

We know a lot about the world.  
How do we use that knowledge to  
look for objects?

**Smart Search.**

*Sushrut Thorat*



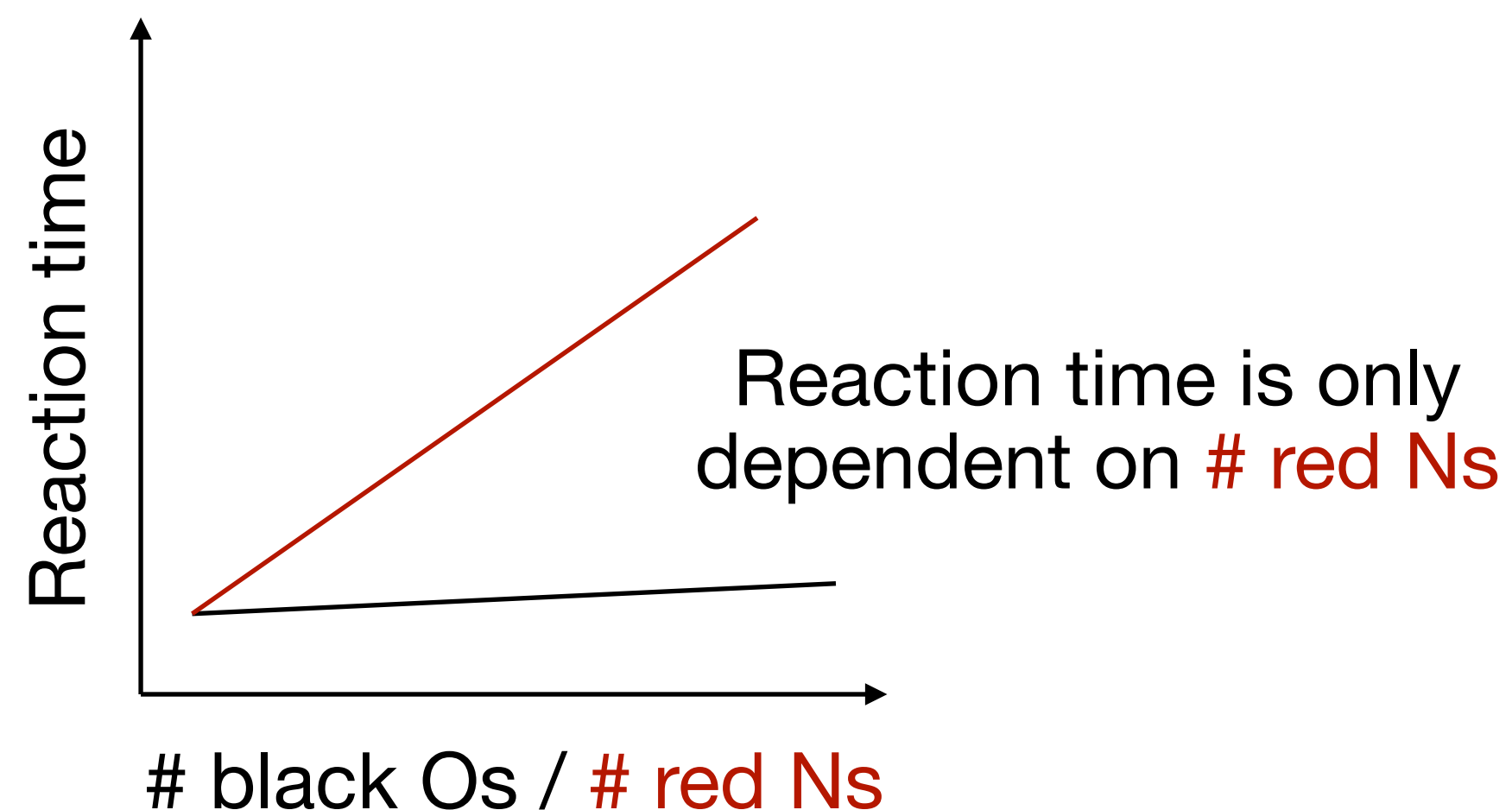
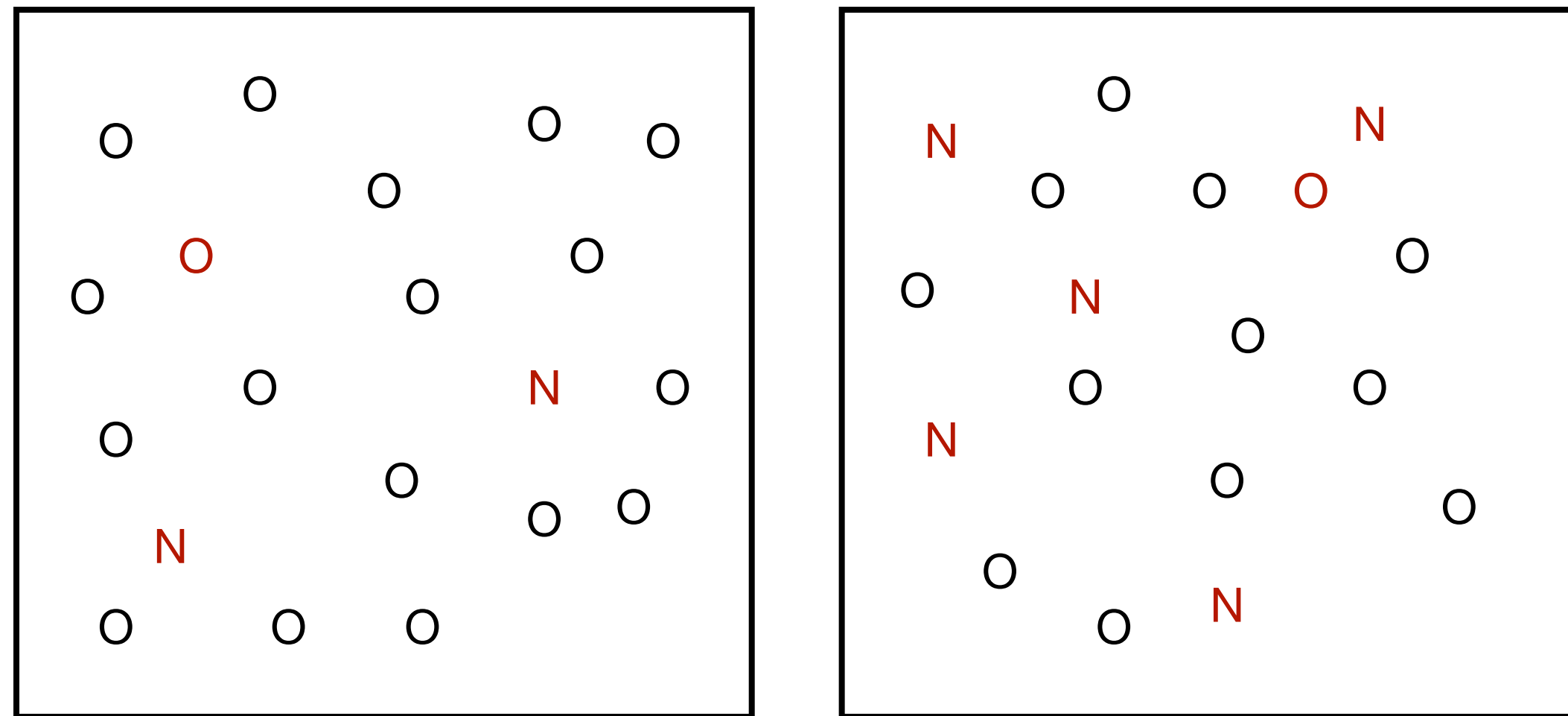
## Where is the faucet?



