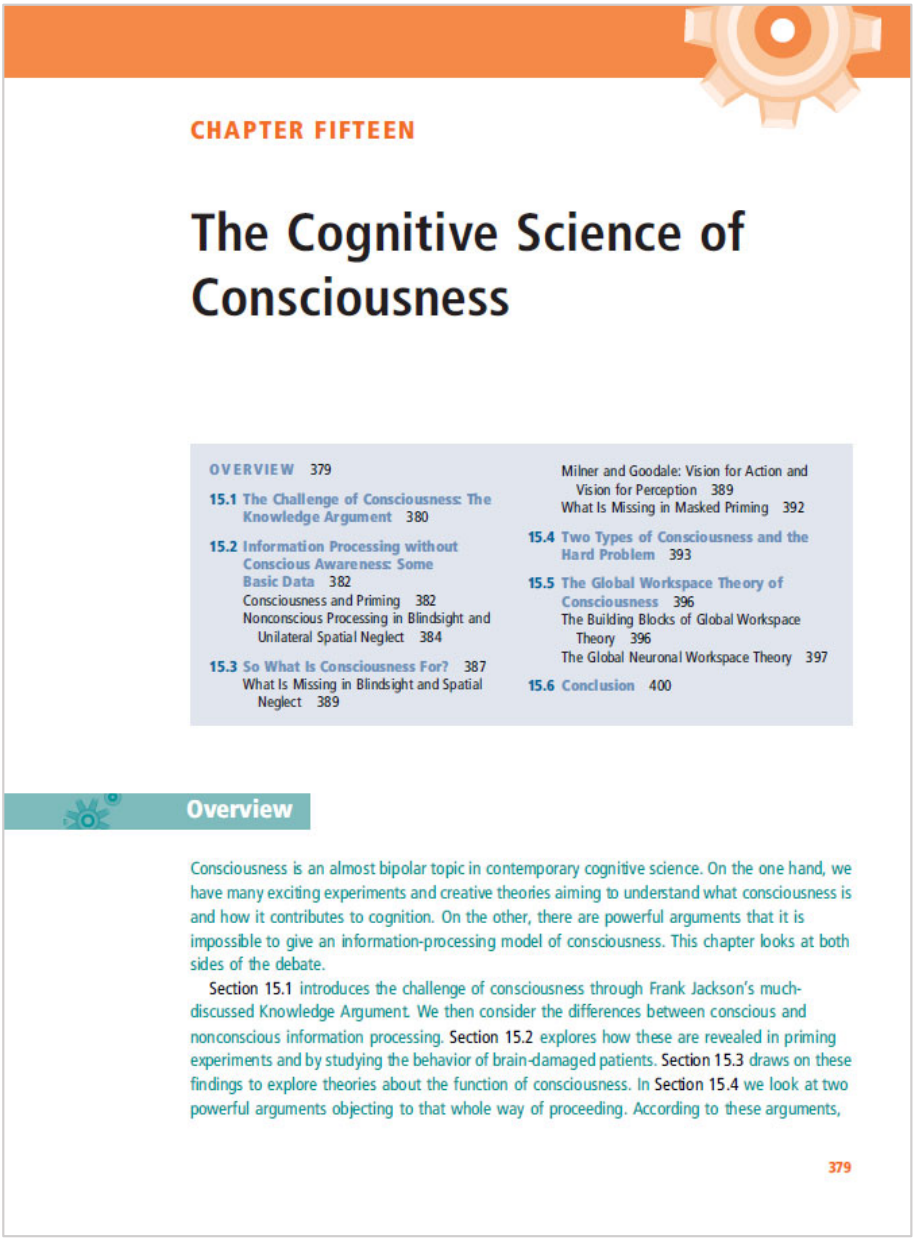
- The global neuronal workspace is generated by the activities of a particular type of neurons called pyramidal neurons.

- Pyramidal neurons are hypothesized to connect specialized modular processes and allow their outputs to be broadcast across the brain so that they are available for high-level cognitive processes such as action-planning and verbal report.

منبع اصلی



José Luis Bermúdez,
Cognitive Science:
An Introduction to the Science of the Mind,
3rd ed., Cambridge University Press, 2020.
Chapter 15 (Section 15.5)



CHAPTER FIFTEEN

The Cognitive Science of Consciousness

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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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