9.00 Introduction to Psychology
Fall 2004
Professor Jeremy Wolfe

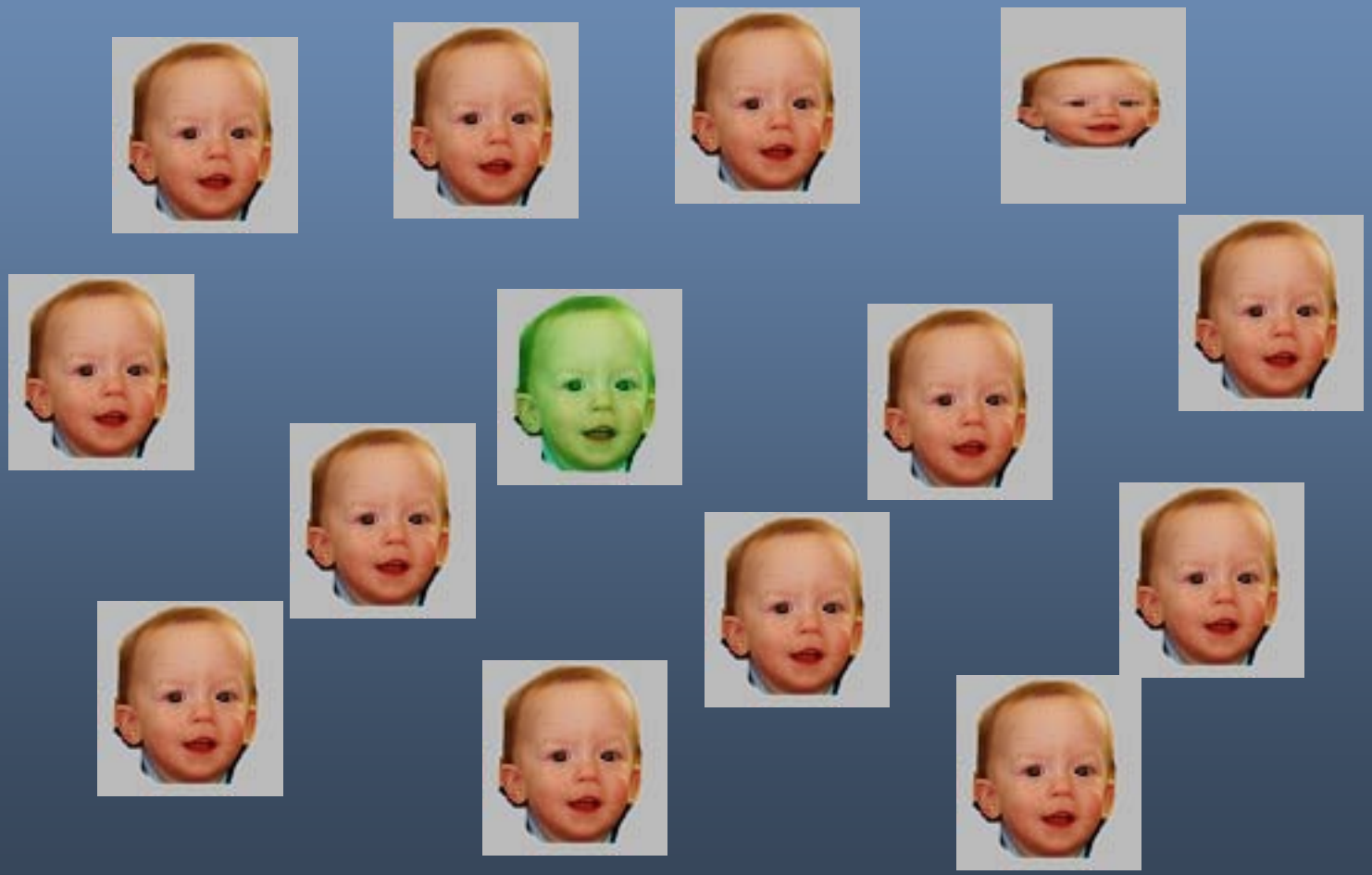
Perception and Attention Demonstrations

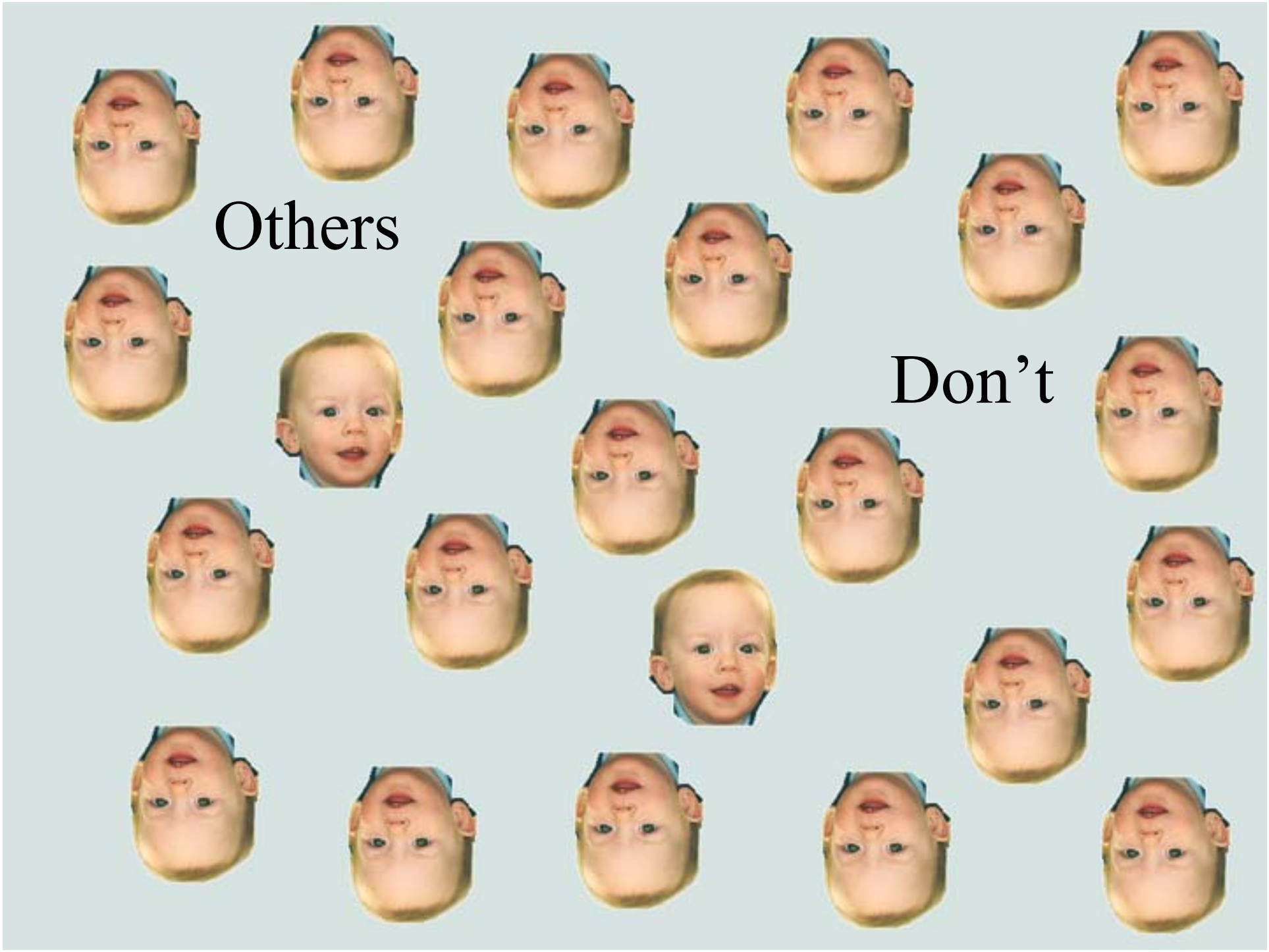
Image from "Where's Waldo?" removed for copyright reasons.

You	*	And
can	*	these
read	*	are
these	*	fine,
words.	*	too.

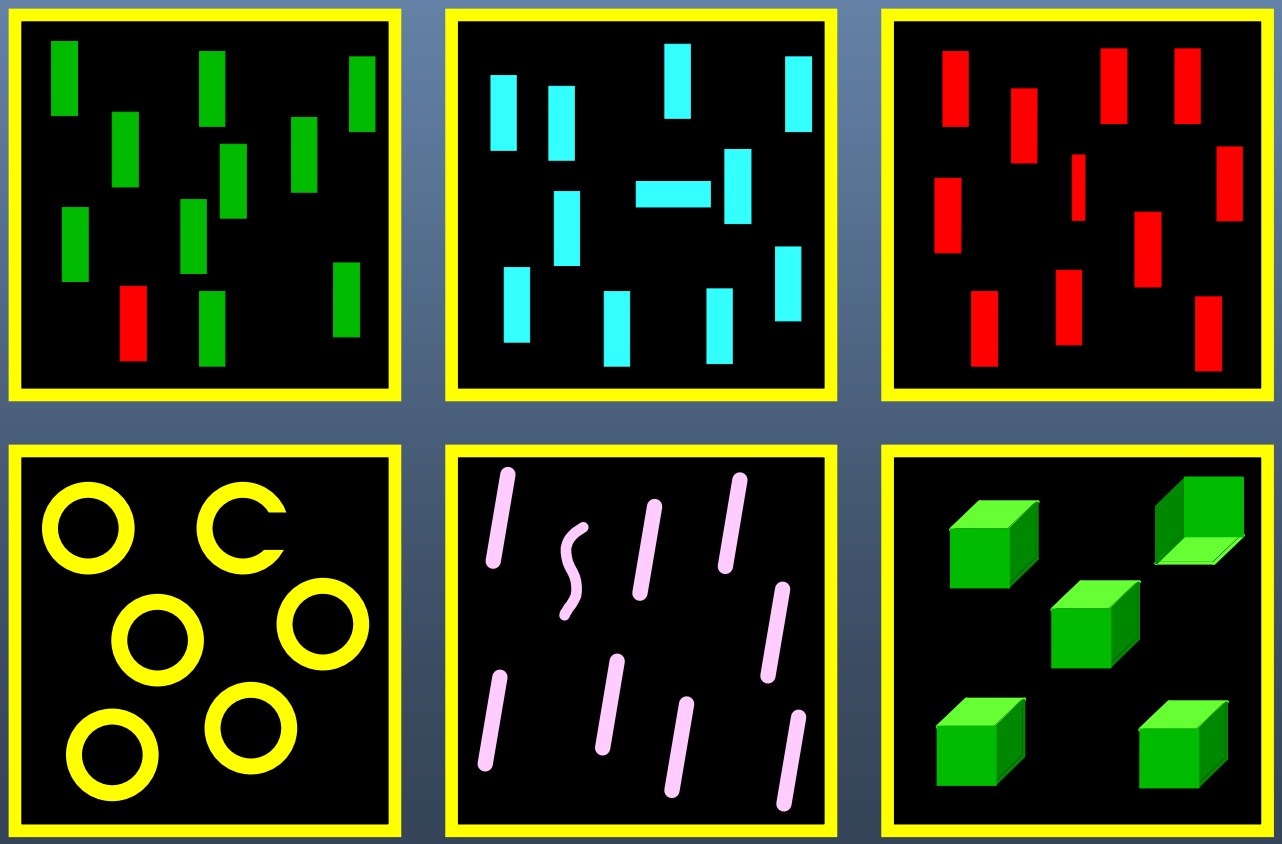
Fixate on the ***

Some visual features seem to escape the bottleneck

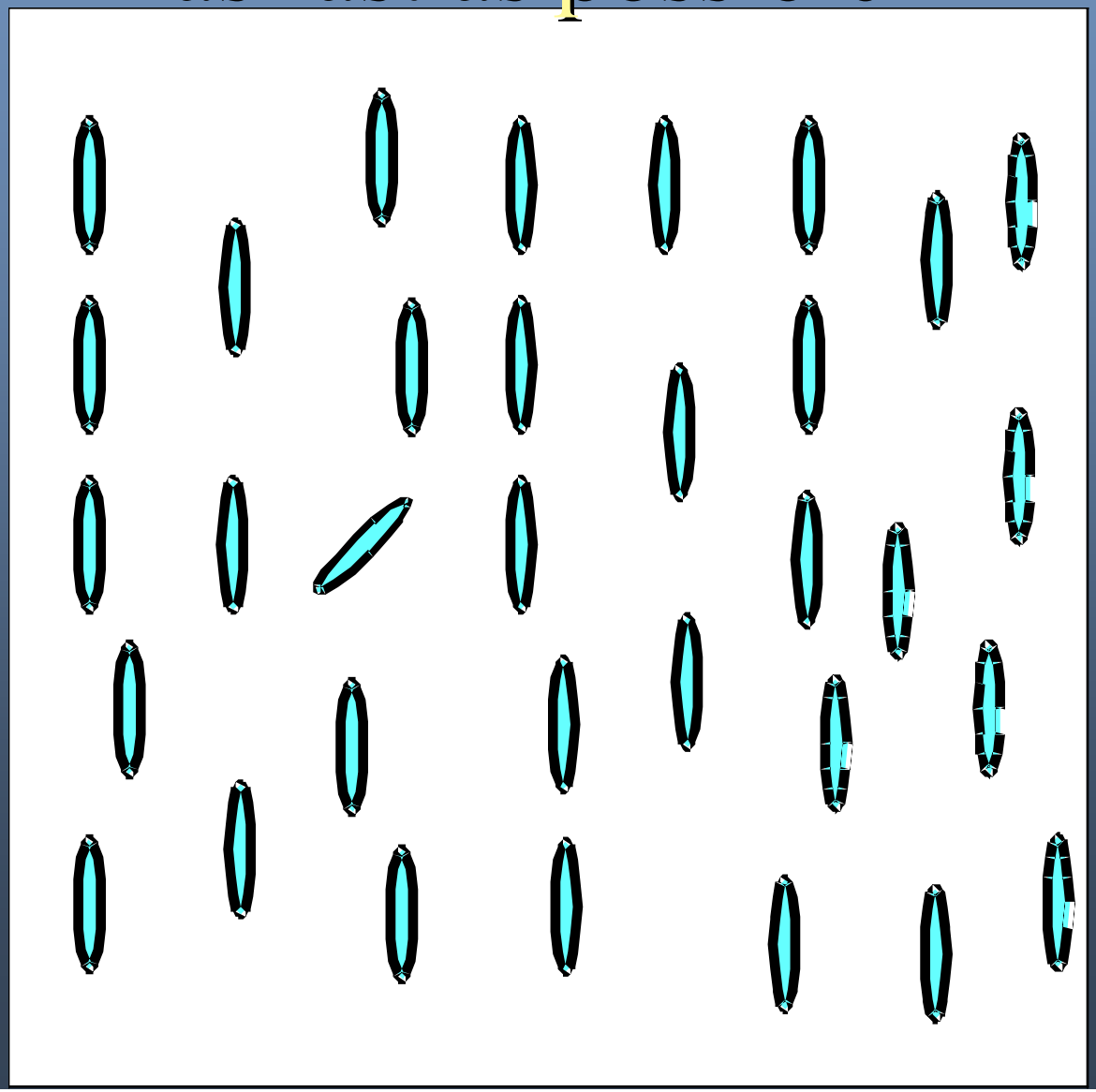



Others
Don’t

We think that there are about 12-18 "basic feature" dimensions.



Is there a tilted line? Say “yes” or “no” as fast as possible



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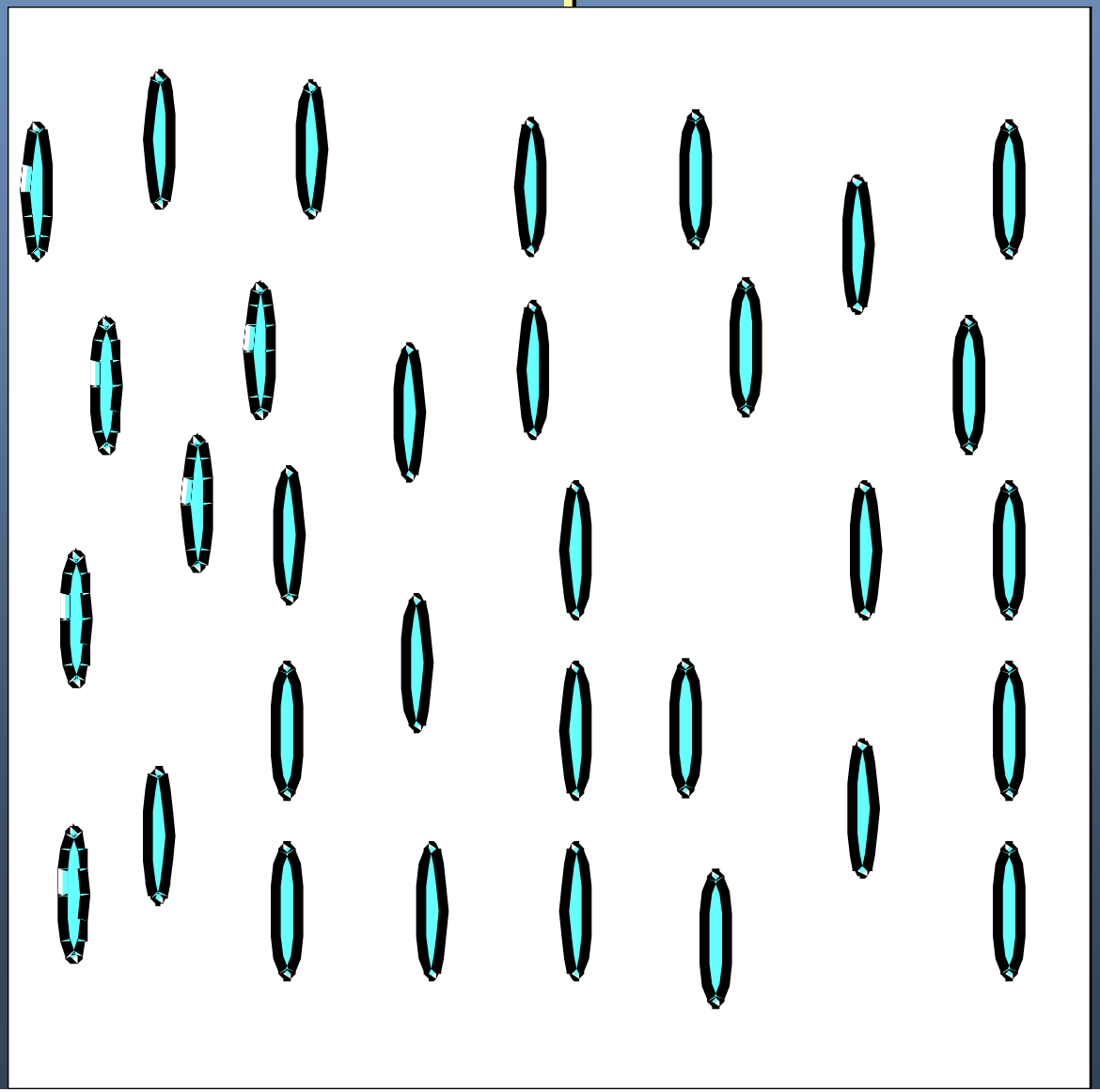

