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# Interests

- ◆ Spatial sound (fascinated at age 8 - choirboy in Sheffield Cathedral)
- ◆ Spatial perception (interested age 19 - steering supertanker - delayed feedback)

# Rudimentary artificial spatial sound

- ◆ 20th century spatial sound (music) disappointingly flat.
- ◆ Stereo, surround (quadrophonics, Dolby surround), ambisonics, WFS

# But

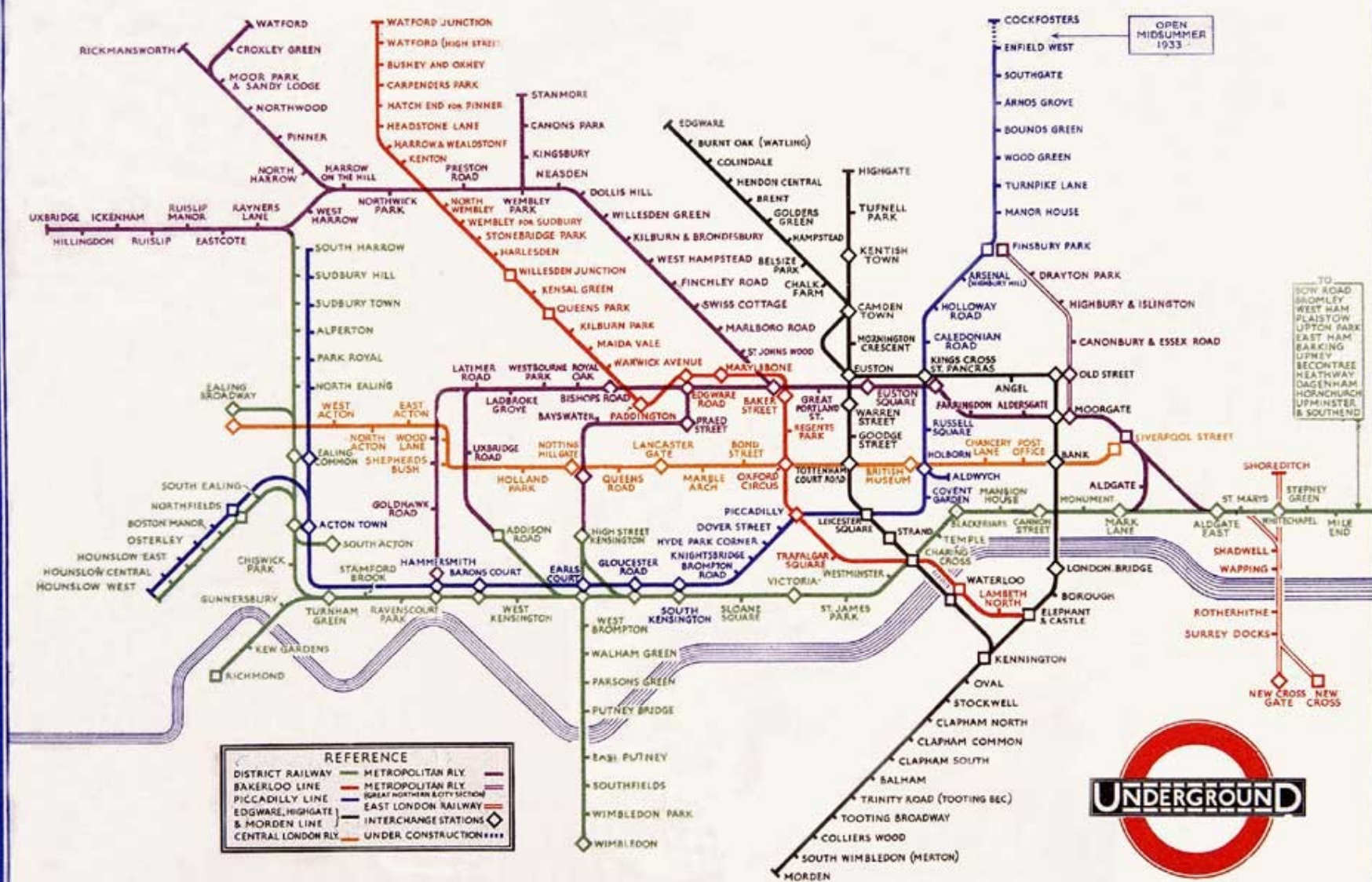
- ◆ This model of perception as essentially passive, simplistic :  
Sensation + 'cognitive factors' (the mysterious workings in the '**black box**') = perception.

# Open the box...

- ◆ If the 'black box' is so inaccessible, is it *remotely* possible to describe how 'prior knowledge', memory, prediction, cognition, conception integrate in **real time** with the ongoing influx of sense data ?