- No sequential scanning.
- Two factors:
  1. Predictable location?
  2. Distinct features?
- Object and scene parsing, action - complex processes!
- Studied since the 1950s.
- Two central chapters: parallel search, complexity reduction

# 1. Parallel search

Where is the red O?

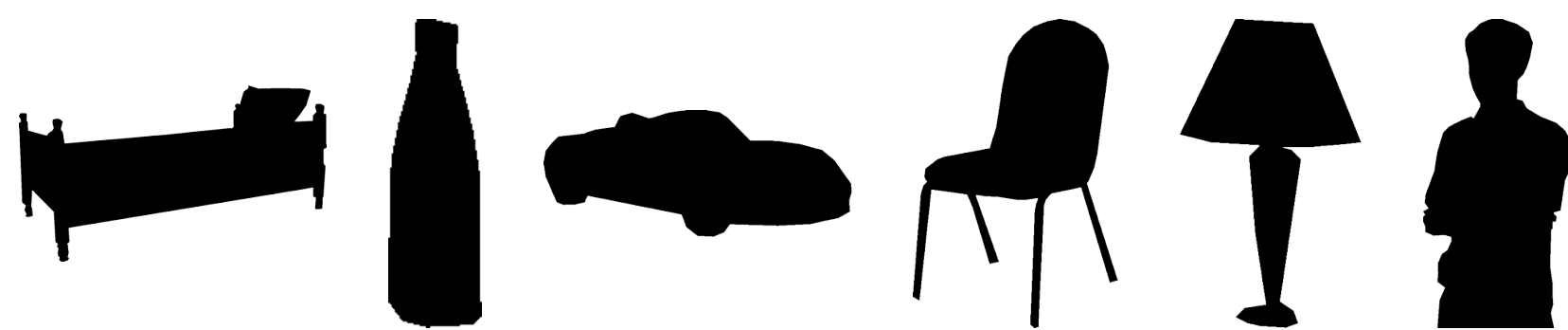
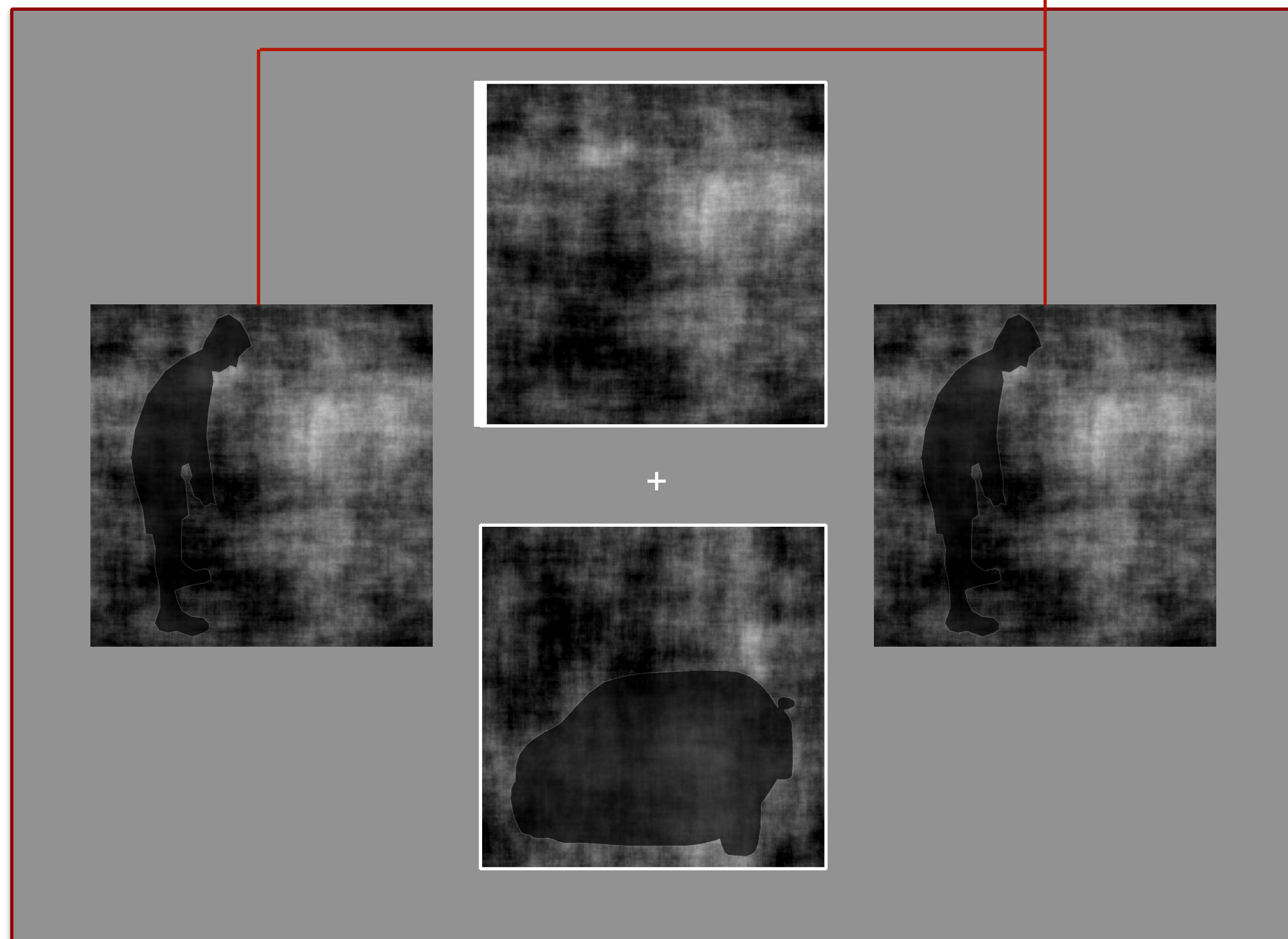


- We select the **red** items “in parallel” across the image.
- Global effects!
- Known for simpler properties - colour, orientation, letters.
- Can we globally select **high level properties**? - shapes, categories? **Unclear**.