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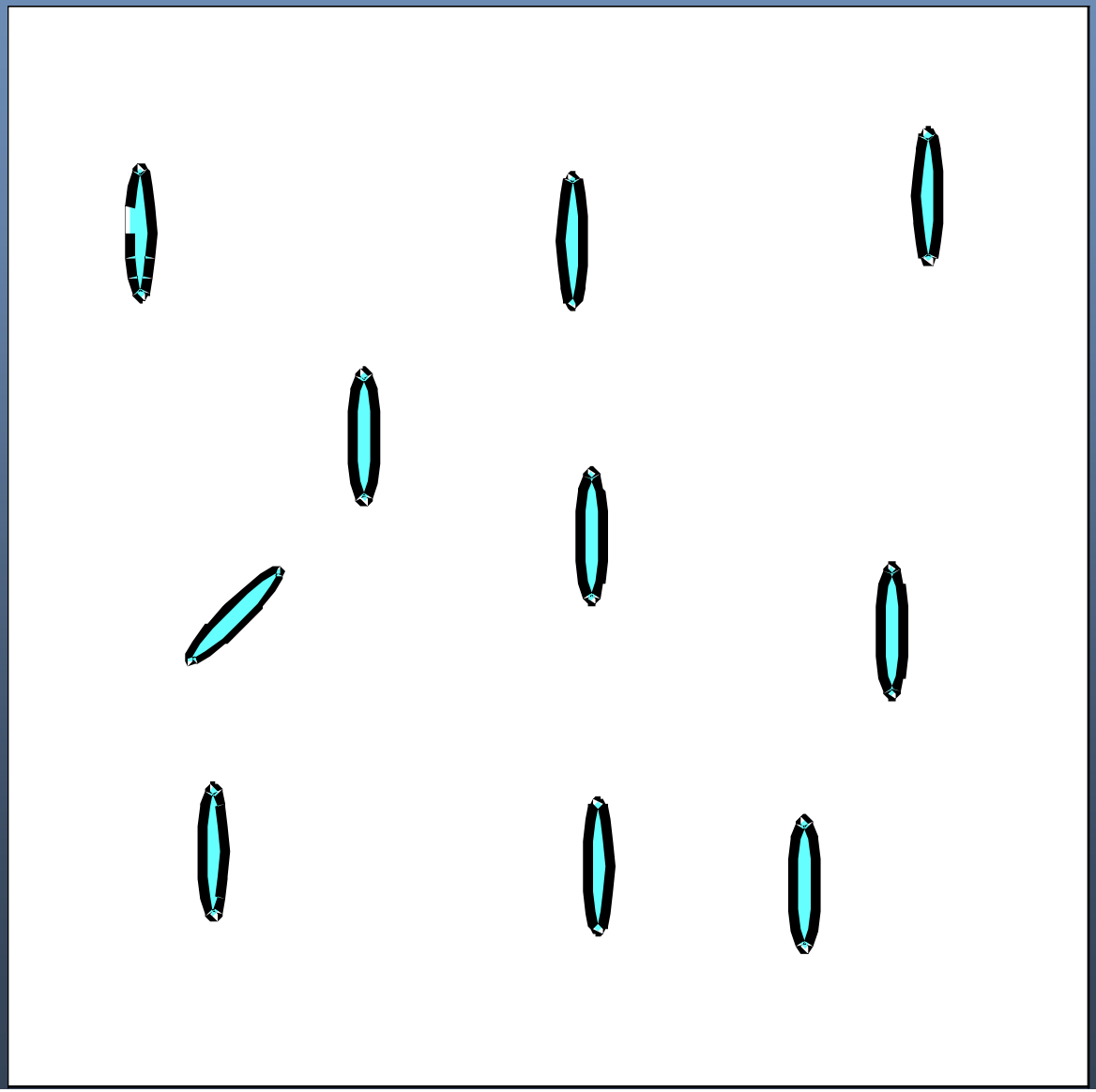

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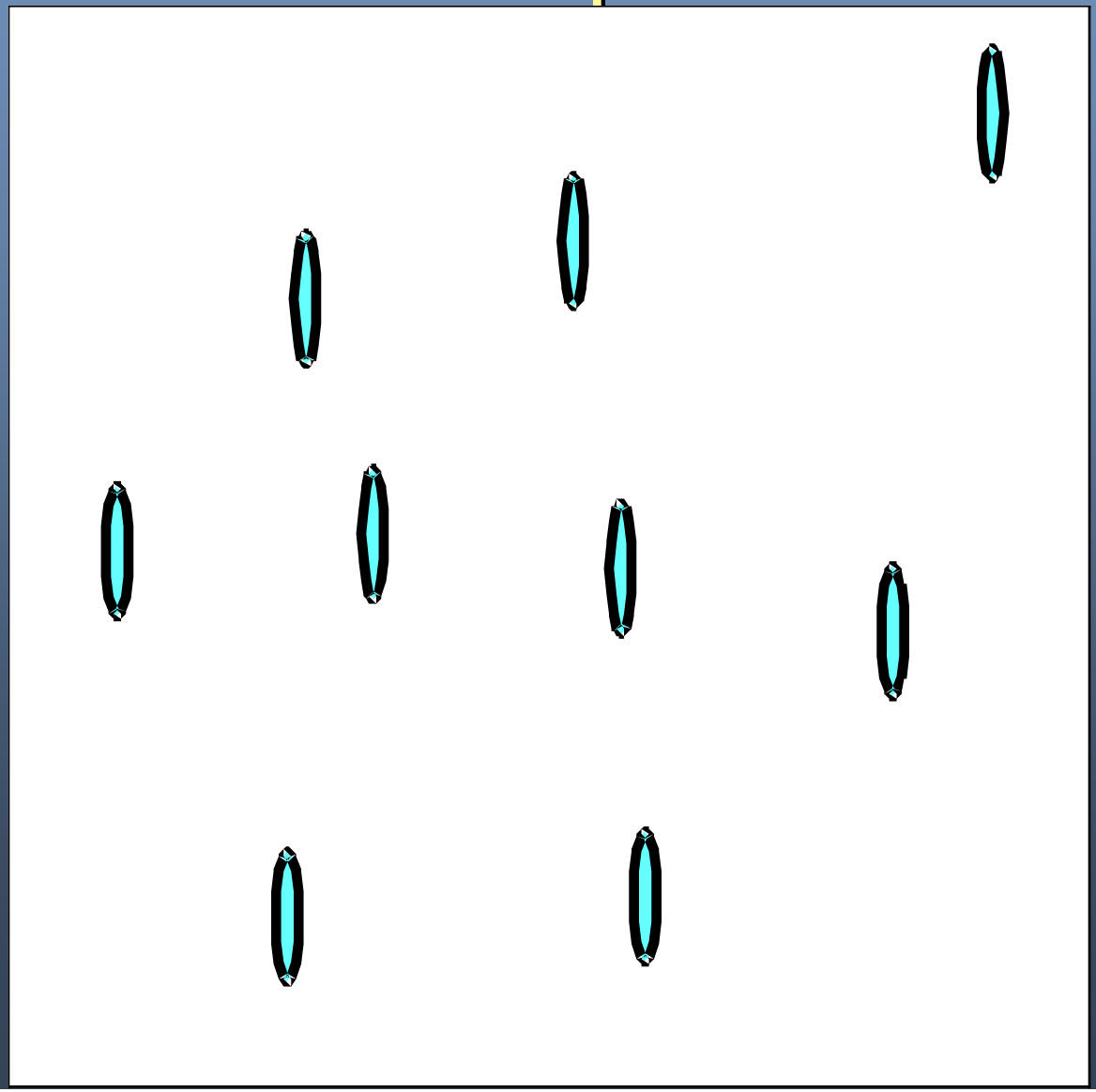
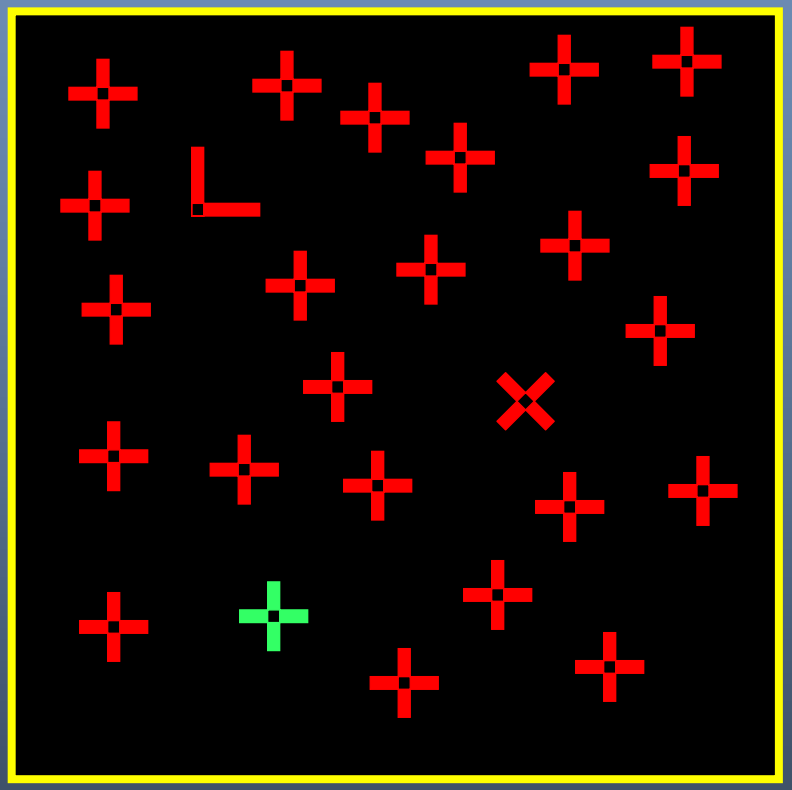
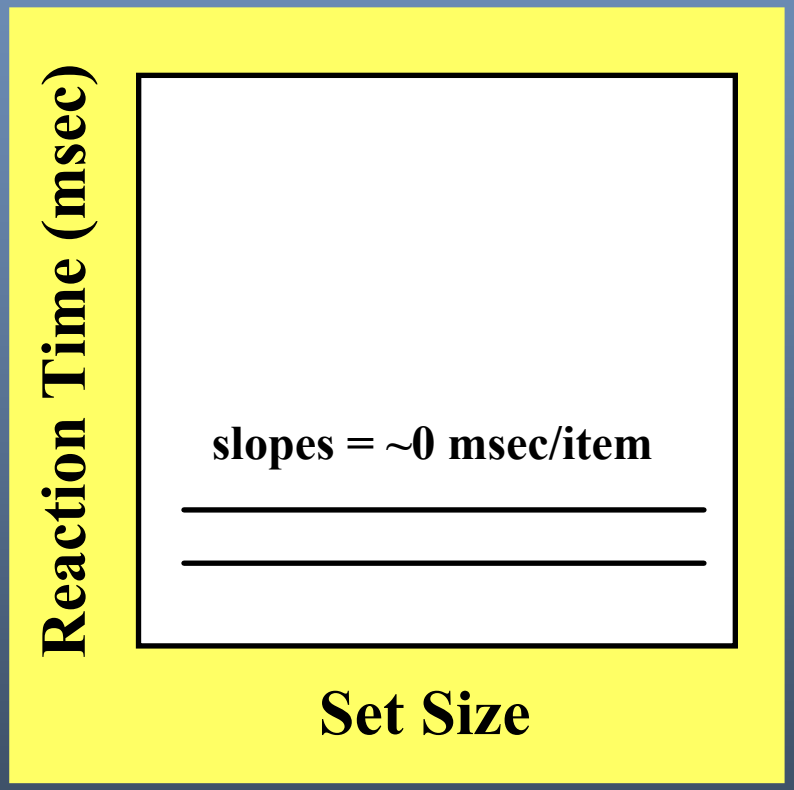
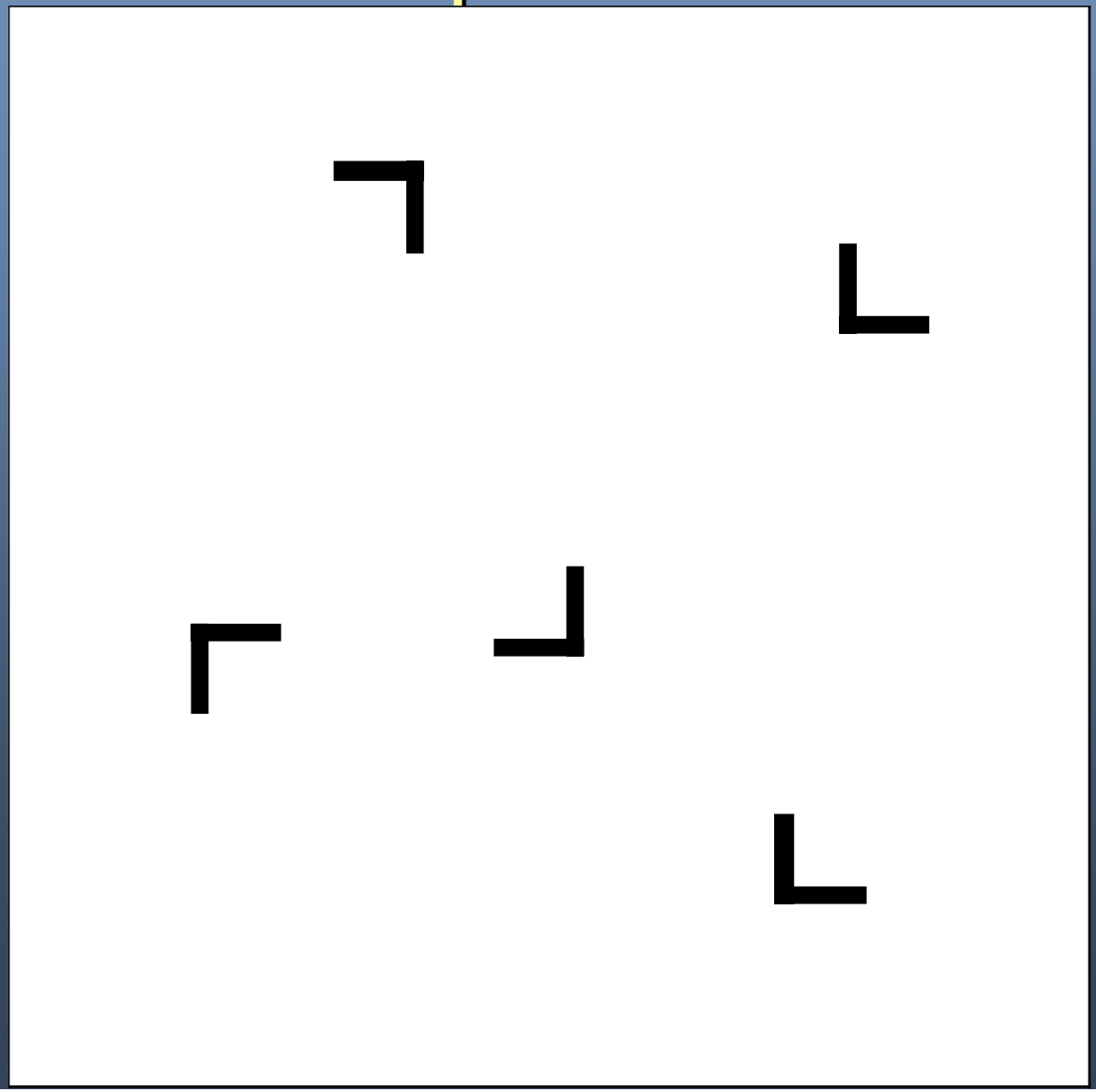


Feature Search: A limited set of features support highly efficient "parallel" search.





Is there a “T”? Say “yes” or “no” as fast as possible



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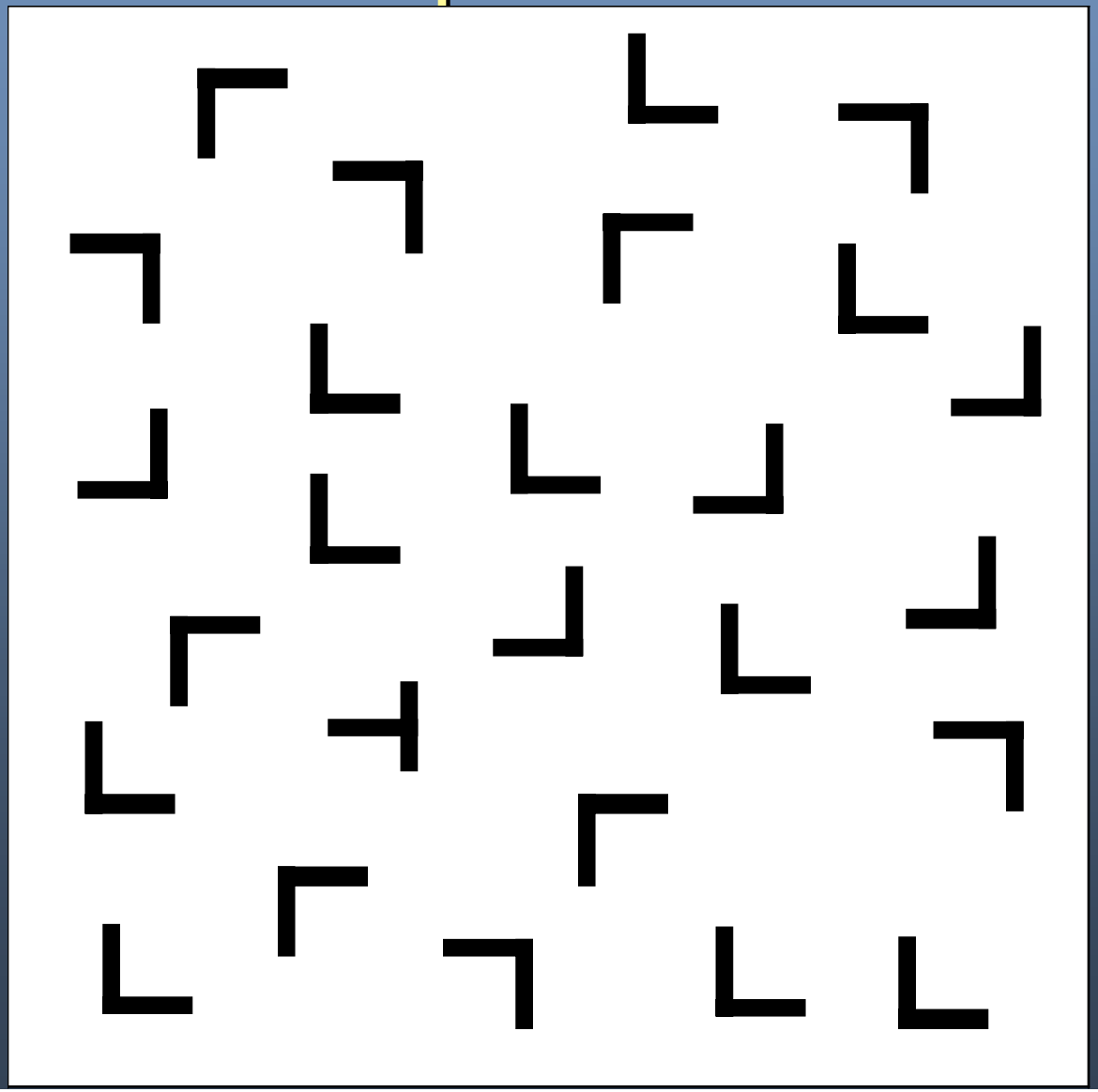

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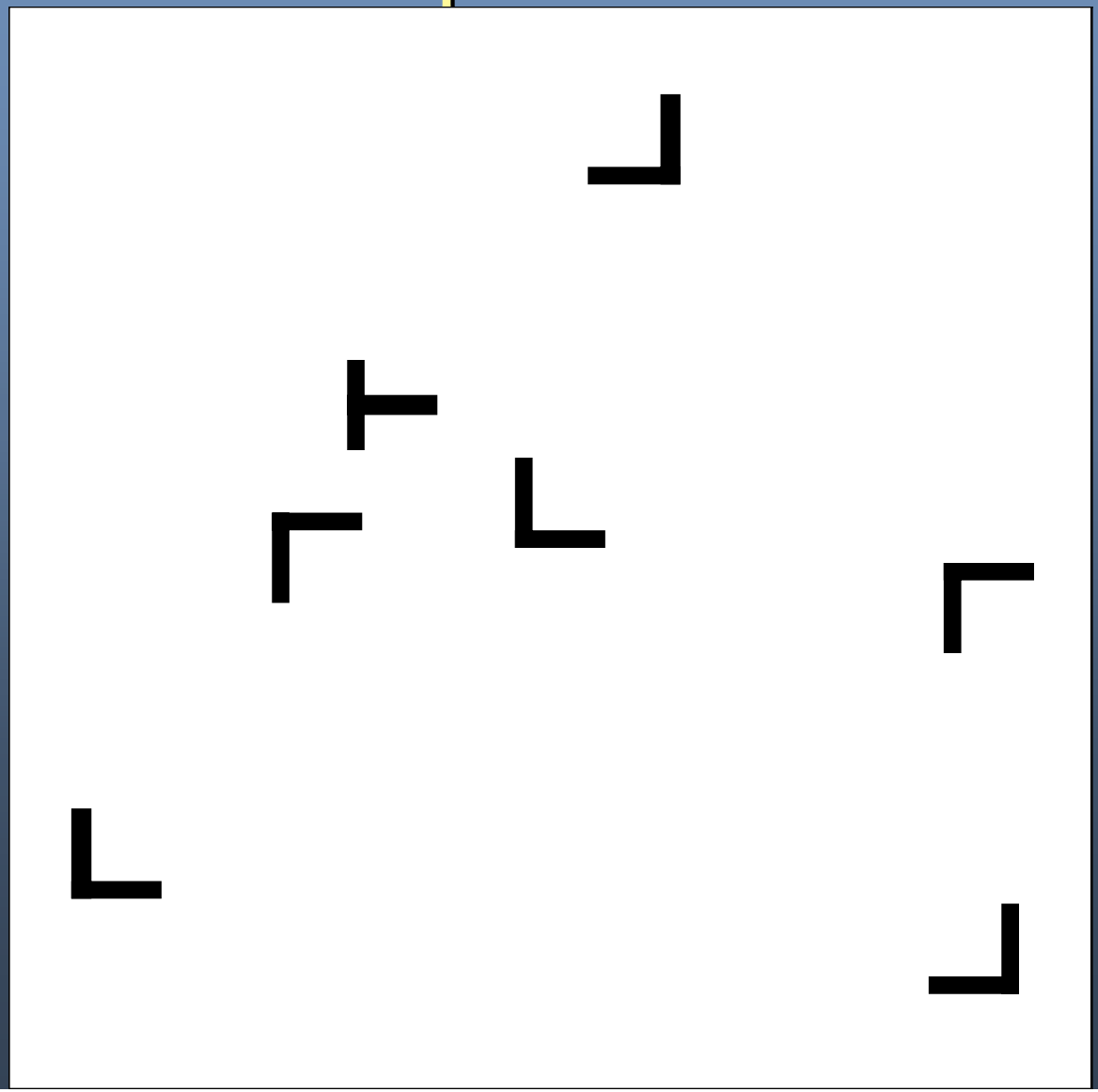