# Cognitive map

- ◆ A simplified 'cartoon' that highlights salient features
- ◆ Like the London Underground map?



**REFERENCE**

DISTRICT RAILWAY	METROPOLITAN RLY.	GREAT NORTHERN & CITY SECTION
BAKERLOO LINE	METROPOLITAN RLY.	EAST LONDON RAILWAY
PICCADILLY LINE	METROPOLITAN RLY.	INTERCHANGE STATIONS
EDGWARE, HIGHGATE & MORDEN LINE	METROPOLITAN RLY.	UNDER CONSTRUCTION
CENTRAL LONDON RLY.	METROPOLITAN RLY.	



H.C. BECK

OPEN MIDSUMMER 1933

TO  
 BOW ROAD  
 BROMLEY  
 WEST HAM  
 PLAISTOW  
 UPTON PARK  
 EAST HAM  
 BARKING  
 UFRAY  
 BECKTREE  
 HEATHWAY  
 DAGENHAM  
 HORNRICHURCH  
 UPHMISTER  
 & SOUTHWEND

# Are my Cognitive Maps the same as yours? ...or even, the same as mine?

- ◆ If not:
- ◆ Can different maps do similar jobs, and
- ◆ Can similar maps do different jobs
- ◆ Are some maps more useful than others
- ◆ Do people actually use the best maps for the job?