Chapter 2

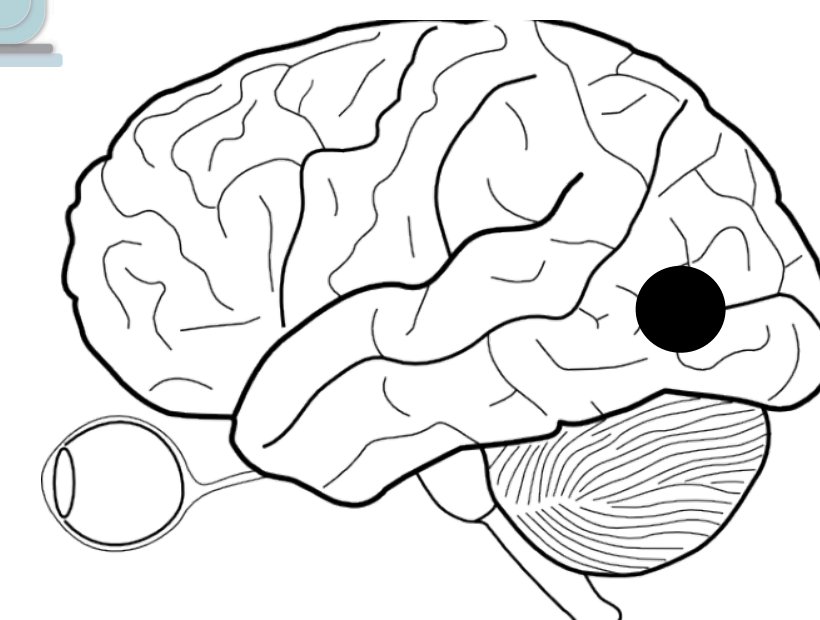
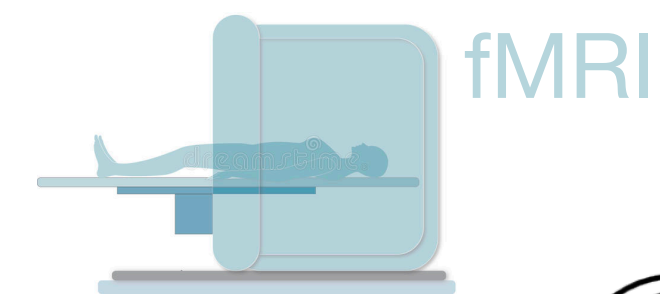
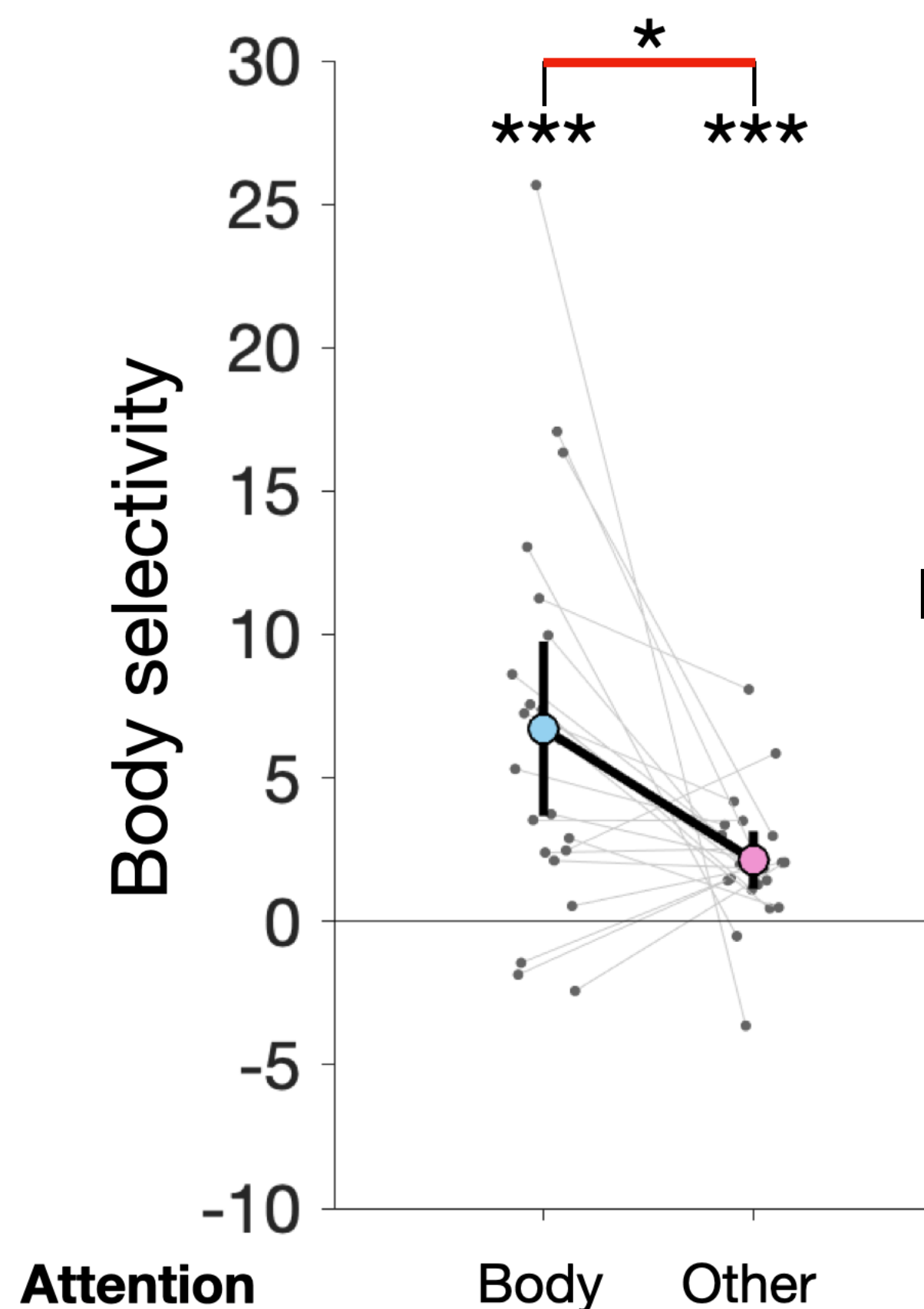