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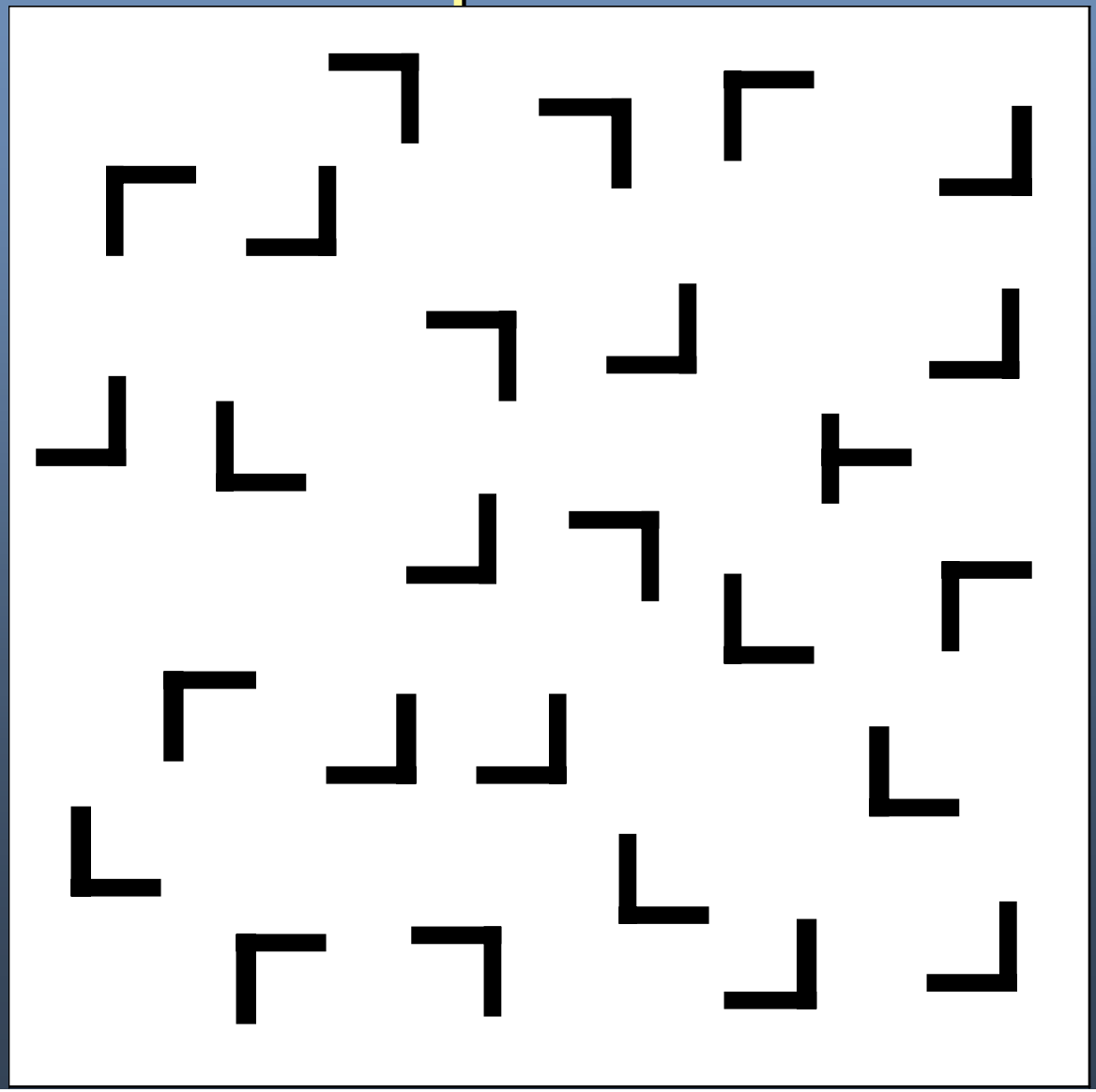
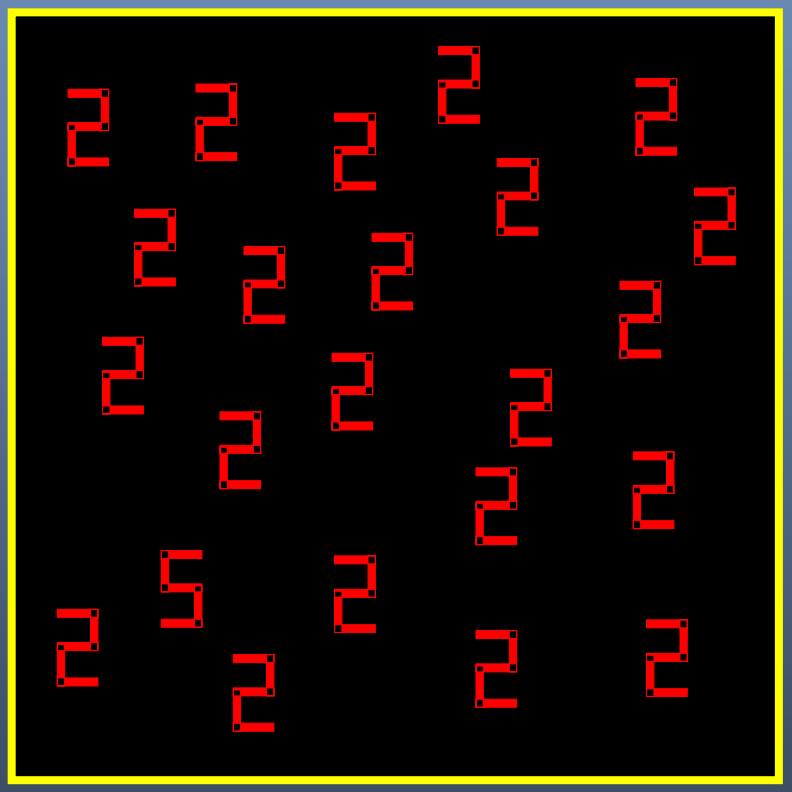
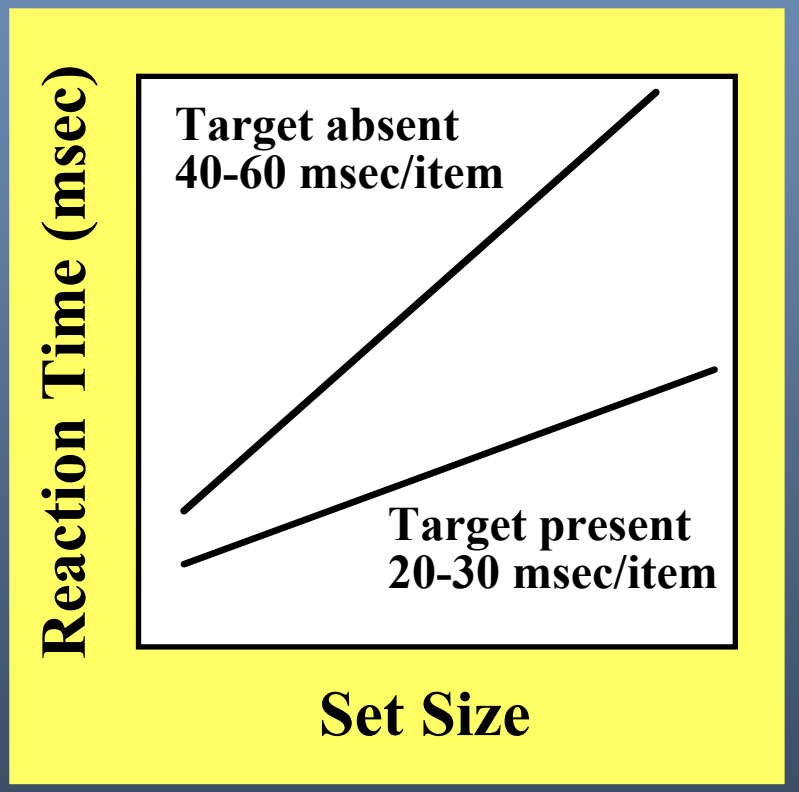


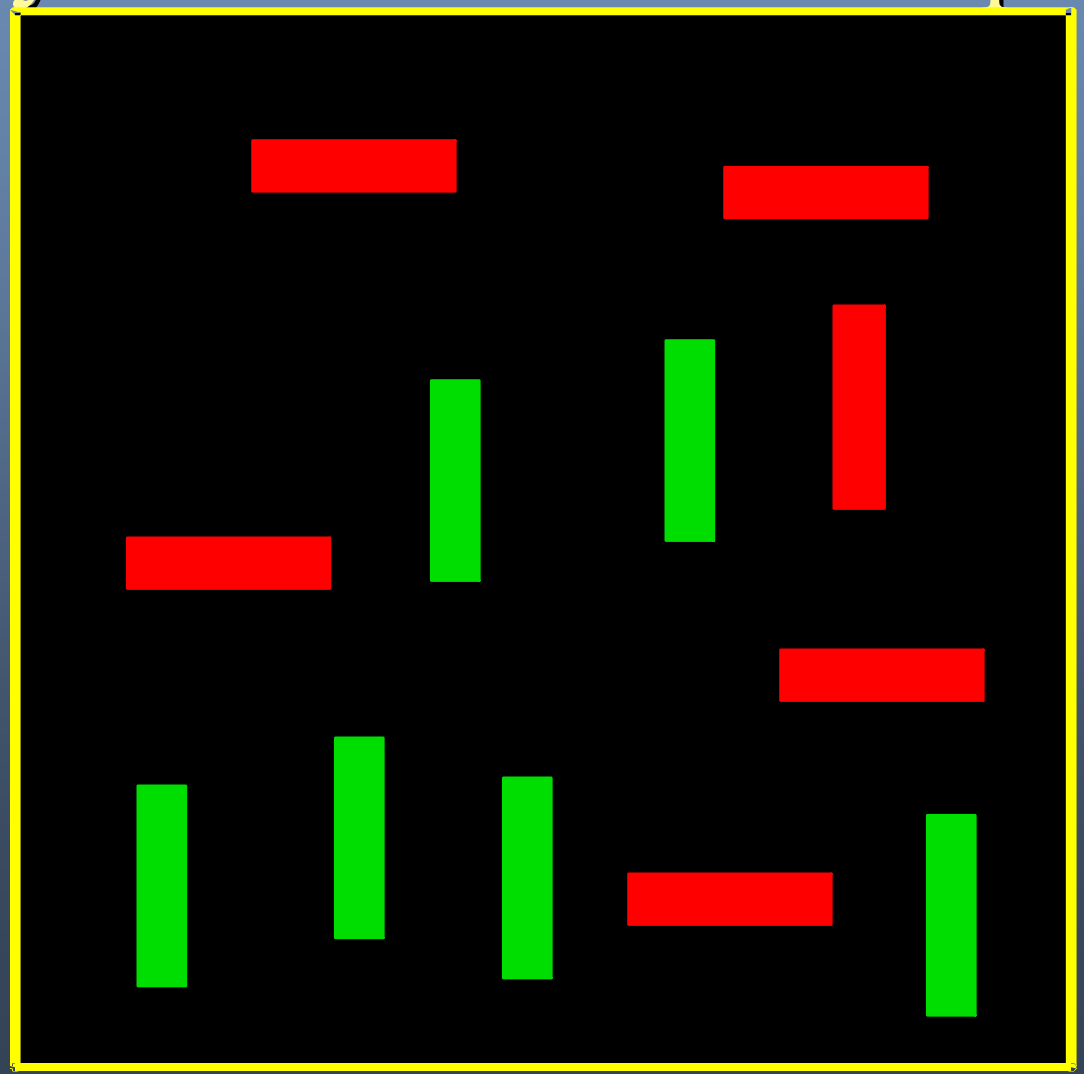
Many other searches are inefficient and seem to require serial deployment of attention from item to item.





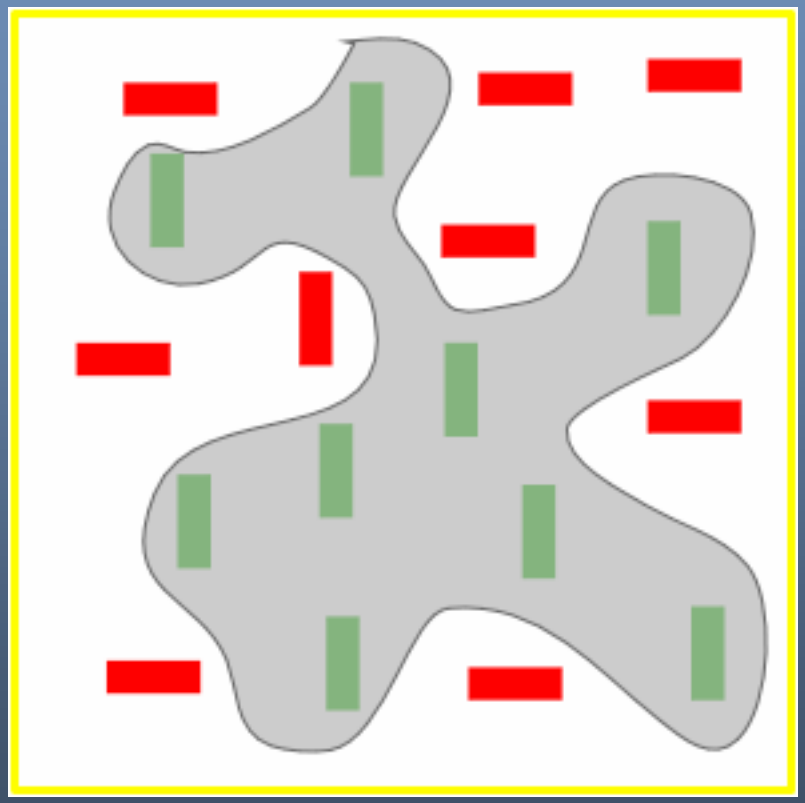
Is there a “Red Horizontal”?

Say “yes” or “no” as fast as possible



The core idea of Guided Search

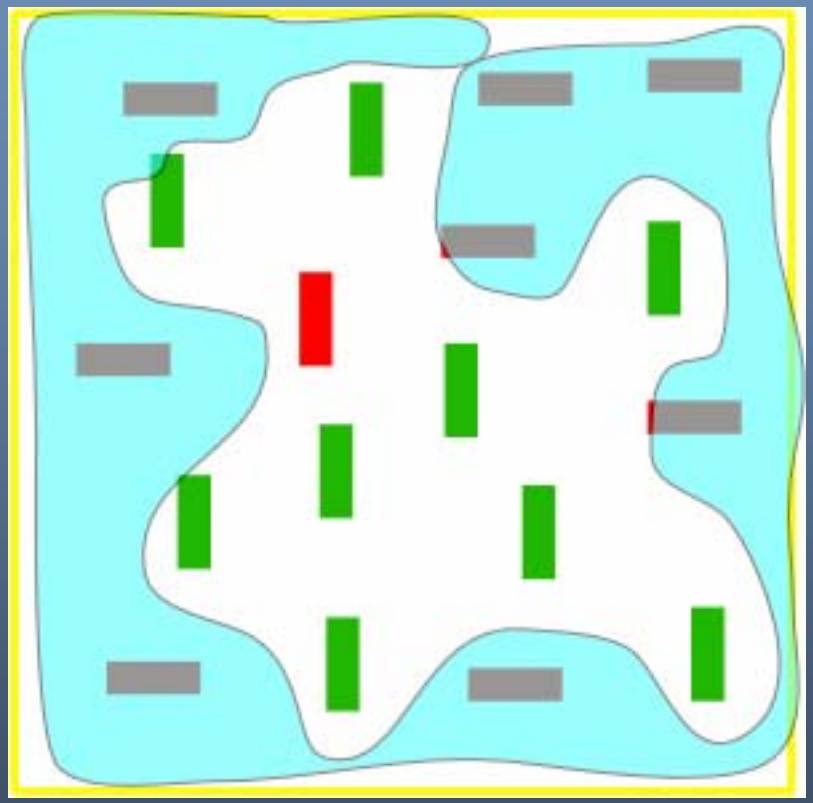
Give me all the red items



Find the red vertical

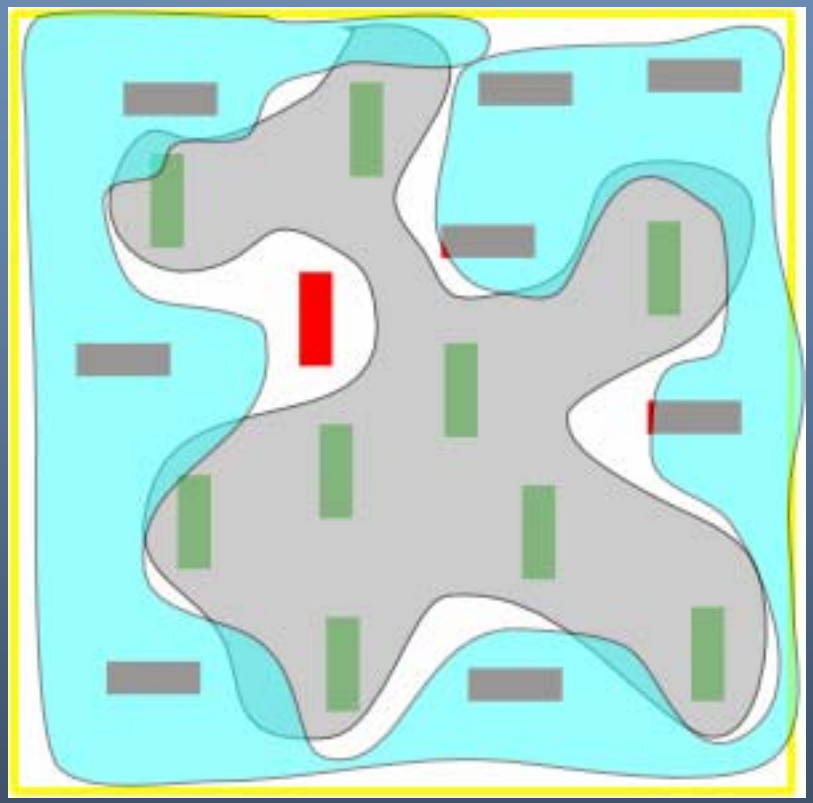
Guided Search

Give me all the verticals



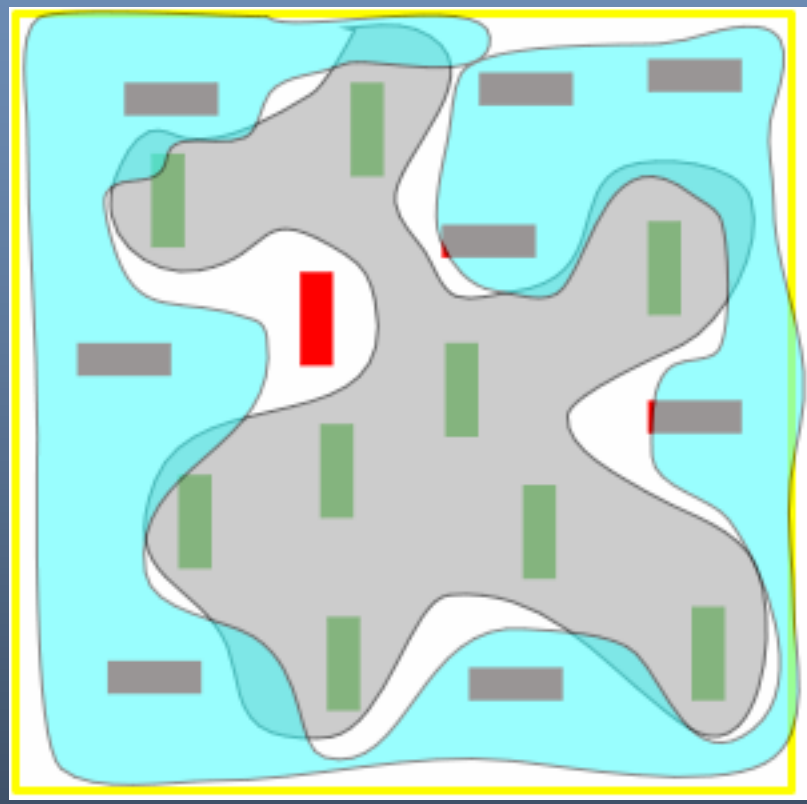
Find the red vertical

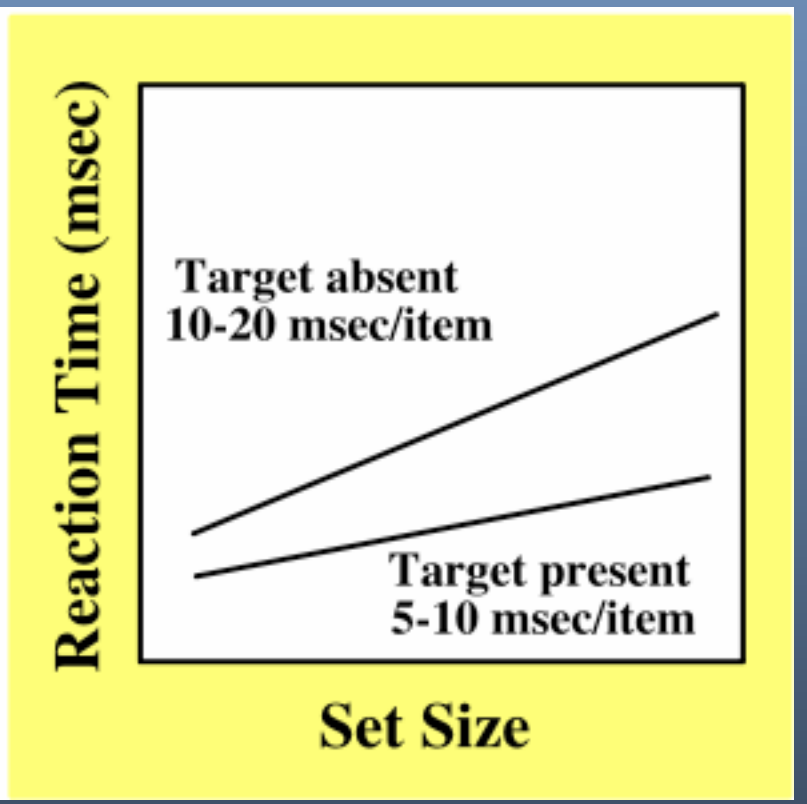
The intersection of those sets is a good place to deploy attention.