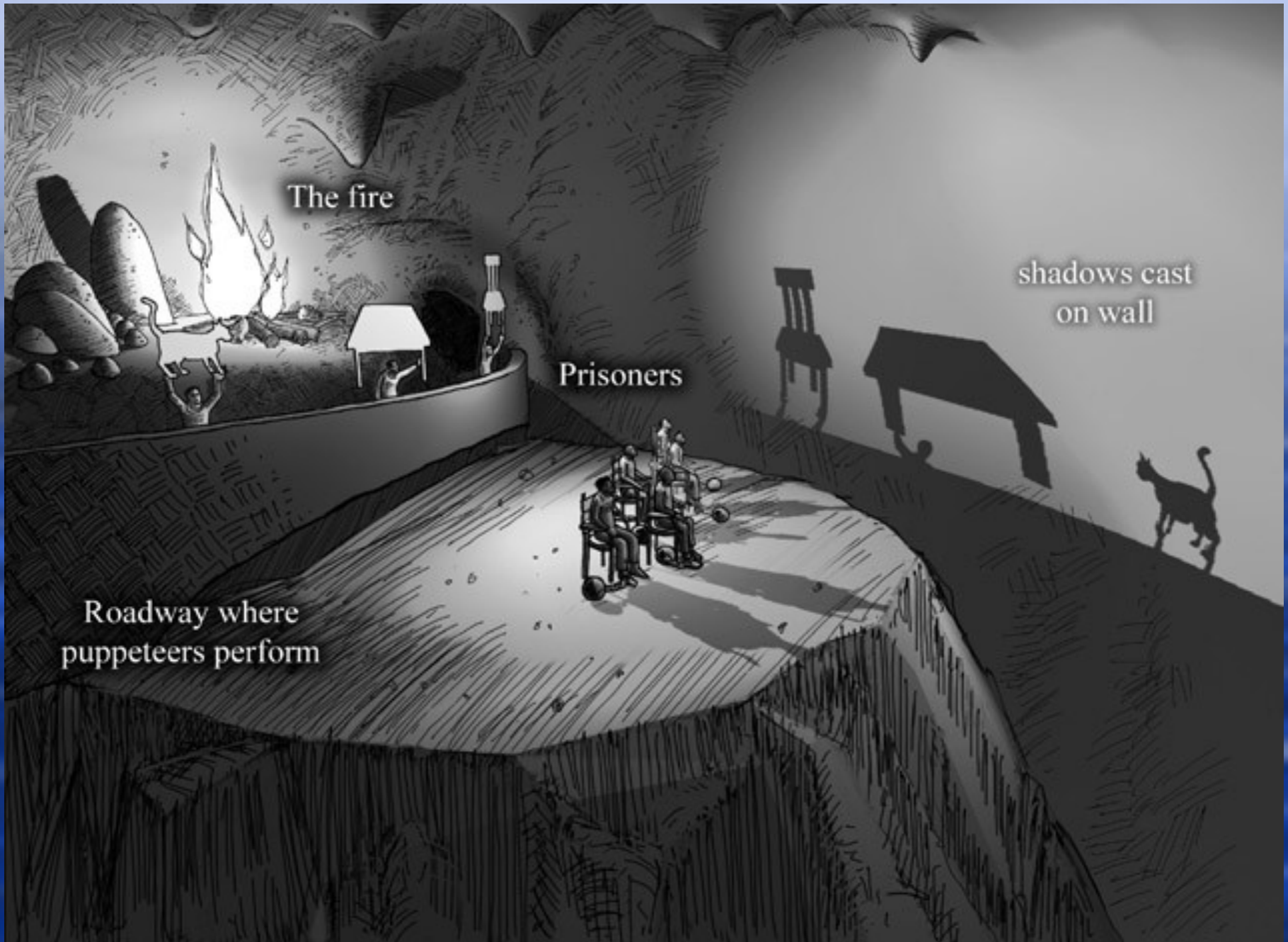


# Why posit maps at all?

- ◆ Ecological approach (Gibson, J): why 'represent' what's already out there?
- ◆ Cognitive constructivism: "information bandwidth" insufficient for the richness of perceptual content

# What problems ameliorated by 'maps'?

- ◆ Signal-to-noise ratios (information overload)
- ◆ Momentary sensation impoverishment
- ◆ Real time interaction ('quick-and-dirty' processing of salient features)
- ◆ Anticipation ...



The fire

shadows cast  
on wall

Prisoners

Roadway where  
puppeteers perform

# Plato's Cave

- ◆ Perhaps we don't perceive underlying, objective reality, merely our (subjective) maps of it?  
*"the map is not the territory"* (Alfred Korzybski)
- ◆ "As if..." argument

# Cognitive maps:

- ◆ Spatial
- ◆ Temporal
- ◆ Causal
- ◆ Other...

# Spatial maps

- ◆ “**Where**” (Ungeleider and Mishkin)  
Direction/dimension/distance -  
Representing *position* in *place*  
Representing ‘place’ itself (but what  
is actually represented?)

# Spatial maps 2

- ◆ **“What”** Mapping of *“things”*  
Size, shape, orientation, mass,  
construction.... “affordances” (?)

# Spatial maps- frames of reference

- ◆ Egocentric (various) - “me-” or “mine-” centric
- ◆ Allocentric (various) - overview - the way things are from no particular viewpoint



# Spatiotemporal maps

- ◆ Route maps (sequence of signposts *and actions*)
- ◆ Events: trajectories, vectors, speeds amplitudes, rotations *changes* of spatial relationships (BioMotionLab [Demos/BMLwalker.html](http://BMLwalker.html))

# Causal mapping

- ◆ **What, Where** and **How** (Milner and Goodale) spatiotemporal mapping
- ◆ Extend into the future (predict, anticipate, adjust, interact); not “now” but “next”
- ◆ Counterfactuals (Gopnik and Wellman) - should/not, might/not - event trajectories - expectation/surprise

# Intuitive physics

- ◆ Rough-and-ready reckoning of how items *can* interact (Piaget, Baillargeon, Spelke, Gibson[E], Van de Valle)

# Intuitions of animate behaviour

- ◆ Physical capabilities
- ◆ Estimates of intentionality (territoriality, theories of other minds?)

# “Opportunity map” For fun, profit and survival

- ◆ Mapping territoriality:
- ◆ Near, far, adjacent, connected, ‘way’ open, blocked, vantage, shelter, tool
- ◆ Prey, predator, competitor, ally -intercept, avoid, hide, negotiate, threaten, placate, persuade

# Mapping meaning

- ◆ Essentially, we have discussed perception as mapping meaning - representing the local causal environment *appropriately*
- ◆ .....

# Modular meaning, modular maps?

- ◆ Modular 'through-and-through'? (Sperber)
- ◆ Or more modular at more primitive stages, less so at more complex, abstract stages (Fodor)?
- ◆ Are mode-specific modules more peripheral and/or more 'primitive' than amodal, transmodal or multimodal ones?

# Multi-perspective mapping

- ◆ Can discipline-specific descriptions of spatial perception map to each other?



# “In the wild”

- ◆ Dancers, race drivers, crane drivers, taxi drivers, ball players pilots, actors, dogs and kings....
- ◆ Specialise in quite different spatial behaviours, probably have finely tuned *neural* spatial representations *specific* to their lives...

# Transferable skills?

- ◆ If specific spatial skills can improve through learning, does this amount to the assertion that spatial perception can be taught?

And indeed, *forgotten*? (age-related deficits)... and *re-learned*?

# “Theory of others’ maps”?

- ◆ Do people understand others’ maps?
- ◆ Do people have incomplete or pared-down representations of others’ maps
- ◆ Individual differences in this?
- ◆ Are effective predators, and formidable competitors, *better* at representing others’ maps?

# Map modules and metaphors

- ◆ Not to suggest the literal topographic mapping of causal circumstances onto specific neural substrates, but
- ◆ is this merely convenient metaphor?
- ◆ are there better metaphors ?

# References and Bibliog

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