Is there a car? Ignored during search, analysed by us



Looking for bodies in one part of the image seems similar to looking for bodies all over the image!

N = 22; 2 sessions



**Body-selective cortex (EBA)**

Body selectivity = Body - Rest  
(neural response)

Parallel search for a high-level property.



## 2. Complexity reduction

Items that occur together can be grouped into “super” items.



Reduction in the effective  
number of items

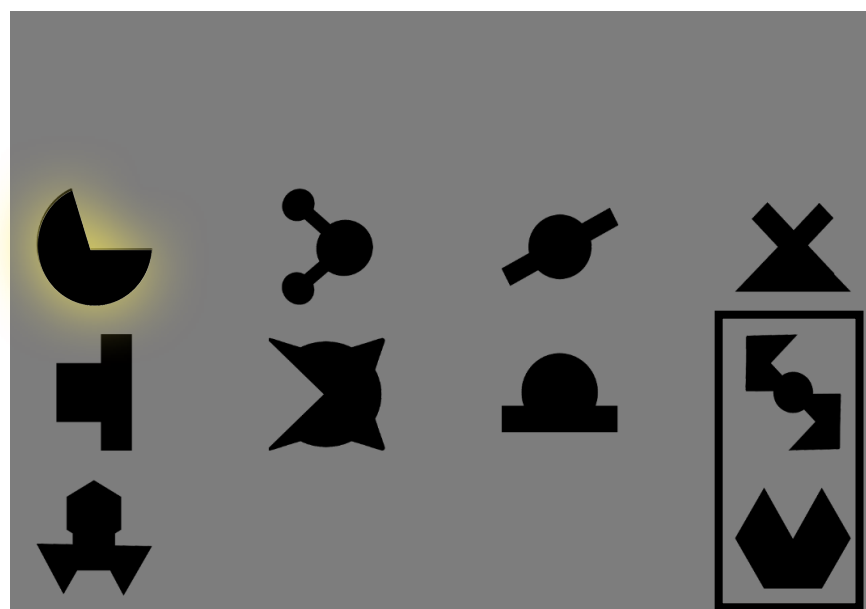
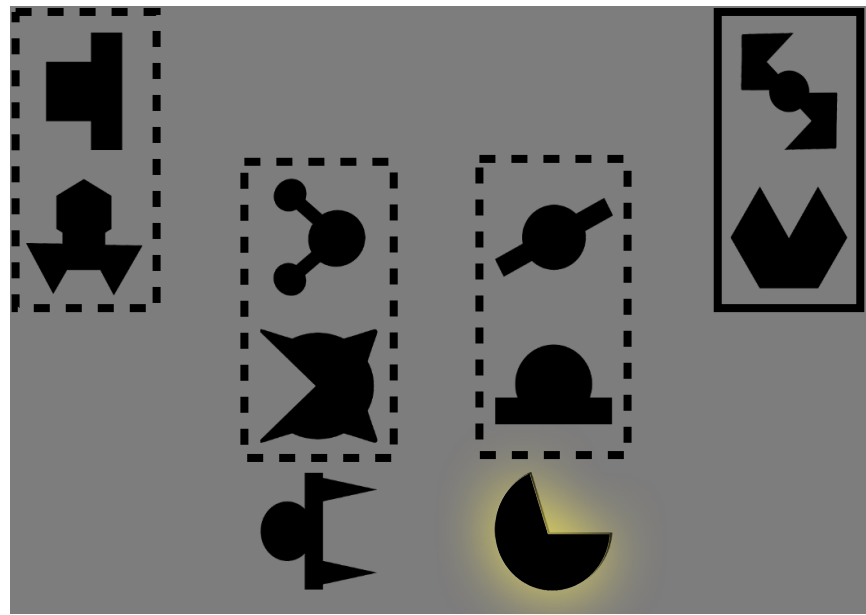
leading to **better search?**