Find the red vertical

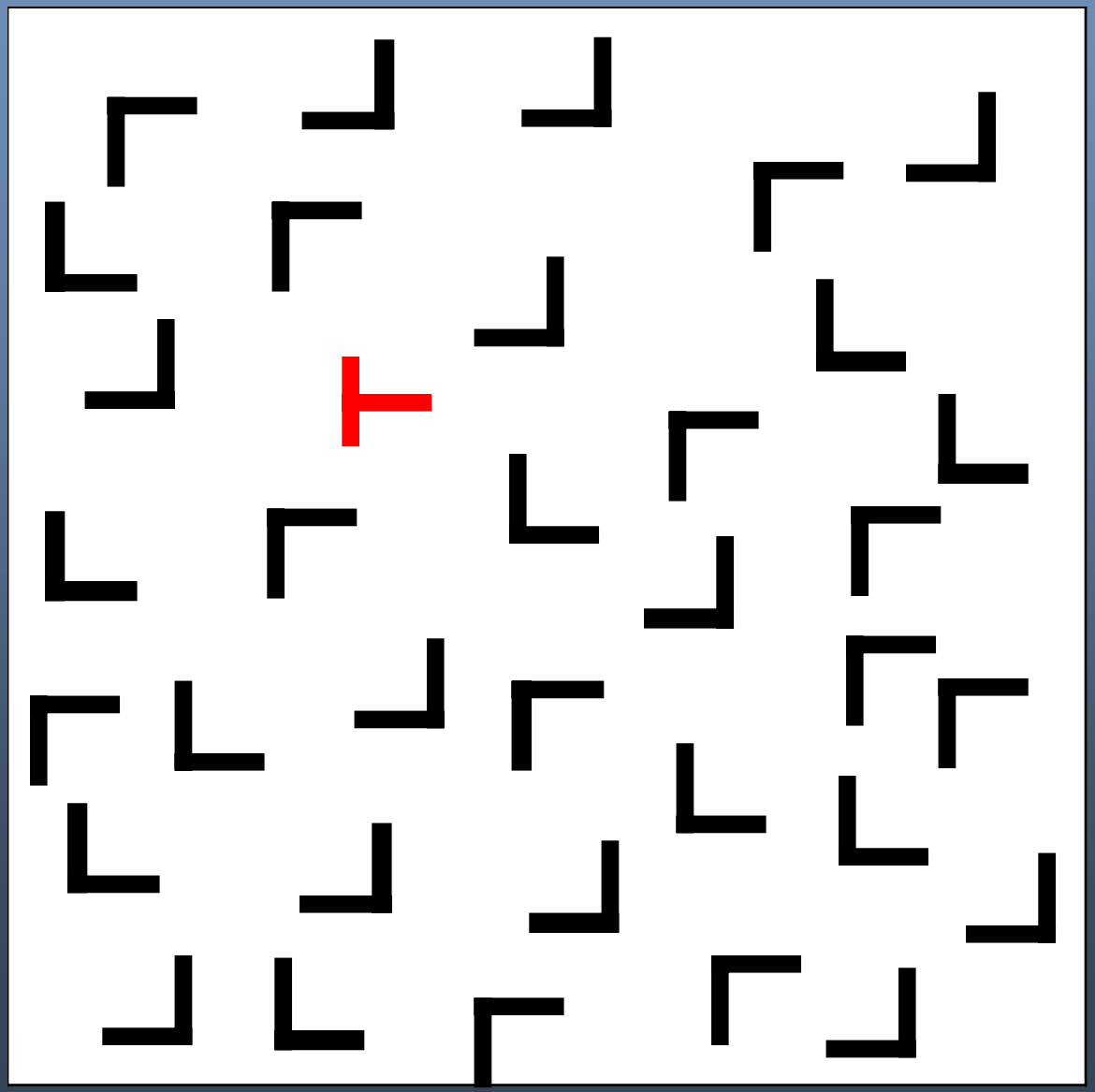
Guided Search



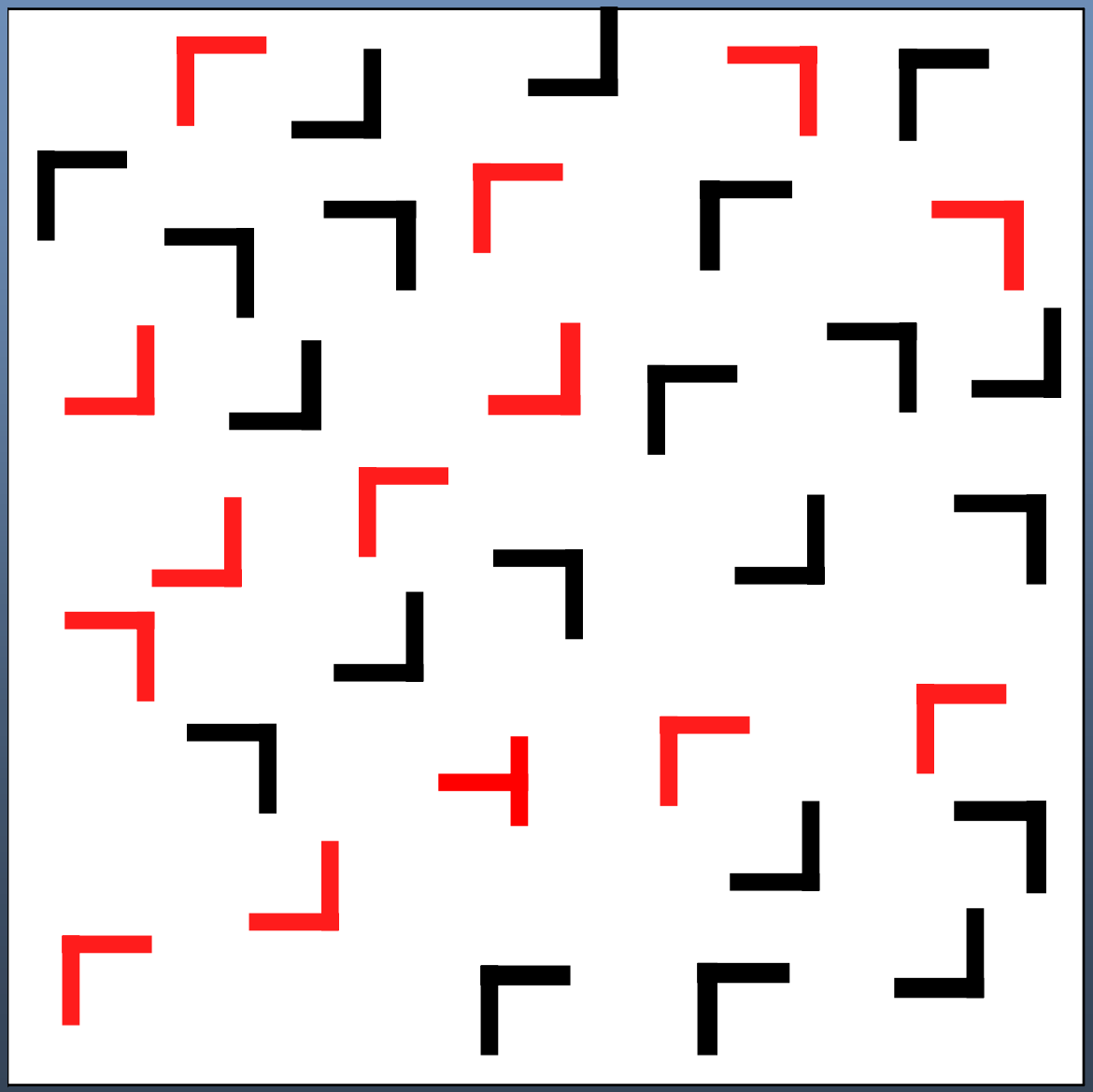


Preattentive processes *guide* the deployment of attention.

Bottom-up guidance: Is there a “T”?



Top-down guidance: The “T” is red.

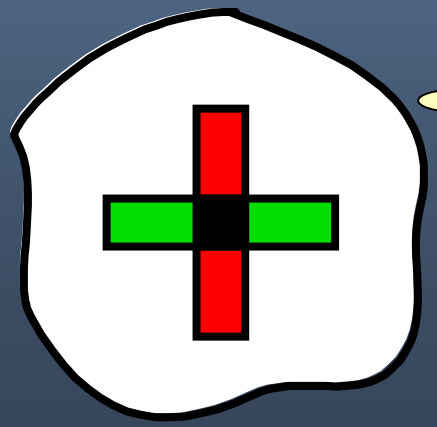


Why do we need attention?

What are those features doing before attention arrives?

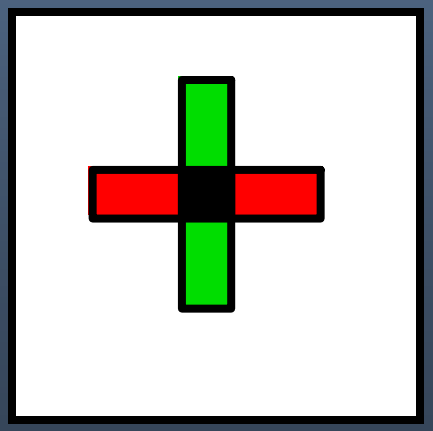
The idea: Before selection, features are loosely bundled into objects

I am a red, green, vertical, horizontal, pointy object



Attention enables the *binding* of features into *recognizable* objects

I am a “plus” with green vertical and red horizontal regions

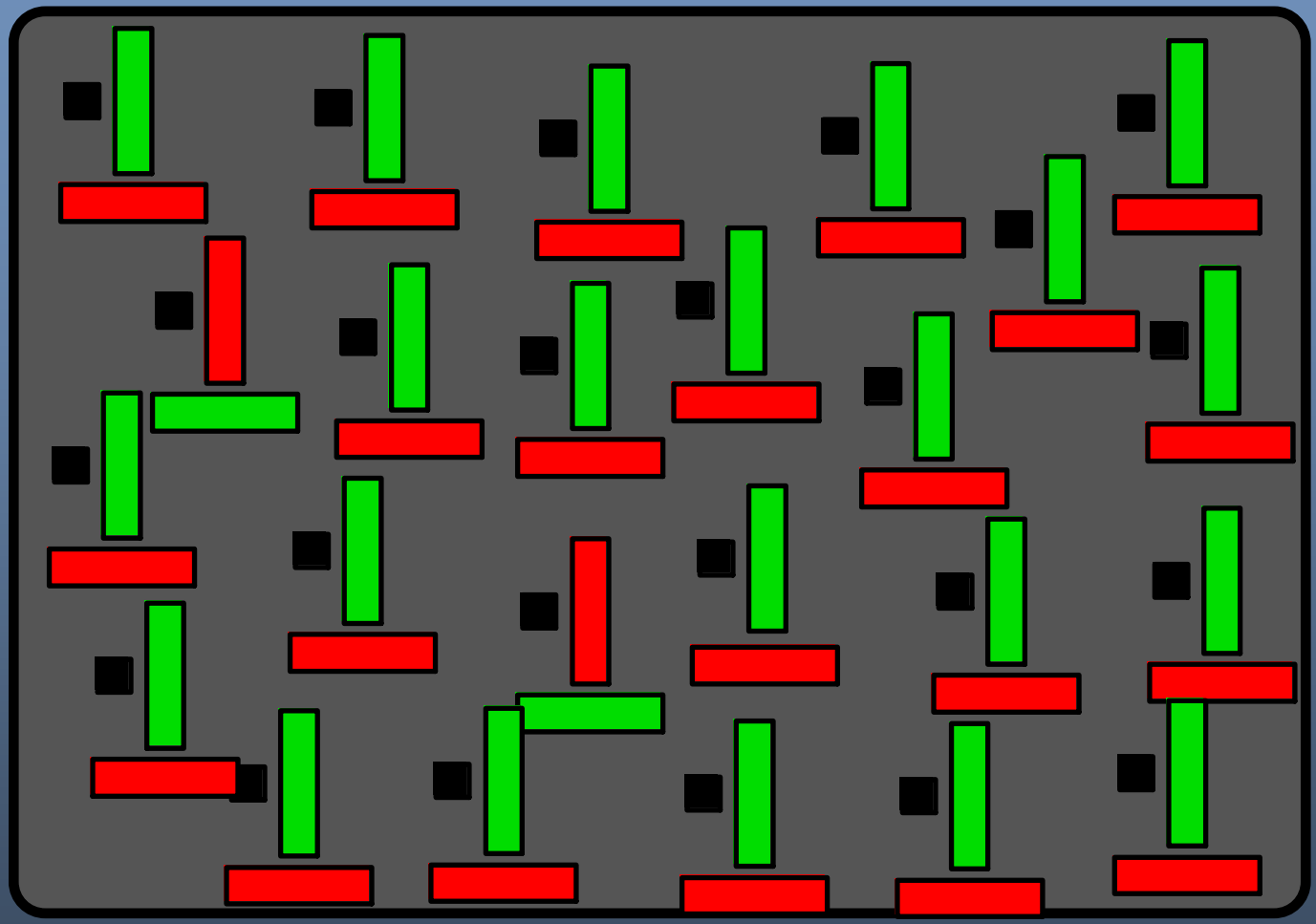


Preattentive features are *bundled* into preattentive object files.

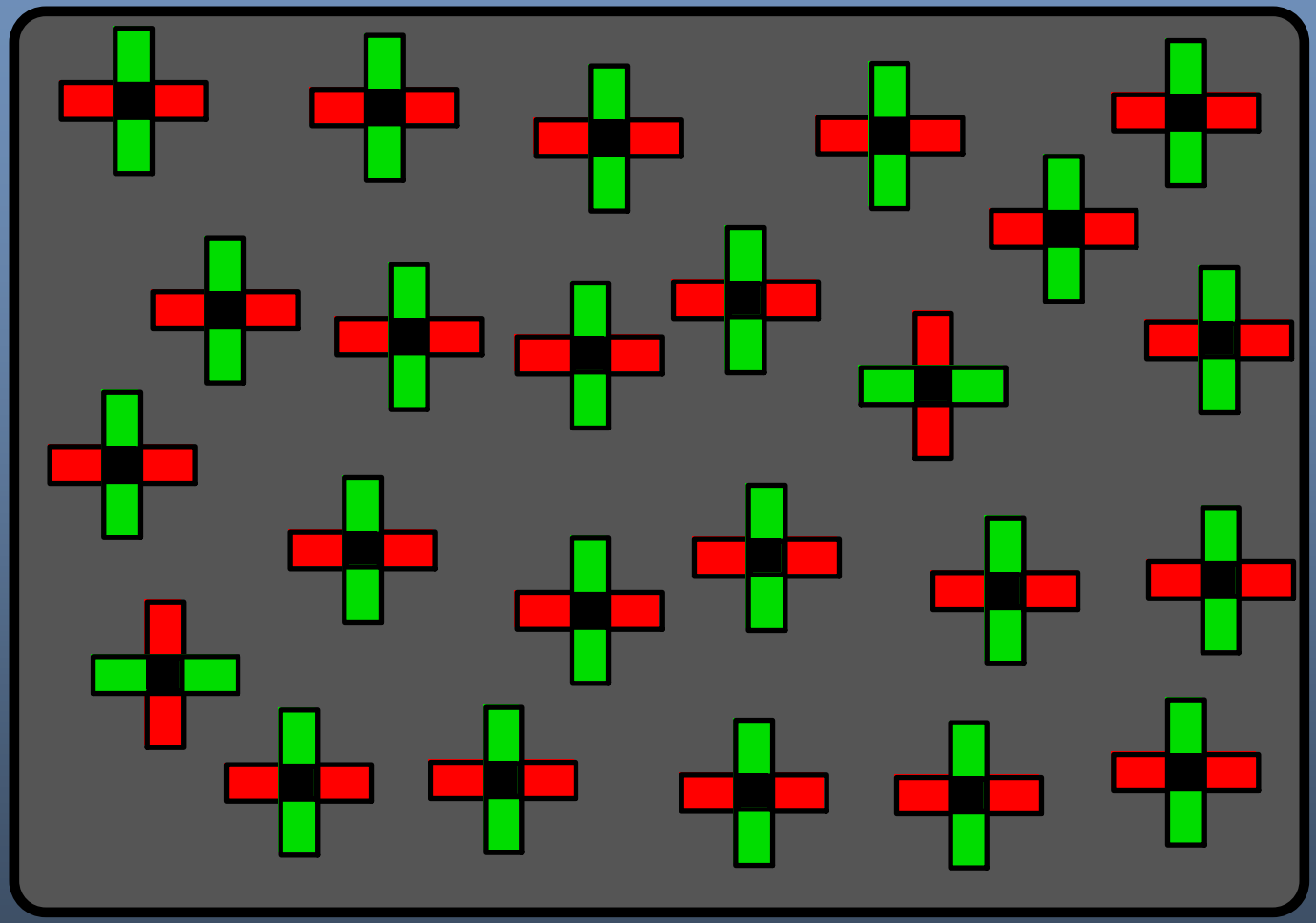
Attention is required to *bind* features into recognizable objects.

