# Theoretical perspectives in Cogntive Science – a first introduction

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# But first – some clearing of the ground

Two underlying very basic questions:

- What is cogntion?
- What is cognitive science

# 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 summer school

# Theoretical perspectives?

- Not the same as theories
- More general – the basic assumptions underlying the theories regarding
  - The study object
  - Possible/acceptable types of theories

Domain and (possible) theoretical pespectives are interrelated

What cognition is and what cognitive science is – or shoud be – are interrelated

# 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

# 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

# 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)

# What is cognition? – the answer from early psychology

One of the three basic parts in psychology

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

# 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

# Cognitive science – a very short history review

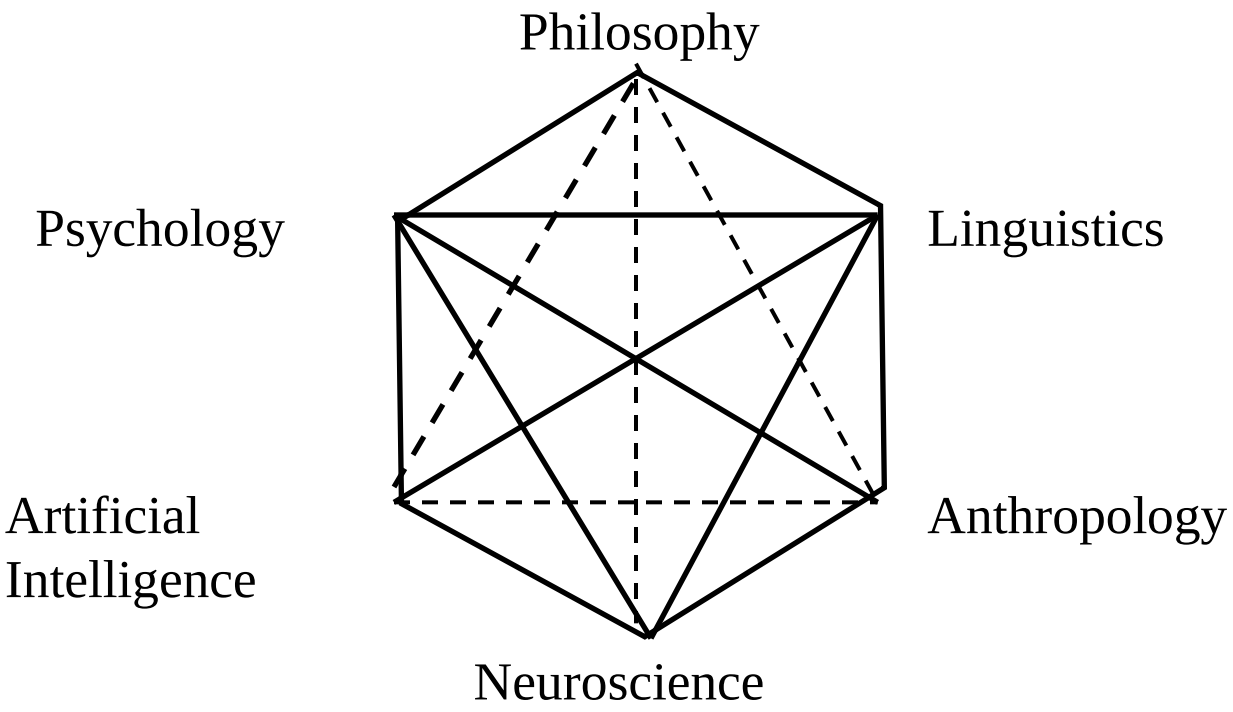
- Interdisciplinary research in cognition
- Emerged in the late 50'ies
  - Miller: Birthday on Sept 11, 1956
- Picked up steam in the 70'ies
- Theoretical "crisis" in the 80'ies – that still is with us

# 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”

# The cognitive sciences

## - from the SOAP-report (1978)



# 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 enteties interact with their environments (Zenon Pylyshyn)

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

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

*... but why these?*

# 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

# Some common characteristcs

- 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)

# But 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)

# 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?*

# Aims and goals of the summer school 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?*

# 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 (Cark & Chalmers); Situated and distributed cognition (Hutchins)

# Cognitive architecture

- One or more levels of information processing
- The representations and transformations of informational states
- Functional architecture – has only indirect connection o the physical properties of the system
- Differences between two agents actions arise because they have different representational contents, not because they are physically different
- Cognitive theories differ in their stance towards cognitive architecture, both regarding number and kinds of representational levels

# Structure of the course

- Introductory comments to each theme by Fredrik and Nils
- Time to look over the literature for today's discussions
- Seminar discussions of classical papers (in two groups)
- Report short reports of the groups' discussions at the end of the day
- Follow-up discussion the next morning