Chapter 5

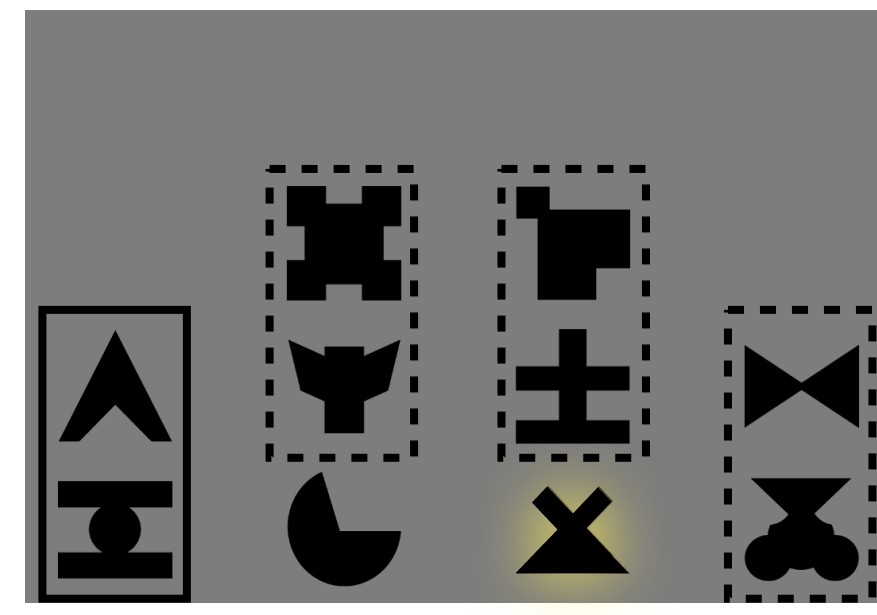


# Structured scenes    Unstructured scenes

Distractors paired

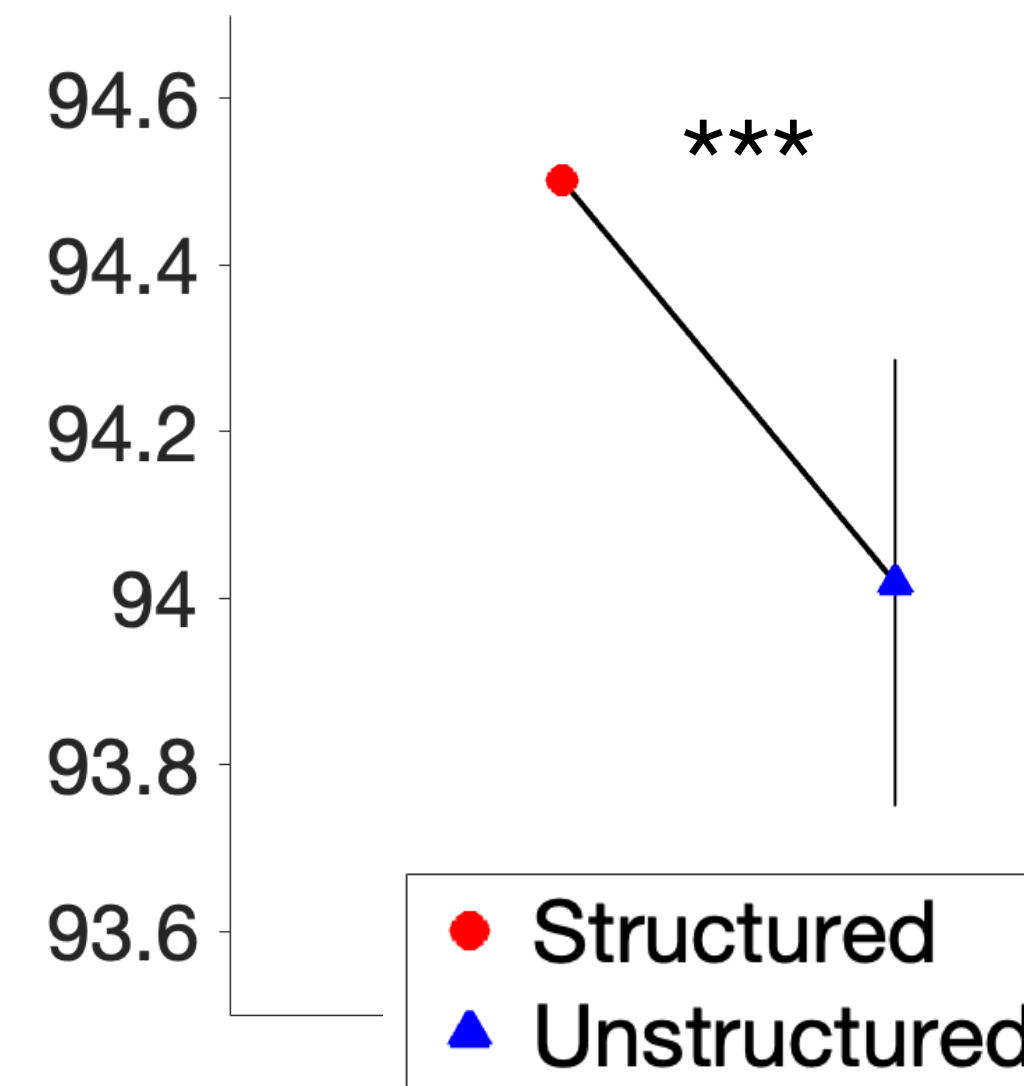


Distractors not paired

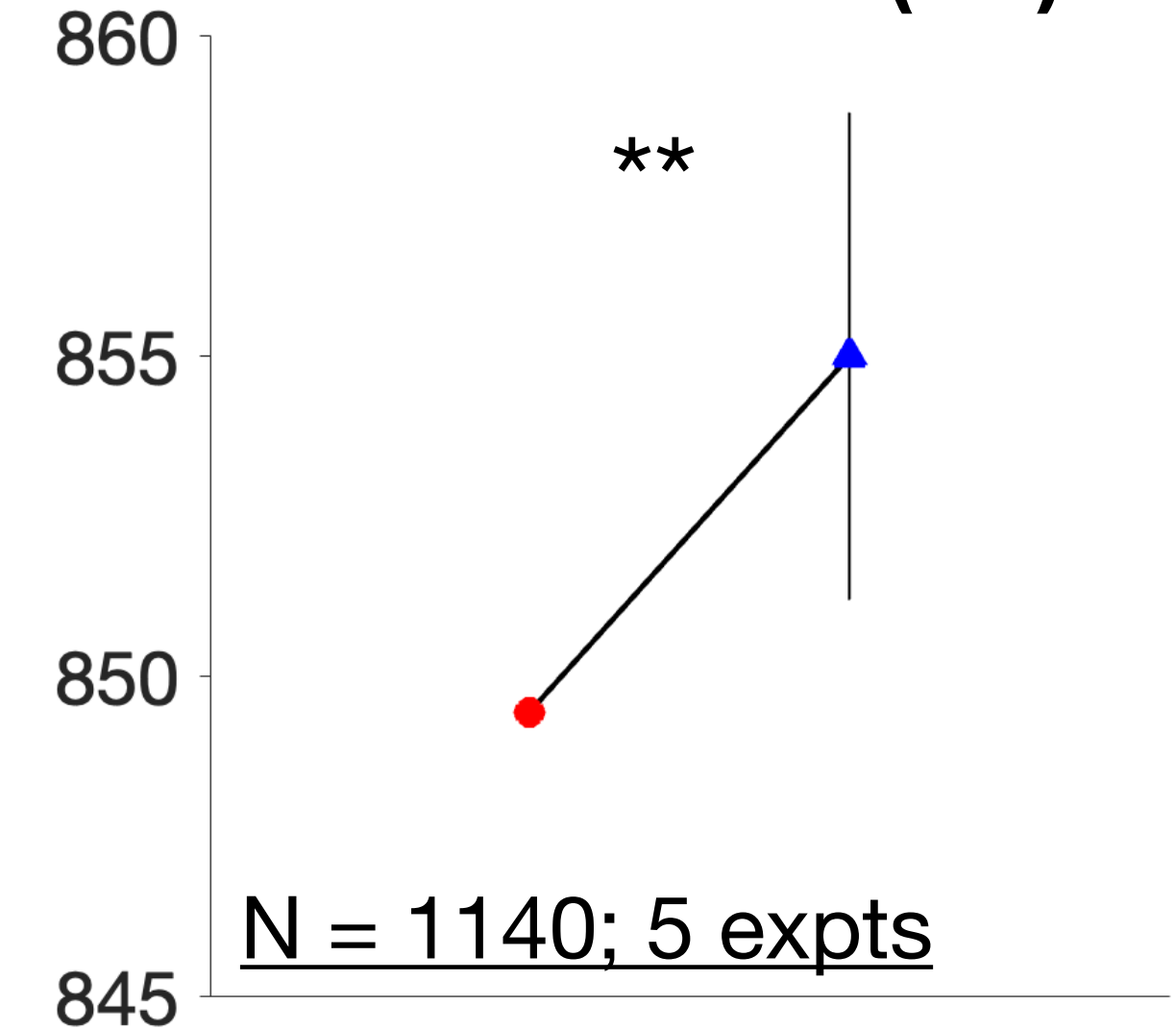


Targets shown in yellow  
Task: indicate location

Accuracy (%)



Reaction time (ms)



N = 1140; 5 expts

Shape co-occurrences could be learned  
and used to make search efficient.

Complexity reduction due to grouped  