Find the "red verticals"

Easy to find red verticals

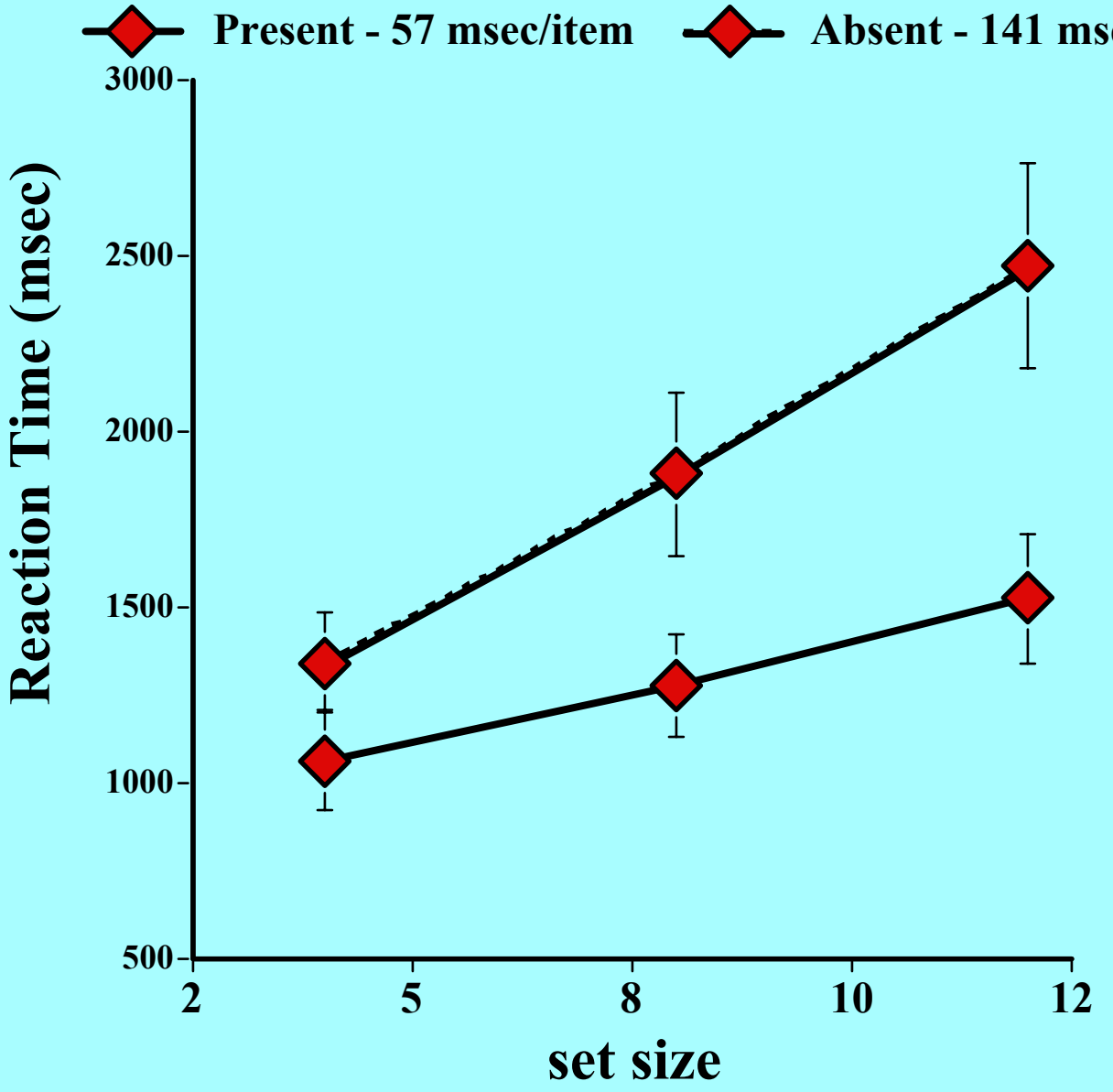


Hard to find red verticals

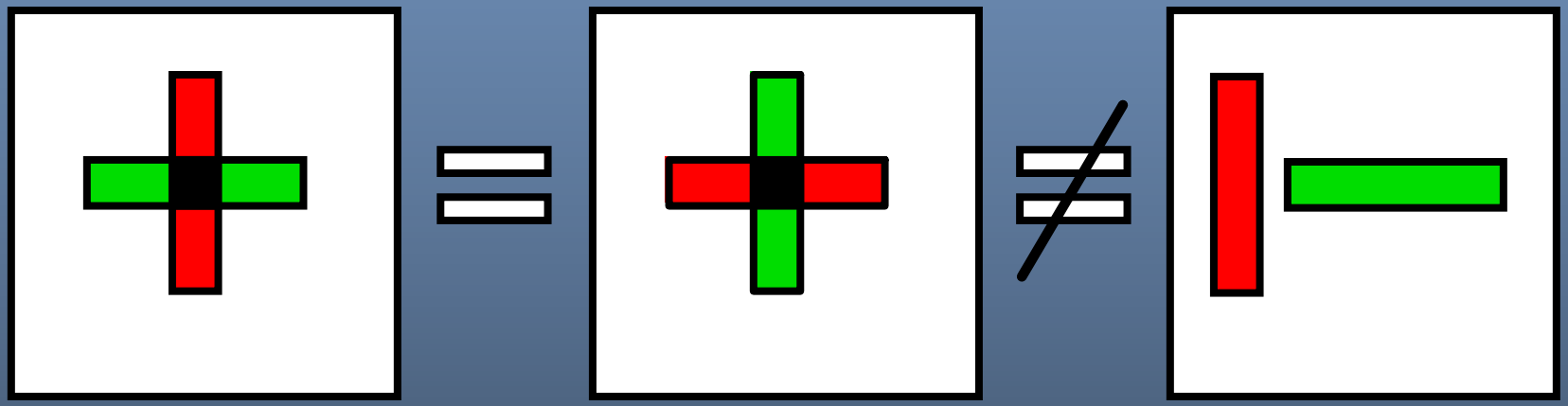


Find the 2 red vertical lines

Why is this “plus” search so inefficient?



Why guidance fails



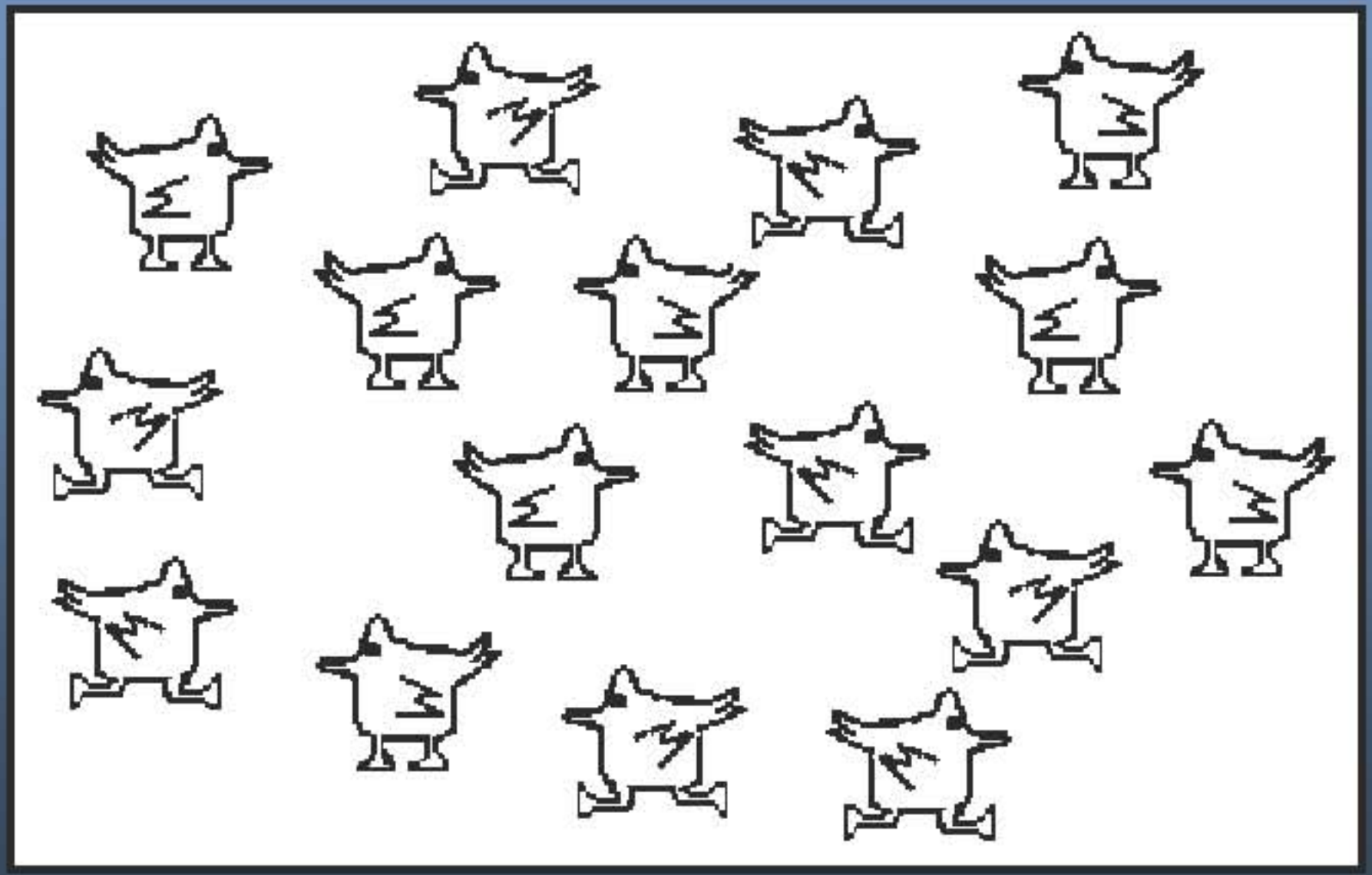
One Object
red & green
&
vert. & hor

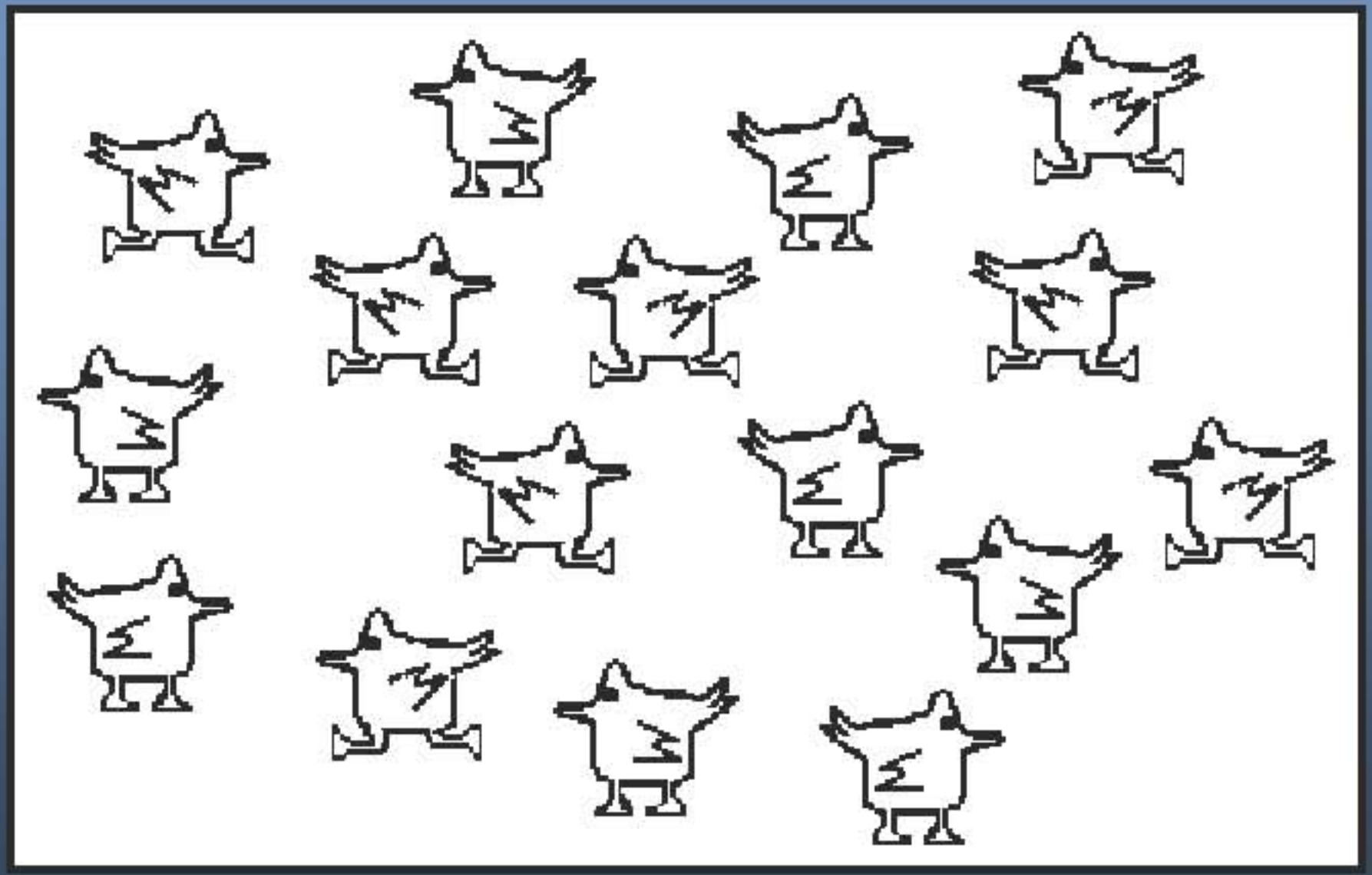
One Object
red & green
&
vert. & hor

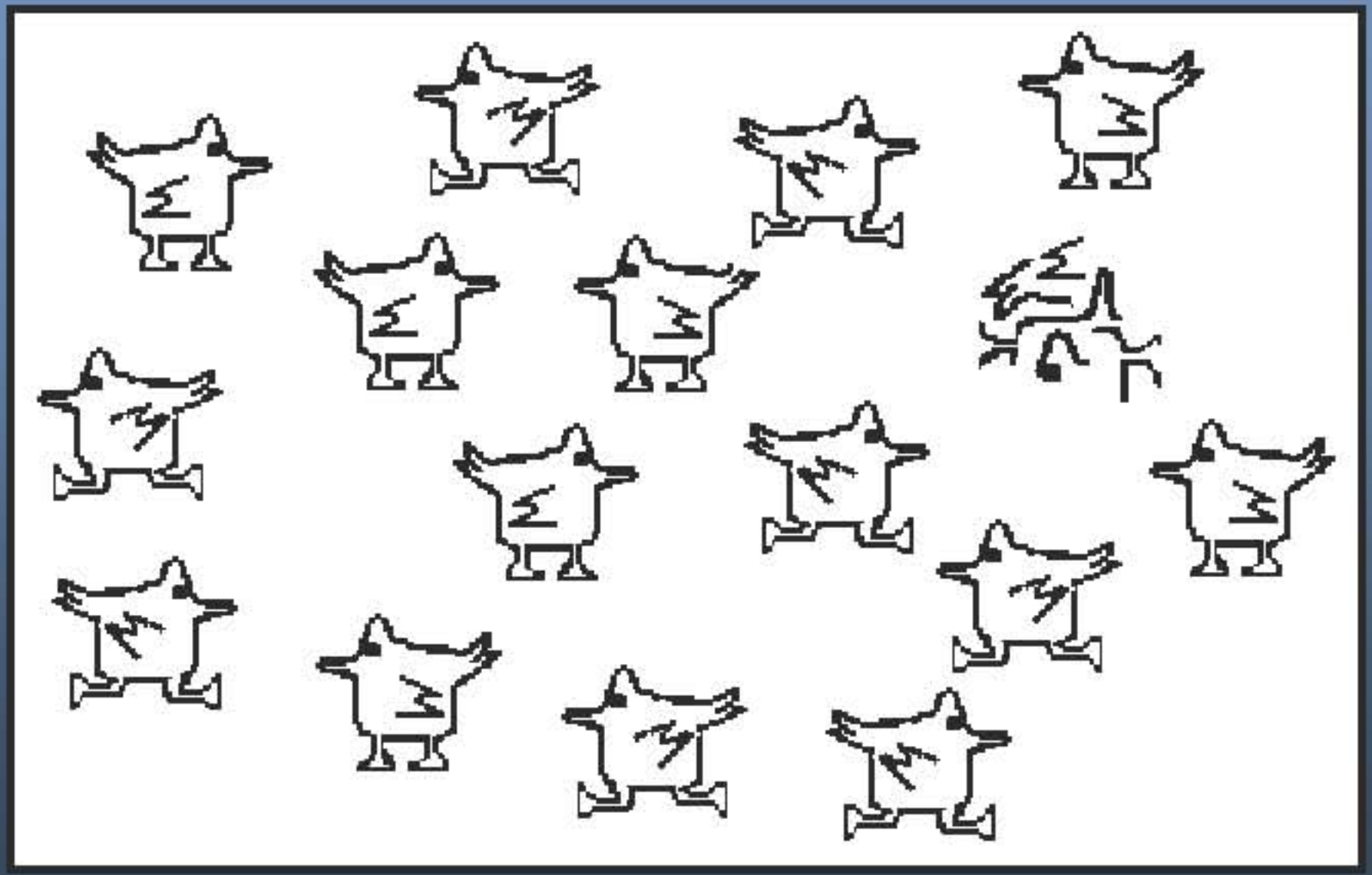
Two Objects
1-red & vert
&
2-green & hor

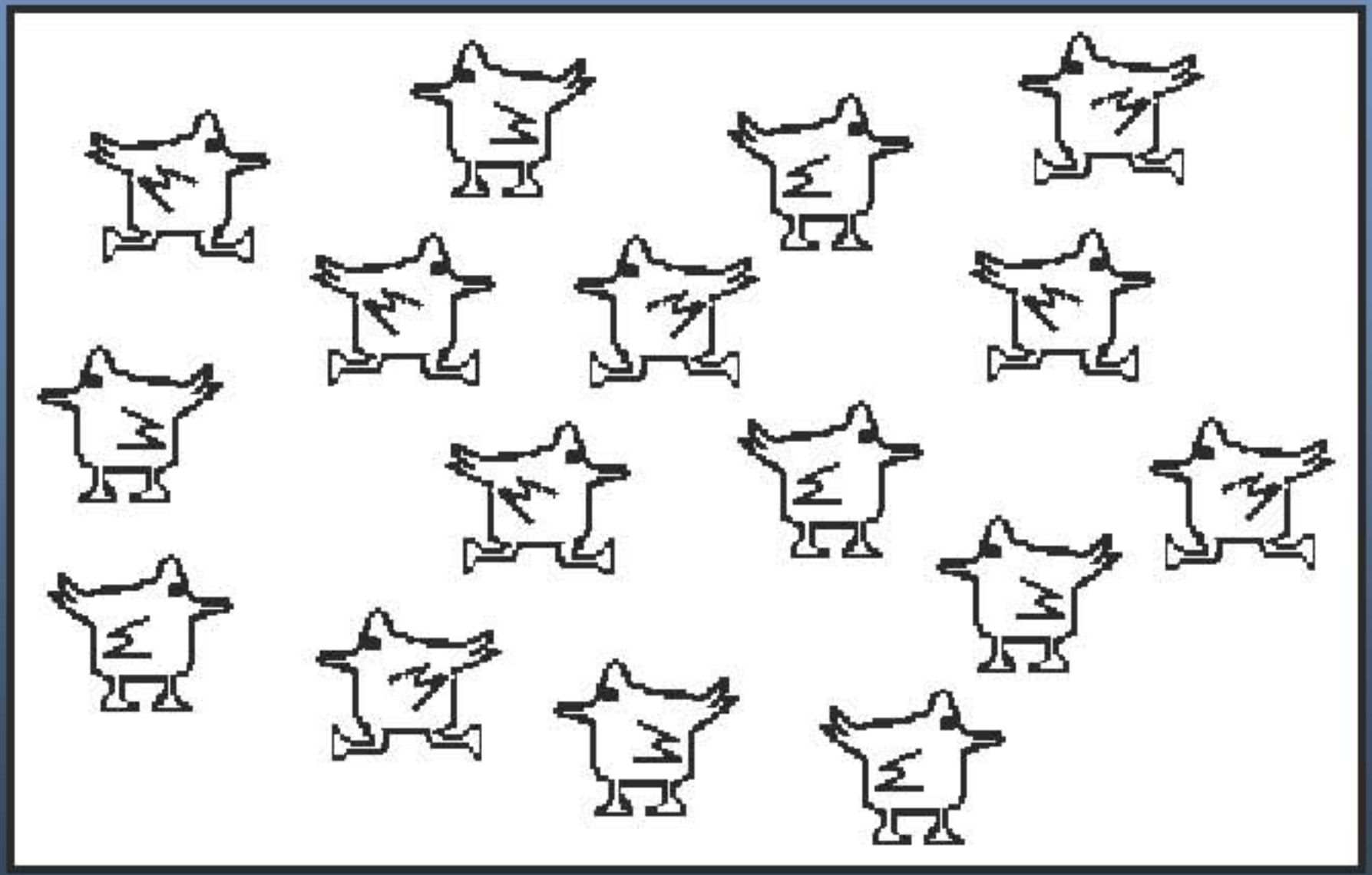
Do things stay together once you bind them?

