

## Theoretical perspectives in Cognitive Science – a first introduction

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## Disposition av dagens föreläsning

- Introducera kursens innehåll
- Presentera undervisningens form
- Examination

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## But first – some clearing of the ground

Two underlying very basic questions:

- What is cognition?
- What is cognitive science

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## So let's discuss this for a few minutes

- Discuss with the person to the left of you for 5 minutes what your answer is to these two questions
- Write down your answer and save until the end of the course

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## Vad kom ni fram till?

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## Theoretical perspectives?

- Not the same as theories
- More general – the basic assumptions underlying the theories regarding
  - The study object
  - Possible/acceptable types of theories
  - Research methods preferred
- Perspectives have shifted over time in Cognitive Science

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Domain and (possible) theoretical perspectives are interrelated  
 What cognition is and what cognitive science is – or should be – are interrelated

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## The three largest or most basic scientific issues

1. What is matter?
  2. What is life?
  3. What is mind?
- 1 = Physics
  - 2 = Biology
  - 3 ≈ Cognitive Science

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## Two general observations

1. We have reasonable first approximations of answers to the first two questions – but are not even close to for the third
2. The current scientific theories regarding matter and life are very different from ordinary language for the first two domains – but not so for the third

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## *So why is Cognitive Science different?*

Tentative answers:

1. Because of its short history – despite its long past
2. We need a Copernican/Newtonian/Darwinian change of perspective
3. We need new frameworks and new or modified theoretical concepts

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## Some really basic questions

- What is cognitive science – or what should it be?
- Which are the methods to be used?
- Relationship between methods and perspectives
- What is cognition?

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## What is cognition? – the answer from encyclopedia

- **Kognition** (def.): "De intellektuella funktionerna såsom tänkande, varseblivning, minne m.m." (Svensk Ordbok)
- Kognition (lat. cogni'to, 'undersökning', 'inlärande', 'kunskap', av cogno'sco 'lära känna (med sinnen eller förstånd)', 'undersöka'), de tankefunktioner med vars hjälp information och kunskap hanteras (Nationalencyklopedin)
- Cognition is a faculty for the processing of information, applying knowledge, and changing preferences (Wikipedia)

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## What is cognition? – the answer from early psychology

One of the three basic parts in psychology

**Cognition – Emotion – Volition** (motivation)

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## The answer from the birth of modern cognitive psychology

- "Cognition refers to all the processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used"

Ulric Neisser

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## Some definitions of Cognitive Science

- Studiet av representation och manipulation av information i naturliga och artificiella system (Peter Gärdenfors)
- The study of intelligence and its computational processes in humans (and in animals), in computers, and in the abstract. (Herbert Simon)
- The study of the principles by which entities interact with their environments (Zenon Pylyshyn)
- The study of the information processes in natural or artificial agents' interaction with the physical and social environment (Nils Dahlbäck)

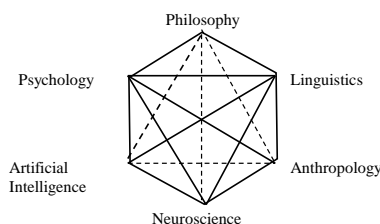
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## Cognitive science – a very short history review

- Interdisciplinary research in cognition
- Emerged in the late 50'ies
  - Miller: Birthday on Sept 11, 1956
- Picked up steam in the 70'ies
- Theoretical "crisis" in the 80'ies
  - that still is with us

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## The cognitive sciences - from the SOAP-report (1978)



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## Gardner's Five Key Features of (early)CogSci

- Representations
- Computers
- De-emphasis on affect, context, culture, and history
- Belief in interdisciplinary studies
- Rootedness in classical philosophical problems

*... but why these?*

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## Cognition as computation:

### The theoretical core of early CogSci

A common theoretical perspective shared by a number of cognitive sciences

- AI: cognition as symbolic processing; the Physical Symbol System Hypothesis
- Philosophy:
  1. (Machine) Functionalism
  2. Language of thought
- Psychology: Human Information Processing

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## Some common characteristics

- Cognition is (or requires) an independent level of description
- Cognition as a separate system or module possible to study in isolation from other parts of the agent (body, sensory organs, I/O gates, etc.)
- Cognition as computation
- Functional descriptions – does not require knowledge of the material base (neurology/hardware)

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## Theoretical crisis after 1980?

- No unifying theoretical core perspective
- Many suggested alternatives, e.g.:
  - Bermudez "The turn to the brain"
  - Clark "Putting brain, body, and world together again"
  - Latour "Distributed Cognition (...) may well reorganize the whole of cognitive science"

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## So things have changed

"Mindware as software"? That was a good slogan once. But it has served its purpose, and it is time to move on.

Andy Clark *Mindware* (p 161)

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## OK, Clark might be right, but

- *What was wrong* with "Cognition as mindware" or "Cognition as computation"?
- If it is time to move on, *where do we go from here?*

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## Aims and goals of the course

### *Theoretical perspectives in CogSci*

- Acquire deeper knowledge of the different versions cognition as symbol manipulation, and the critique against them
- Based on this, formulate your own answer to the question *where do we go from now?*

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## Contents

- AI/cognition as symbolic processing – the PSS hypothesis (Newell & Simon)
- The intentional stance (Dennet)
- Neurophilosophy – arguments for reductionism (Churchland et al)
- Connectionism/artificial neural networks (Churchland)
- The Language of thought (Fodor)
- The extended mind hypothesis (Clark & Chalmers); Situated and distributed cognition (Hutchins)

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## Structure of the lectures

- Read the sessions literature before each session
- Short introduction lecture (10-15 min)
- Discuss today's texts in small groups (3-5 persons)
- Return to class when 30 minutes left of lecture
- Present discuss topics and issues addressed in the groups
- Questions or comments are welcome. Send to me the day before each session

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## Examination

- Take home exam (hemtenta)

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