distractors might improve search.



# Takeaways

1. Human visual search uses the structure in the environment via specialised, “smart” operations, such as parallel search and complexity reduction.
2. We can look for faces/bodies across the visual field “at once”. **It is unclear if this generalises to other objects.**
3. Objects occurring together could be processed as a group making it easier to process scenes. **How does the brain process co-occurring objects?**
4. Which of these insights, or related explorations, might be helpful in building better artificial intelligence systems? “What I cannot create, I do not understand” - R.F.





People involved in this research:



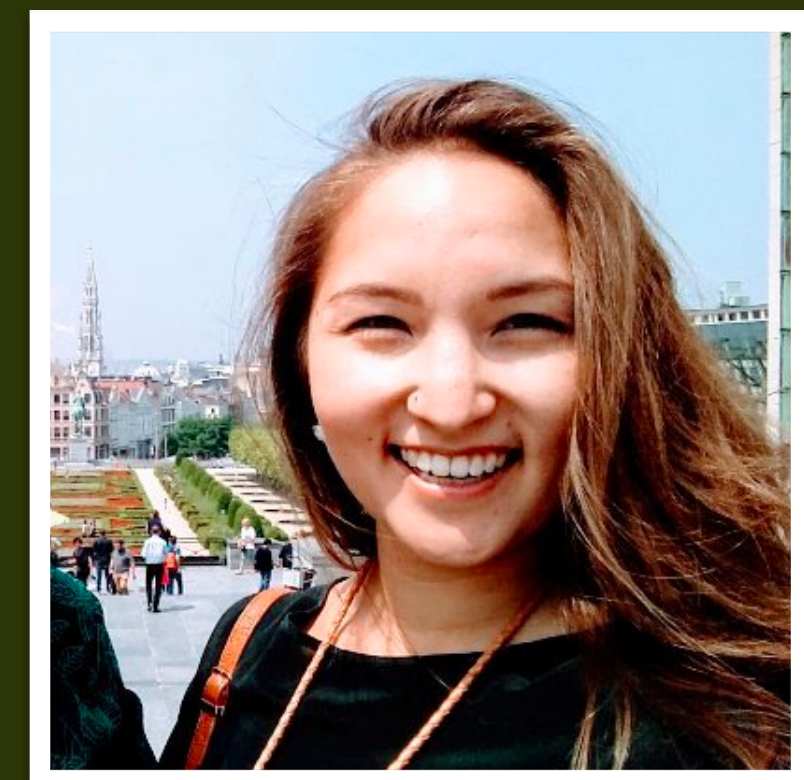
**Marius Peelen**



**Marcel van Gerven**



**Giacomo Aldegheri**



**Genevieve Quek**



**MISC**



# Learning effect in Chapter 5