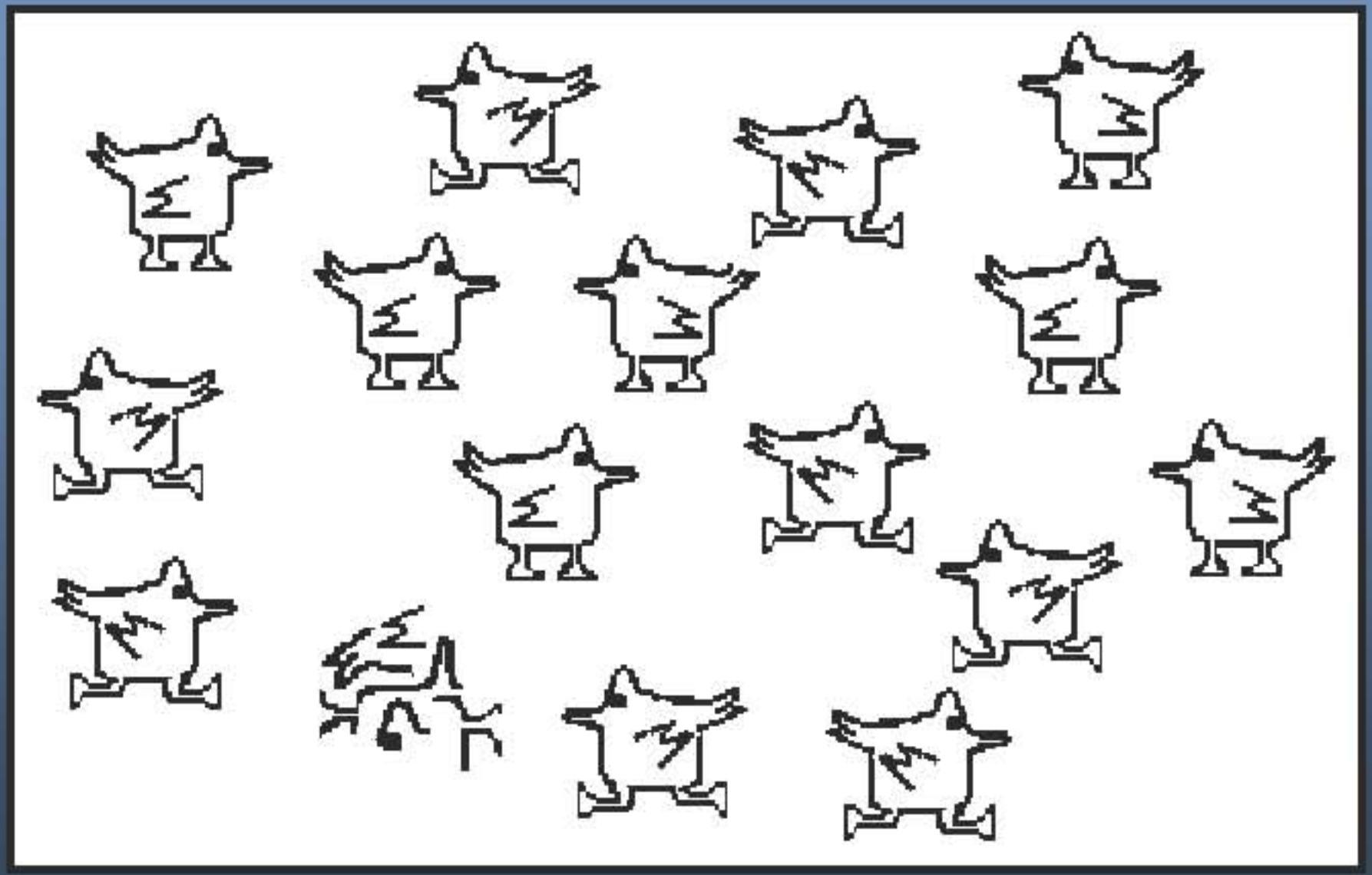
Meet the dancing chickens

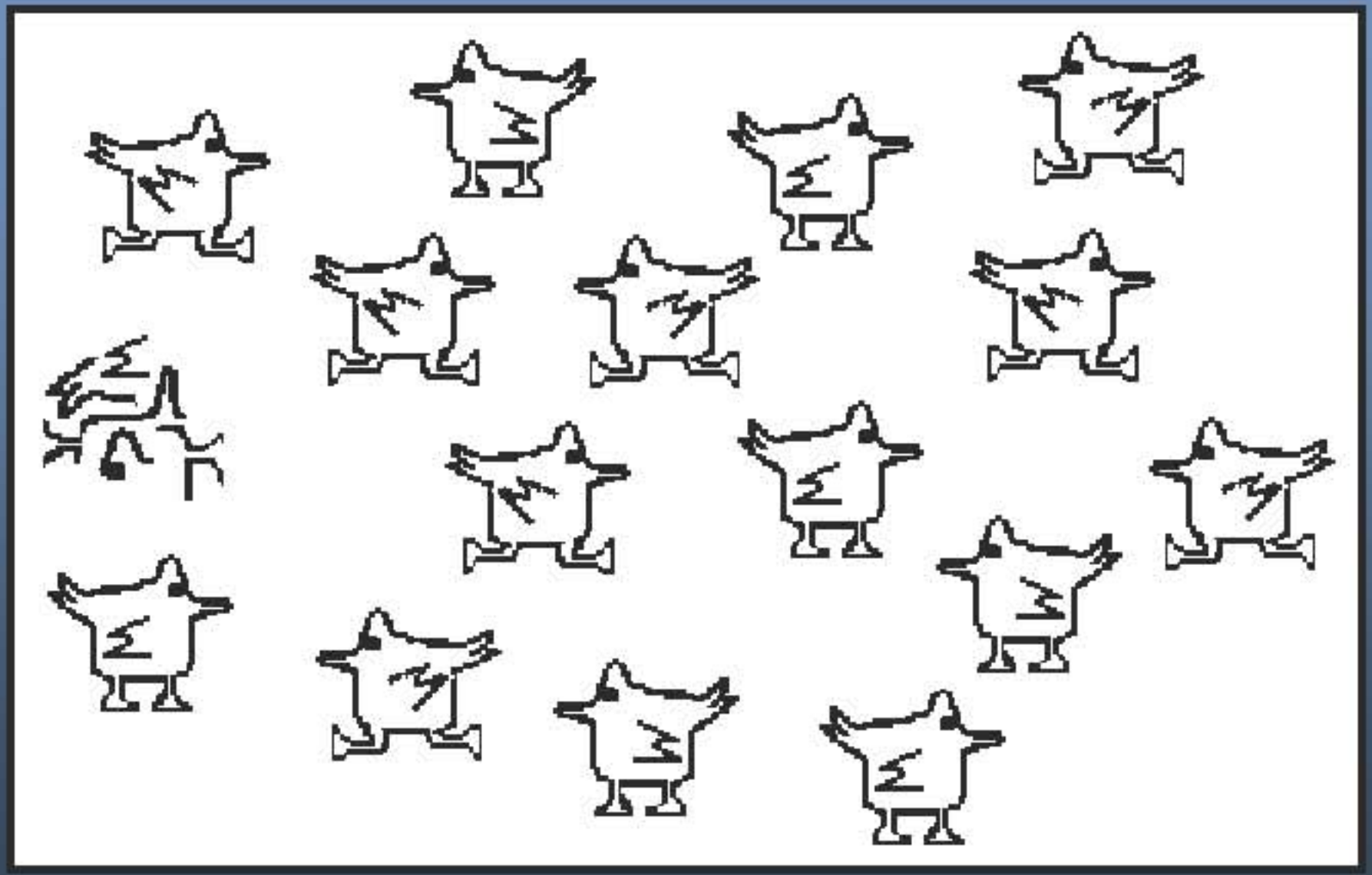








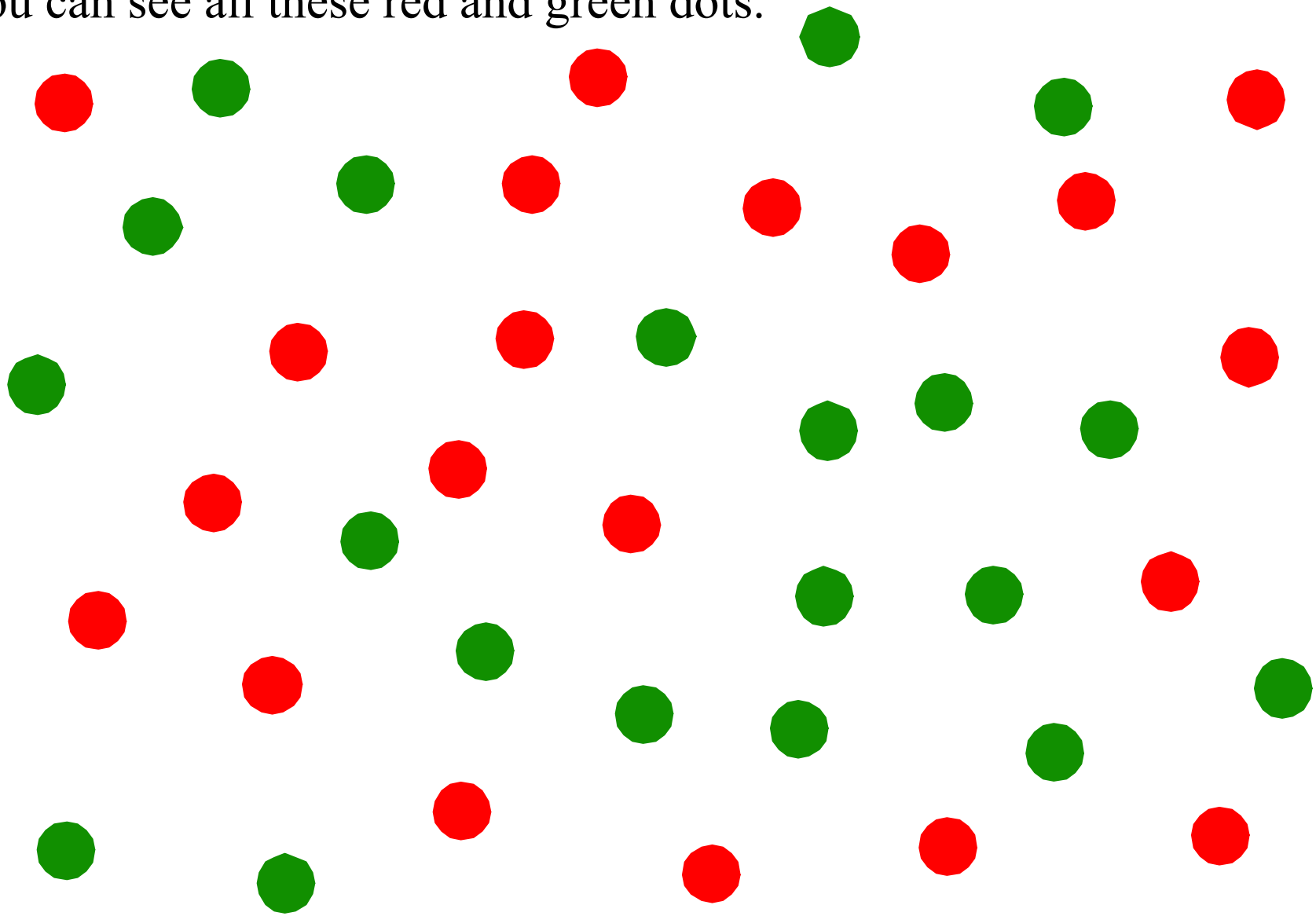




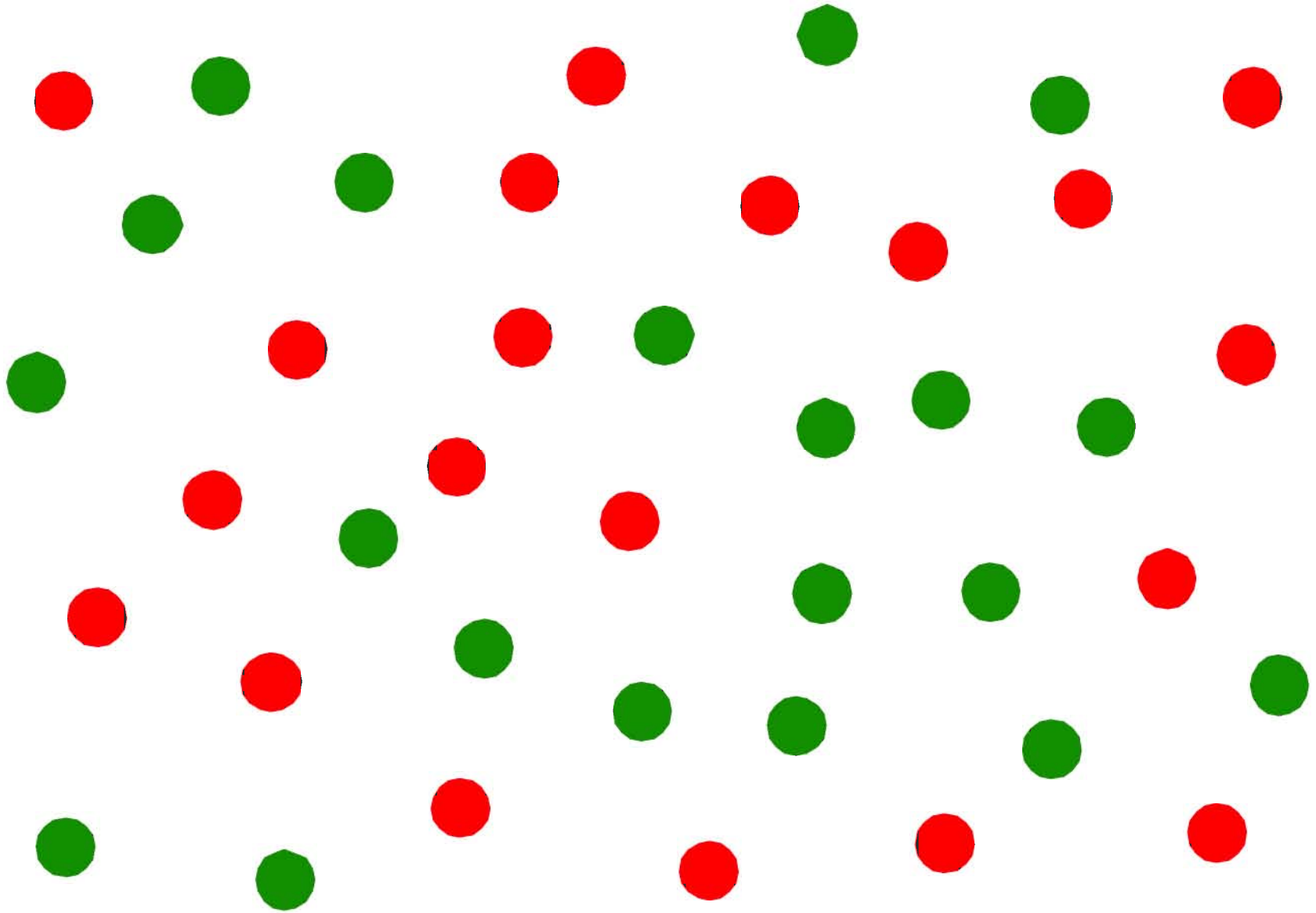
How bad are you?

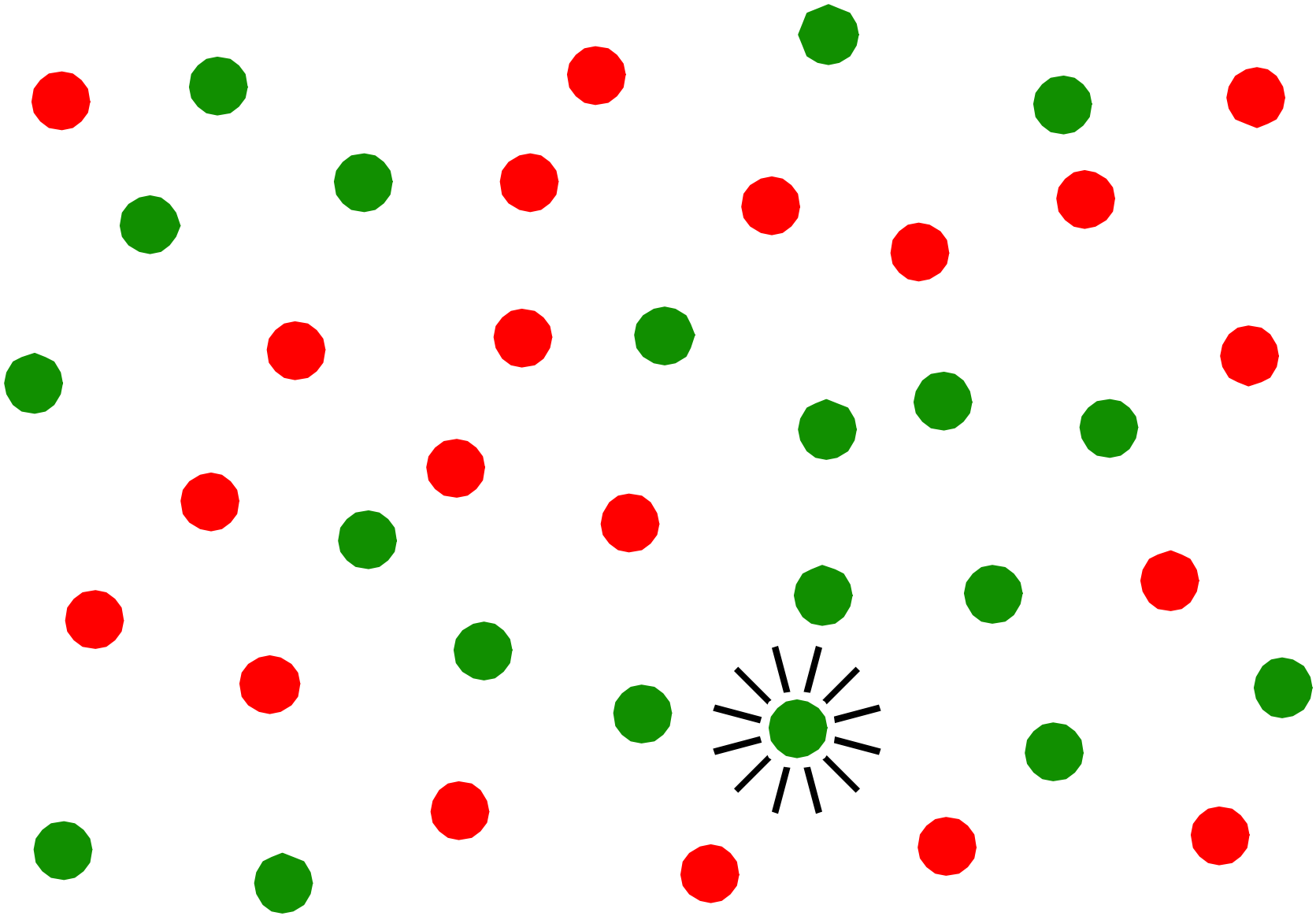
The “IsWas” Paradigm

You can see all these red and green dots.

