

# Meaning Machines CS 672 Names and Kinds (2)

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## Agenda

Paper Assignments  
Survey of Kripke and Putnam  
Breakout Sessions  
Recap discussions

## Paper Assignments

19 papers

- 4 philosophy
- 4 psychology
- 4 linguistics
- 7 AI

## Paper Assignments

- Pylyshyn: Situating Vision. (Psychology) Iris
- Agre: Computation and Experience. (AI)
- Ballard: Deictic codes (Psychology)
- Siskind: Dynamics from Video (AI) Juan
- Grice: Meaning (Philosophy) Michael
- Clark: Using Language (Linguistics) Judy
- Lewis: Scorekeeping (Philosophy)
- Stalnaker: Assertion (Philosophy) Adrian

## Paper Assignments

- Grosz and Sidner: Discourse (AI) Juan
- Traum and Allen: Obligations (AI) Anubha
- Brennan and Clark: Conceptual Pacts (Psych) Sinuk
- Nakano et al: Face-to-face Grounding (AI) Insuk
- Gorniak and Roy: Semantics in Scenes (AI) David
- Ginzburg and Cooper: Clarification (Ling)

## Paper Assignments

- Kyburg and Morreau: Fitting words (Ling)
- Barker: Dynamics of vagueness (Ling) Adrian
- Graff: Shifting sands (Philosophy)
- Bloom: Learning meaning (Psych) Lynn
- Roy and Pentland: Learning meaning (AI) Xiaoxu

## Survey of Kripke and Putnam

Natural kinds

Reference fixing

Twin Earth

Knowing and learning meaning

Putnam's positive proposal

Grounding language in thought

Knowing what you think and mean

## Overview

The world has a rich, real structure,  
including objects, events, kinds, etc.

– For example, WATER.

Our social practices and cognitive abilities  
allow us to use words to refer to them.

– So "water" means WATER.

## Overview

This setup supports our intuitions and makes them clear and easy to draw out.

- Twin Earth, and other counterfactuals.

BUT, it undercuts just about every simple idea for how we know and use meanings.

- Cluster concepts, prototypes, definitions, etc.

## Natural kinds

### Terminology

- Natural kind
- A priori
- Reference
- Extension
- Intension
- Indexical

## Kinds and discovery

Gold:

Suppose there was an optical illusion which made the substance appear to be yellow; but, in fact, once the peculiar properties of the atmosphere were removed we would see that it is actually blue.

## Reference fixing

We use 'gold' as a term for a certain *kind* of thing. Others have discovered it and we have heard of it. We thus as part of a community of speakers have a certain connection between ourselves and a certain kind of thing.

## Reference fixing

In the case of proper names, the reference can be fixed in various ways. In an initial baptism it is typically fixed by ostension or a description. Otherwise, the reference is usually determined by a chain, passing the name from link to link.

## Reference fixing

- Gold is the substance instantiated by those items over there.
- Certain properties, believed to be characteristic of the kind and present in the original sample, are used to place new items in the kind.
- Science discovers new properties that are better than the original set.
- The original sample gets augmented by new items.

## Twin Earth

Apart from the differences we shall specify in our science-fiction examples, the reader may suppose that Twin Earth is *exactly* like Earth.

One of the peculiarities of Twin Earth is that the liquid called 'water' is not H<sub>2</sub>O but a different liquid whose chemical formula is very long and complicated: XYZ.

## Twin Earth

On Twin Earth the word "water" means XYZ.  
On Earth the word "water" means H<sub>2</sub>O.

- Even in 1750.



## Twin Earth

Oscar<sub>1</sub> (Earth, 1750) and Oscar<sub>2</sub> (Twin Earth, 1750) understood the term 'water' differently although they were in the same psychological state and although given the state of science at the time it would have taken their scientific communities about fifty years to discover that they understood the term 'water' differently.

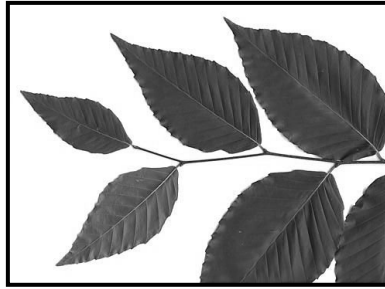
## Elms and Beeches

Putnam: My concept of an elm tree is exactly the same as my concept of a beech tree...yet I mean elm when I say elm.

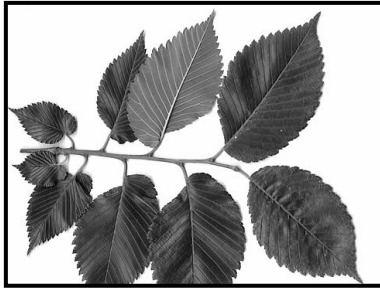
Cut the pie any way you like, meanings just ain't in the head.

