Foundations of Cognitive Psychology

Metaphors for the Mind
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I. Analogies and Metaphors

Thesis:
Much of scientific reasoning and discourse is done with metaphorical language. This is especially true in psychology.

“In psychology, we can only describe things by help of analogies. There is nothing peculiar in this; it is the case elsewhere as well. But we have constantly to keep changing these analogies, for none of them lasts us long enough.” (Freud, 1926/1959, p. 195)

By analyzing the metaphors of the mind, and how those metaphors have changed, we can gain insight into the history and current state of cognitive psychology.
I. Analogies and Metaphors

A. Metaphors in Science

a) Metaphors can aid understanding.

analog: the atom is like the solar system

Metaphorical description: electrons orbit the nucleus.

B. Flashbulb Memory Hypothesis

Example of a metaphor in psychology.
Flashbulb memories are "memories for the circumstances in which one first learned of a very surprising and consequential (or emotionally arousing event (Brown & Kulik, 1977, p. 73)."

These memories are "...very like a photograph that indiscriminately preserves the scene in which each of us found himself when the flashbulb was fired (Brown & Kulik, 1977, p. 74)"

Do you have "flashbulb memories?"

2) Flashbulb Memory Hypothesis

Strengths:
Compelling - compliments our own experiences
Provides specific predictions -
- indiscriminate
- high accuracy
2) Flashbulb Memory Hypothesis

Problems
Metaphors are often mistaken for explanations:
How does flashbulb memory work? Is there a camera like mechanism in the brain?
Obviously not, so this is not an explanation of why we remember emotional events.

B. Flashbulb Memory Hypothesis

Problems (continued)
Compelling metaphors are very difficult to dislodge.
- Overwhelming evidence that memories are not indiscriminate and not accurate, yet the hypothesis still holds a prominent place in public discourse.

“Each of us will remember what happened that day, and to whom it happened. We’ll remember the moment the news came -- where we were and what we were doing…” (President G. W. Bush, Address to the Joint Session of Congress, September 20, 2001.)
II. Prominent *Metaphors of Mind*  
(*based on Sternberg, 1990*)

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III. Mechanistic Metaphors in the Evolution of Cognitive Psychology

A. Telephone Systems and Information Transmission

Shannon and Weaver (1949) model of communication

Miller (1951; 1967) *Language and Communication*

Described humans as a communication channel.

B. Computer Metaphor

The computer was developed during WWII in a major effort to decode messages sent by the Axis Powers.

The code breaking machine *Colossus*, 1943
B. Computer Metaphor

Alan Turing was one of the people who worked on that project.

“General Turing machine” (Turing, 1950)

Any process that can be defined by a series of precise steps can be programmed to be performed by a general machine that processes symbols.

1 0 0 0 0 1 1 B 0 0

Philosophical foundation of the computer metaphor of mind

William James (1842-1910)

Functionalism: description of mental processes in terms of their function, or adaptive significance.

The mind is what it does.

If we can describe what the mind does as a series of steps, then these steps could be performed by a symbol processing (Turing) machine.

Cognitive Psychology and the computer metaphor

“The task of a psychologist trying to understand human cognition is analogous to that of a man trying to discover how a computer has been programmed.”

(Ulric Neisser, Cognitive Psychology, 1966, p. 6)
C. Neural Networks  
(beyond the simple computer metaphor)  

Hopefield (1982)  
Described a method of storing information that was more  
“neurologically realistic” than the simple on/off switches of  
a digital computer.

Memory consisted  
of a set of  
homogeneous  
components  
connected in layers

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Simple Pattern Associator (Rumelhart & McClelland, 1986)

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Backward propagation  
(multi-layered pattern recognizer, Rumelhart, Hinton, & Williams, 1986)

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Neural Networks

Neural Networks had a number of properties that made them attractive as a metaphor:
- large storage capacity
- content addressable
- distributed representation
- "graceful degradation"

IV. Conclusions on metaphors

b) Metaphors are closely tied to discoveries and technologies of the day.
c) These metaphors help us understand our mental processes by tying them to everyday experiences (i.e., they are compelling).
d) But, we must remember, they are metaphors, not explanations or scientific statements, and they can be misleading, and resistant to change.