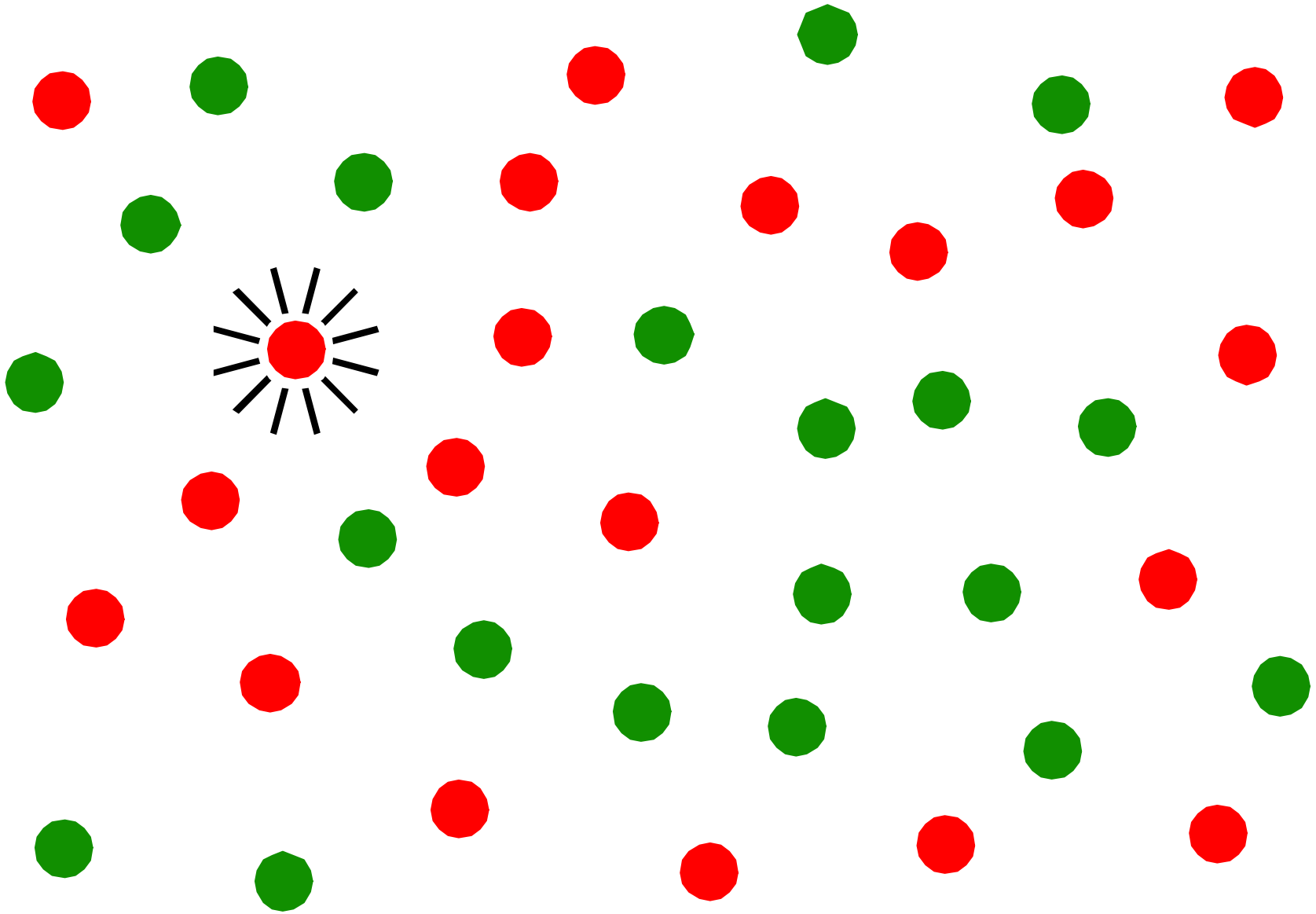


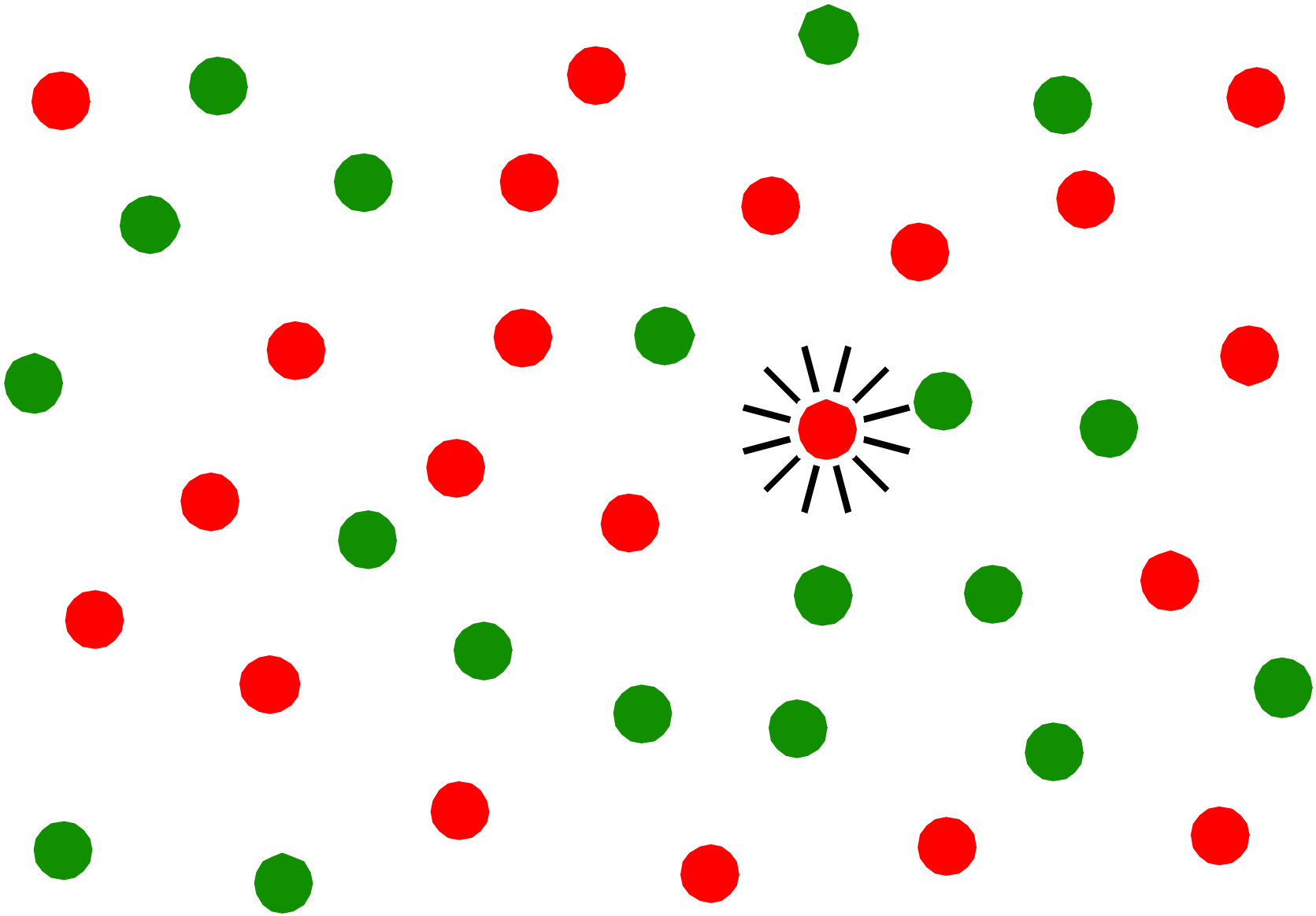
Does the cued dot change color?



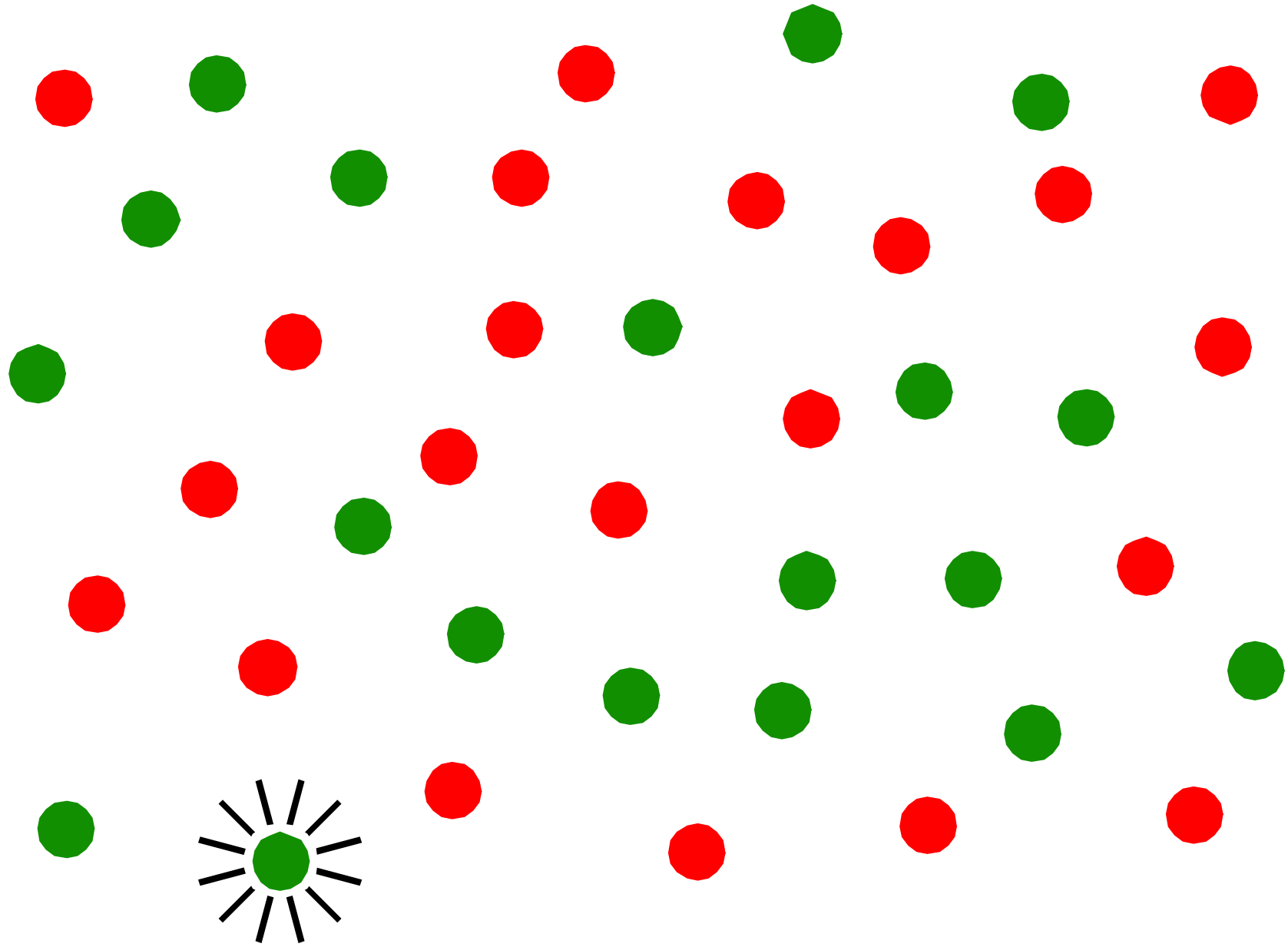


No

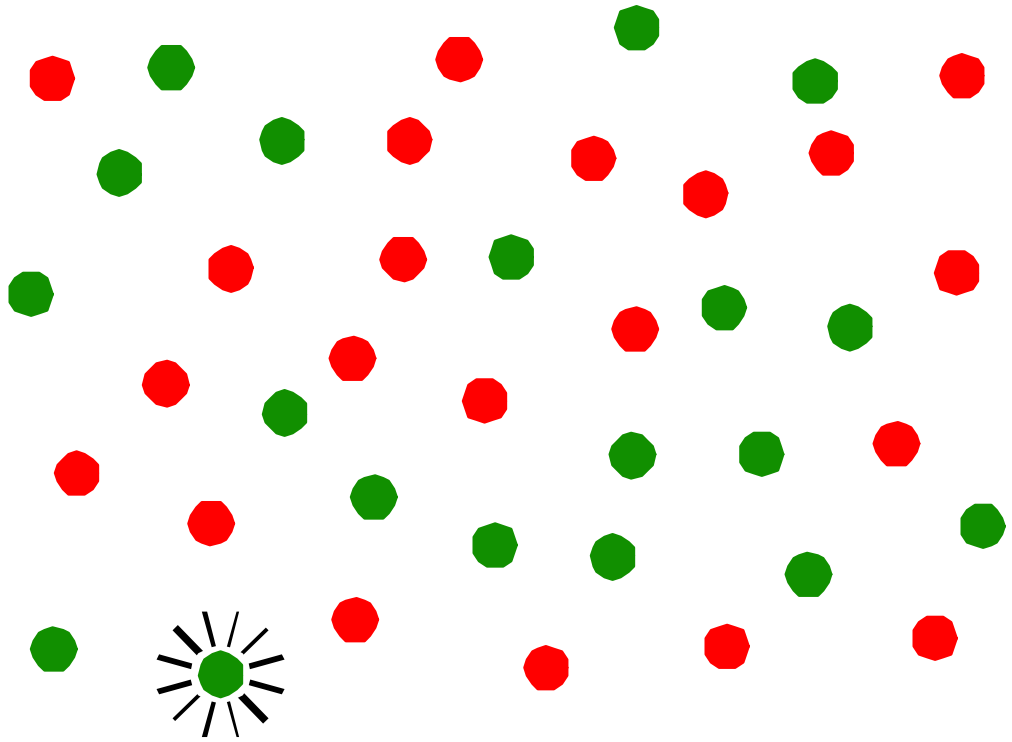

No



Yes

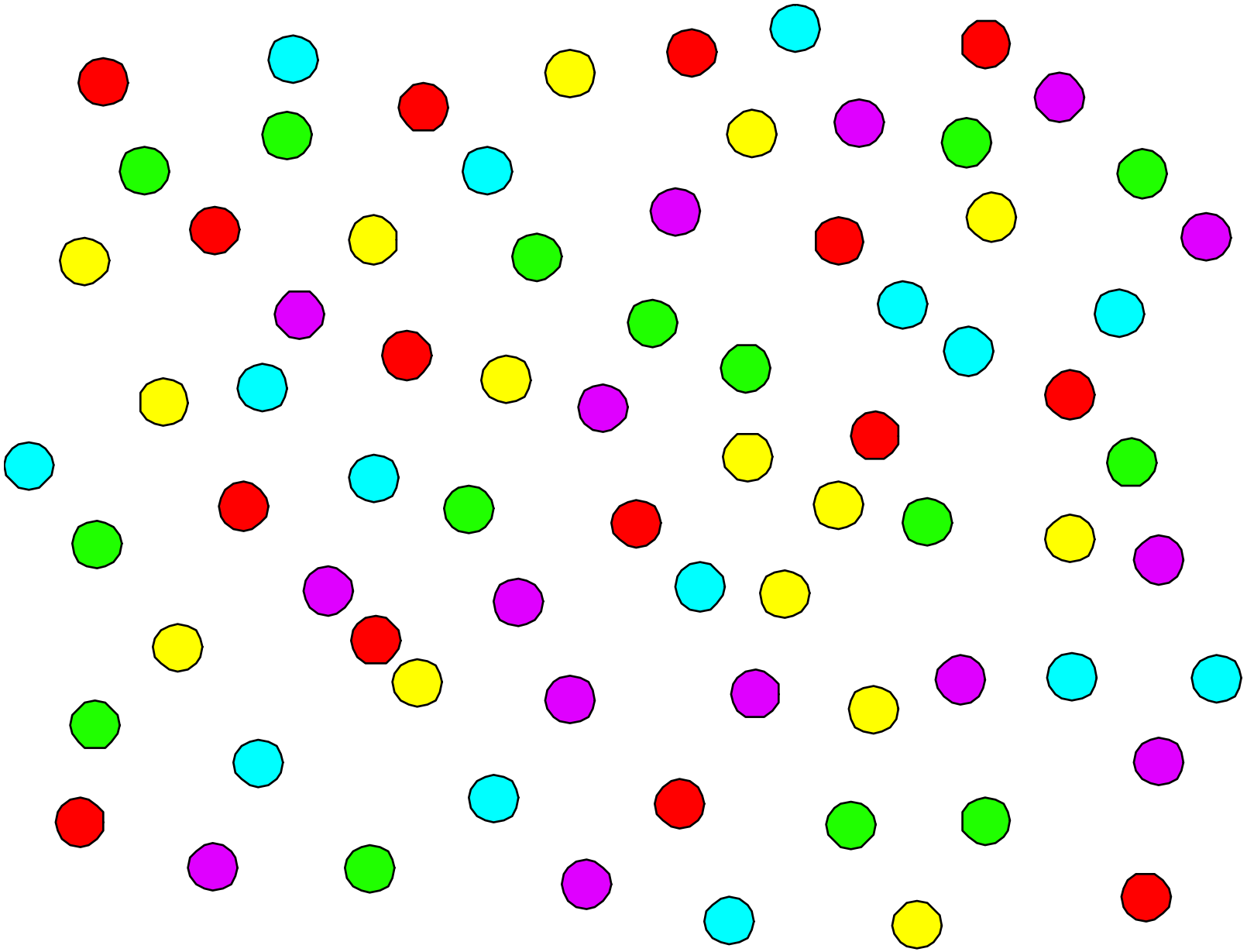

No

Basic color and form information are immediately available.



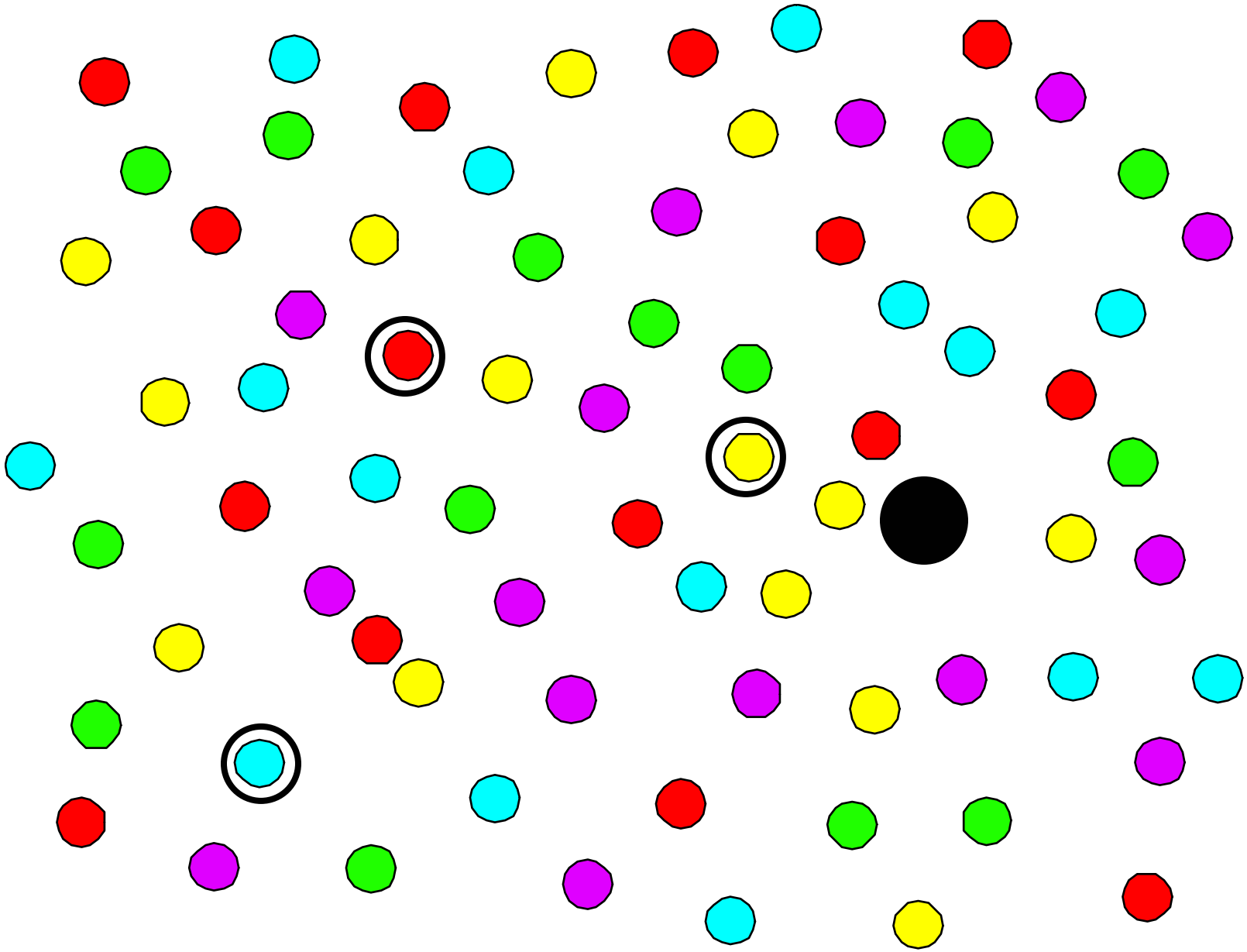
Why can’t you do the task?

More Dots….Tell me the color that the highlighted dot IS



If the dot turns black, tell me the color that it WAS.