## Elms and beeches

The leaves are pretty similar



*Beech leaves*



*Elm leaves*

## Elms and beeches

The bark is totally different



*Beech bark*



*Elm bark*

## Knowing and learning meaning

We have now seen that the extension of a term is not fixed by a concept that an individual speaker has in his head, and this is true both because extension is, in general, determined *socially* – there is division of linguistic labor as much as of 'real' labor – and because, extension is, in part, determined *indexically*.

## Knowing and learning meaning

The other problem is to describe individual competence. Jones has to have some ideas or skills in connection with W in order to play his part. Once we give up the idea that individual competence has to be so strong as to actually determine extension, we can begin to study it in a fresh frame of mind.

## Putnam's positive proposal

### Water

Syntactic markers

- Mass noun, concrete

Semantic markers

- Natural kind, liquid

Stereotype

- Colorless, transparent, tasteless, etc.

Extension

- H<sub>2</sub>O

## Grounding language in thought

Words like water aren't indexical.

Mental content may be.

## Knowing what you think and mean

Be aware of a puzzle:

Your concepts don't determine what you think about.

So you don't know what you think about.

Must distinguish:

What our thoughts are

What our thoughts are about

## Breakout Sessions

Plan:

- Meet for 45 minutes in groups of 5
- 30 minutes for discussion, with scribe following
- 5 minute break
- 10 minutes to prepare talk, with scribe leading

Regroup for 4 five minute talks

- Summarizing what each group did

## Breakout sessions

Discussion & talks should address substance

- Frame issues around topic
- Develop consensus position, or indicate key disagreements

And process

- Highlight differences in perspectives across fields
- Point out difficulties of terminology and perspective to watch out for

## Breakout sessions

Overall issue:

Develop a specification for a computer system whose utterances have meaning – according to the intuitions developed by K, P & al.

Focus on:

- Perceptual abilities
- Social abilities
- Inferential abilities
- Broader status

## Team assignments

### Question 1: Perceptual abilities

- Michael, Adam, Liping, Meredith

### Question 2: Social abilities

- Lynn, Insuk, Sam, Wei

### Question 3: Inferential abilities

- Adrian, Iris, Xiaoxu, Anubha

### Question 4: Broader status

- Judy, David, Sinuk, Juan

## Question 1: Perceptual abilities

Most of our meanings are grounded, in the sense that we know what kinds of things our words name, and can identify those kinds of things when we come across them. Think of water.

What would a computer system have to know, do, be, or have, for it to represent the connections between words and kinds in the world around it this way?

## Perceptual

To perceive is to compose some relation  
between the word and the world  
So we need a representation of the world  
We do not need a complete representation.

## Perceptual

Water

- take some stereotypical properties then use them to pick out instances of those properties in the world
- have it represent world as having water when watery like stuff is around (clear, liquid)
- discriminative capacity should be no more acute than human ability to discriminate.
- ability to perceive doesn't constitute the meaning of the concept
- reliable indicator of water like stuff.



## Question 2: Social abilities

Putnam claims that he can't tell an elm from a beech, yet his words refer to those kinds by objective standards.

What would a computer system have to know, do, be, or have for its words to refer to things that aren't grounded in its perception this way?

## Social Abilities

Division of linguistic labor

Two different entries for elm and beech

Two different entries for platinum and white gold

Know when (what circumstances) distinction must be made

Way of finding out difference

## Question 3: Inferential abilities

Our intuitions in science-fiction scenarios show that we can easily keep track of other people's intentions to ground language in their experience and their community.

What kinds of inferences would let a computer system keep track too – and how might existing formal models of meaning support them (e.g., model-theoretic, DRT, information-state approach, semantic web)

### Q3

Our intuitions in science-fiction scenarios show that we can easily keep track of other people's intentions to ground language in their experience and their community.

What kinds of inferences would let a computer system keep track too – and how might existing formal models of meaning support them (e.g., model-theoretic, DRT, information-state approach, semantic web)

- Understanding the question was a problem in itself!
- Discussed what kinds of knowledge we might share; focused on knowledge of a lexical item such as 'dog'
- Some of us tried steering the conversation towards inference-making and "keeping track of stuff"
- Explaining DRT – storing discourse markers and information about them.

## Question 4: Broader status

Kripke's thought experiments about naming show people using language creatively, setting up conventions and passing those conventions through relationships within the community.

What would a computer system have to know, do, be, or have, to be able to participate in this kind of creativity? Should they be able to?

## Computer System Input

Have sensor data

- Camera
- “Tastebuds” (black-box system)

Syntax, semantic marker

Previous user interactions

- Add, reinforce, or remove previous ‘beliefs’.

## System Database

Putnam's normal form description (p. 269)

- Syntax Markers
  - Water: mass noun, concrete
- Semantic Markers
  - Natural kind, liquid
- Stereotypes
  - Colorless, tasteless, thirst-quenching, etc.
- Extension
  - H<sub>2</sub>O (or XYZ)

## Interactive Session

User refers to brown liquid as 'water', system complains that water is colorless.

User refers to -15C liquid as 'water', system complains that H<sub>2</sub>O freezes at 0C.