More Dots….Tell me the color that the highlighted dot IS



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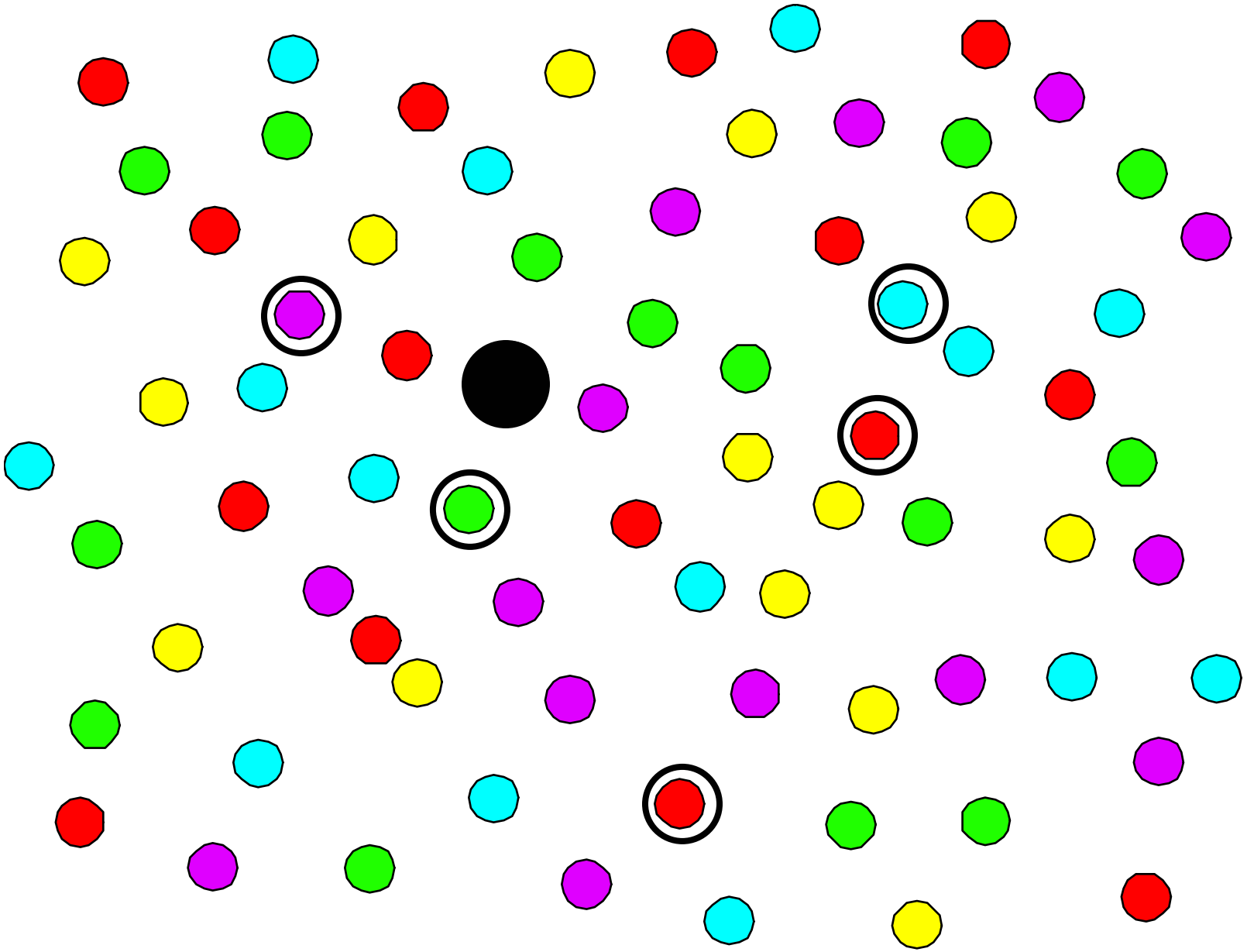

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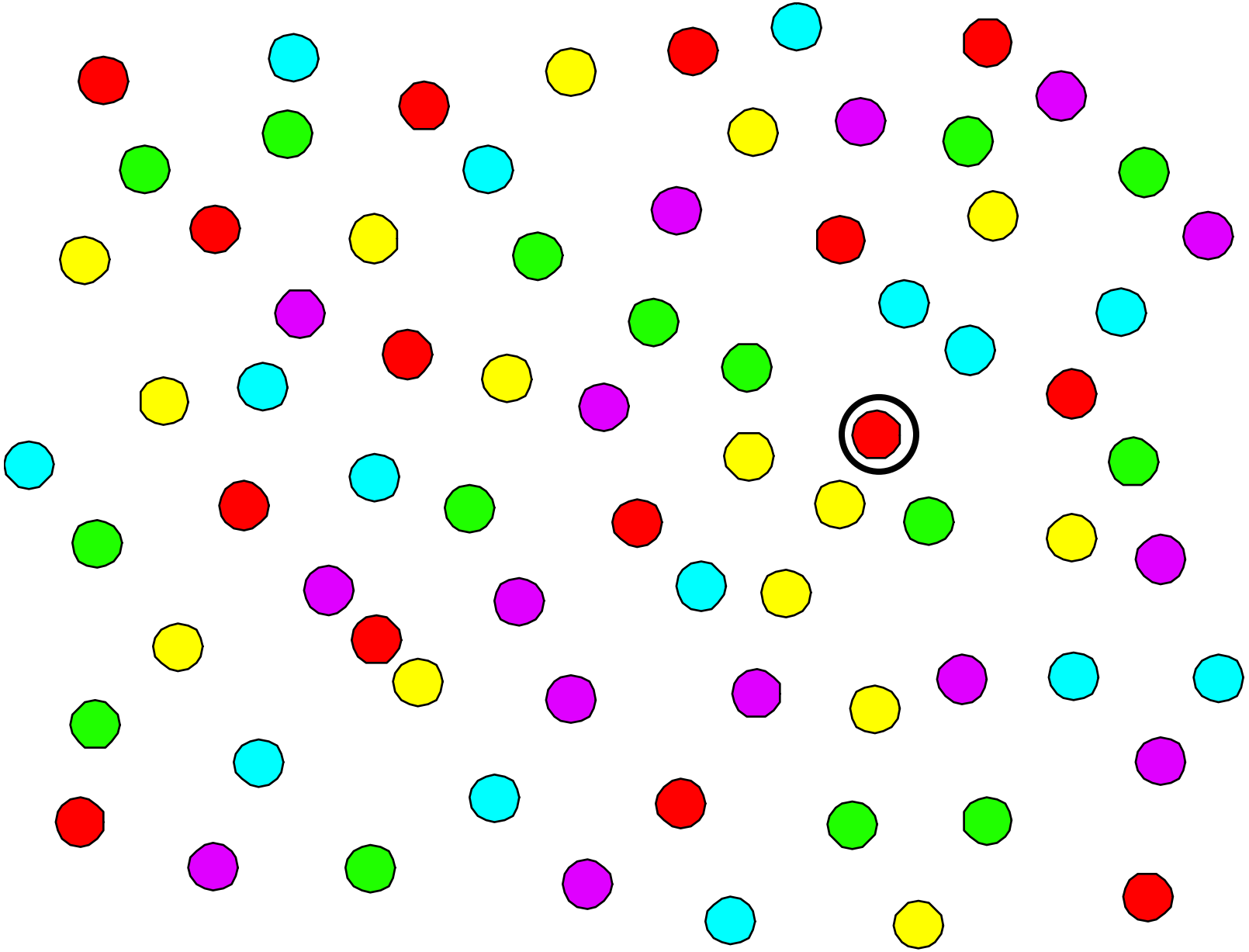

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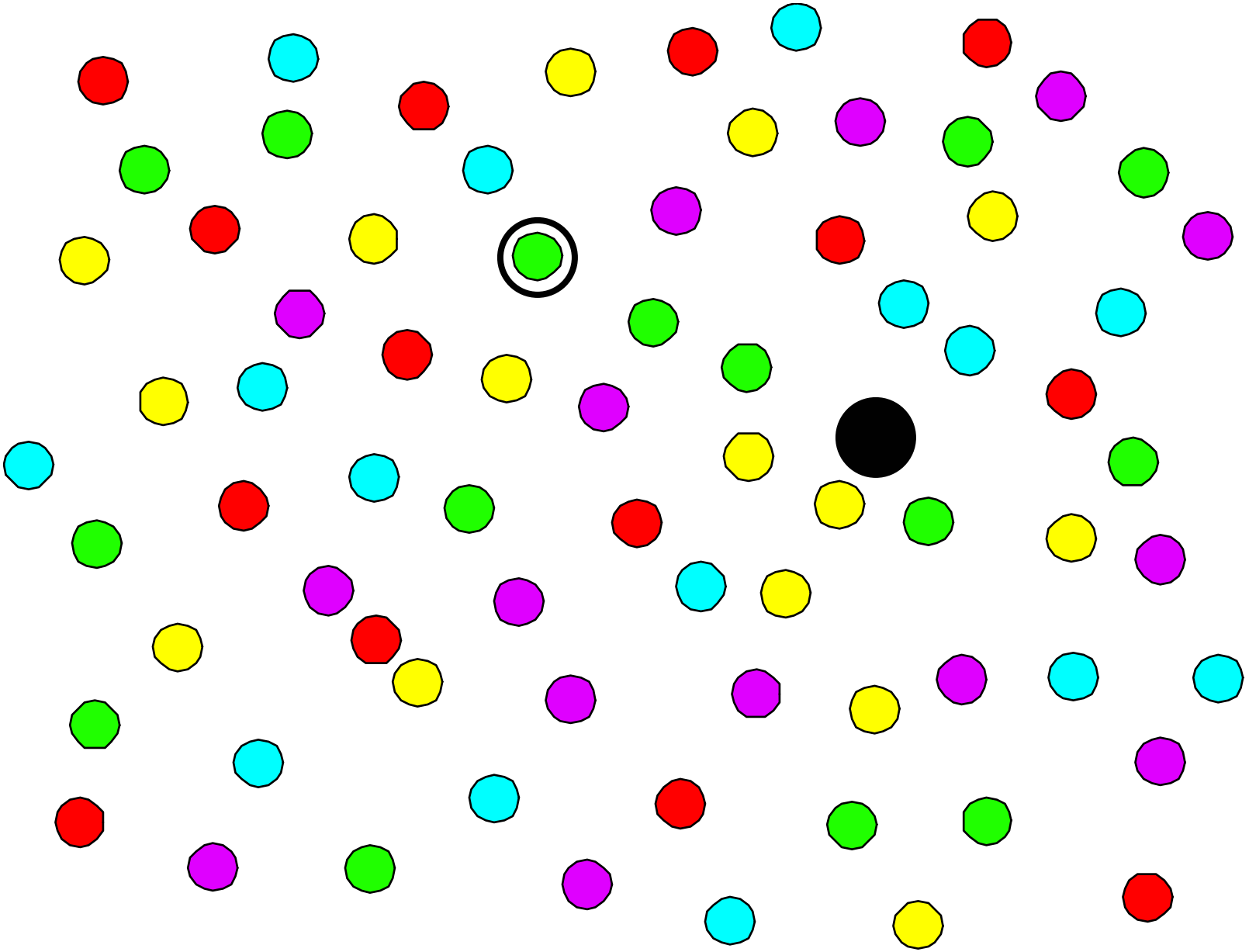

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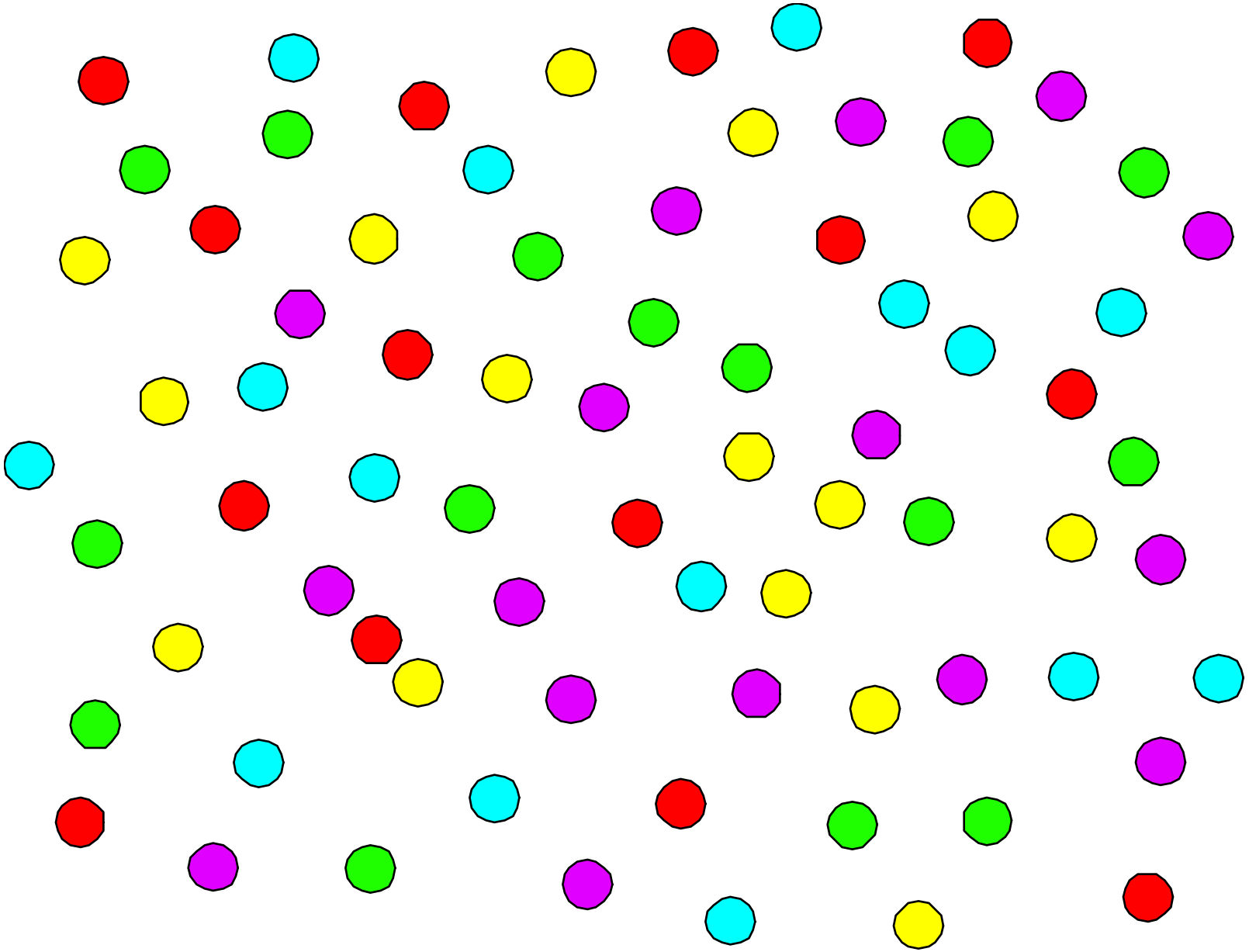
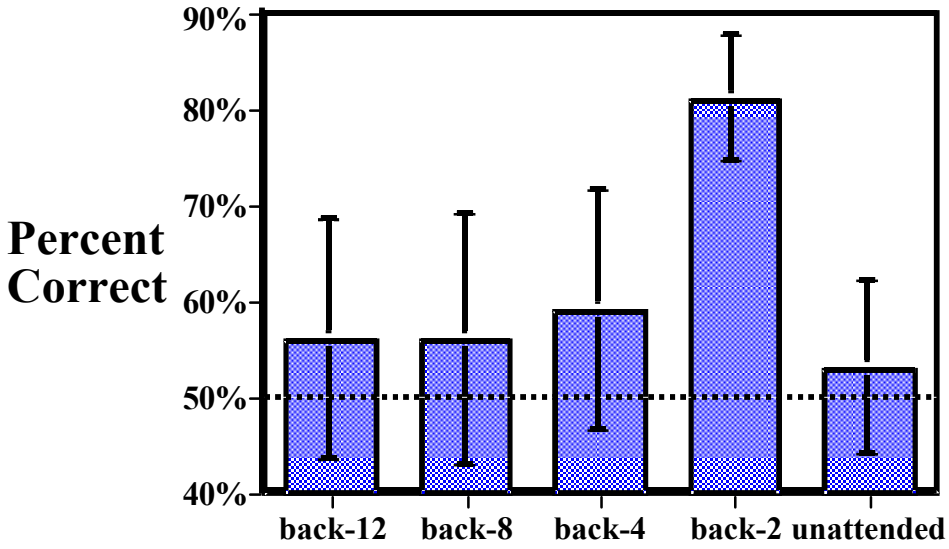
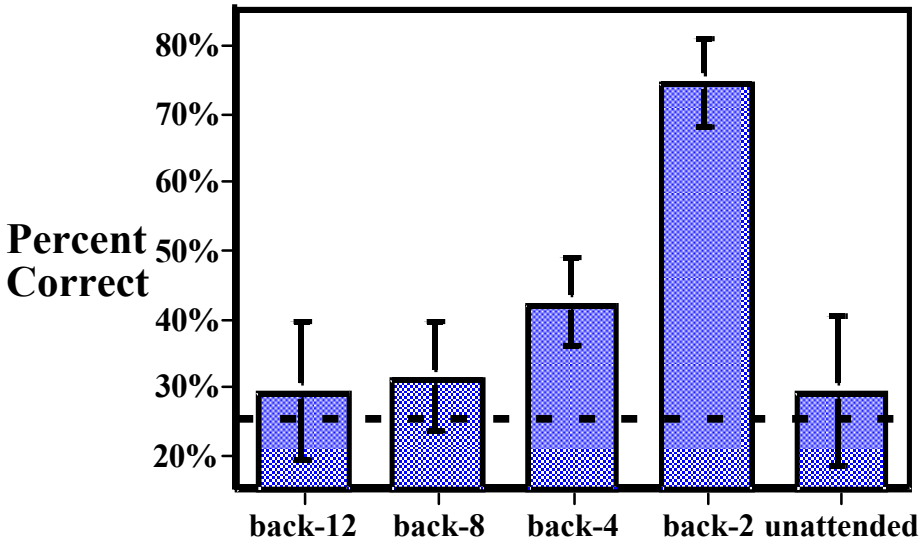


If the dot turns black, tell me the color that it WAS.

Results from a two-color version of the ISWAS exp.



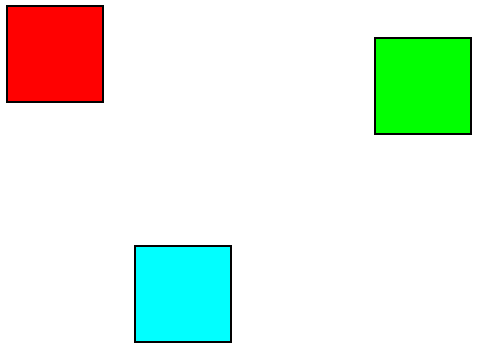
Results from a four-color version of the ISWAS exp.



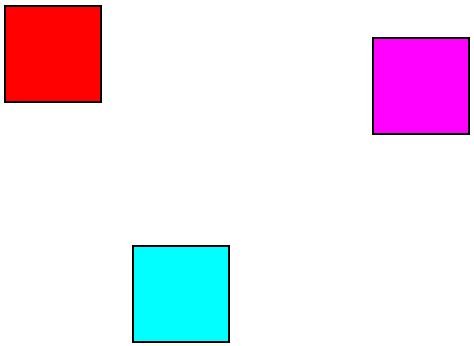
Visual Short Term Memory

How big is it?

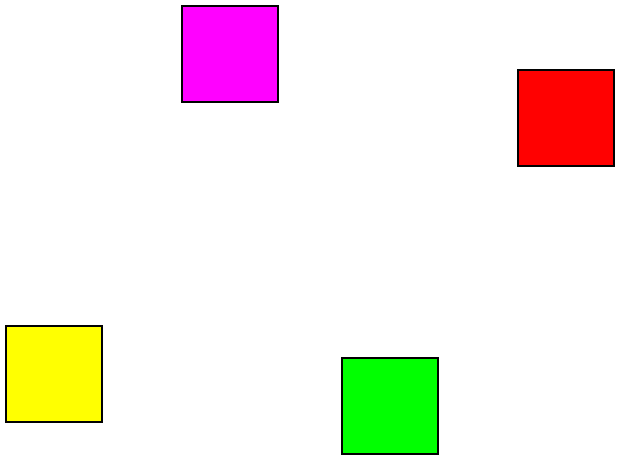
Remember these



Did anything change?



Remember these



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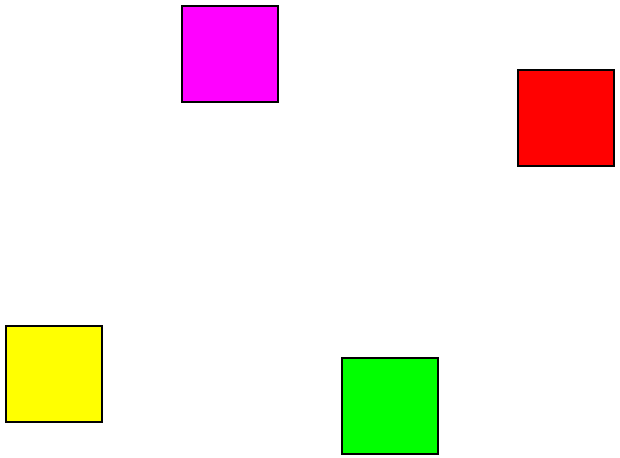
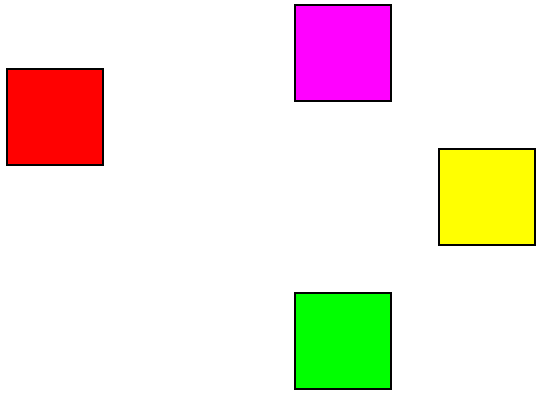
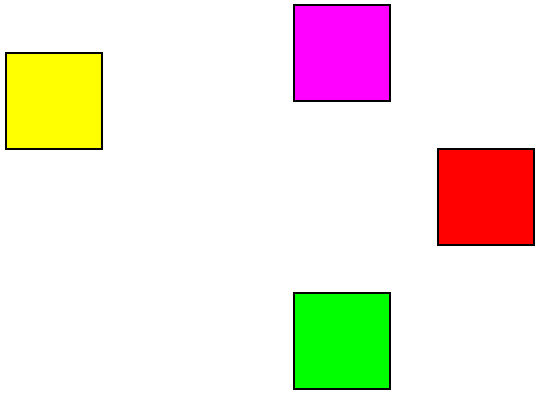


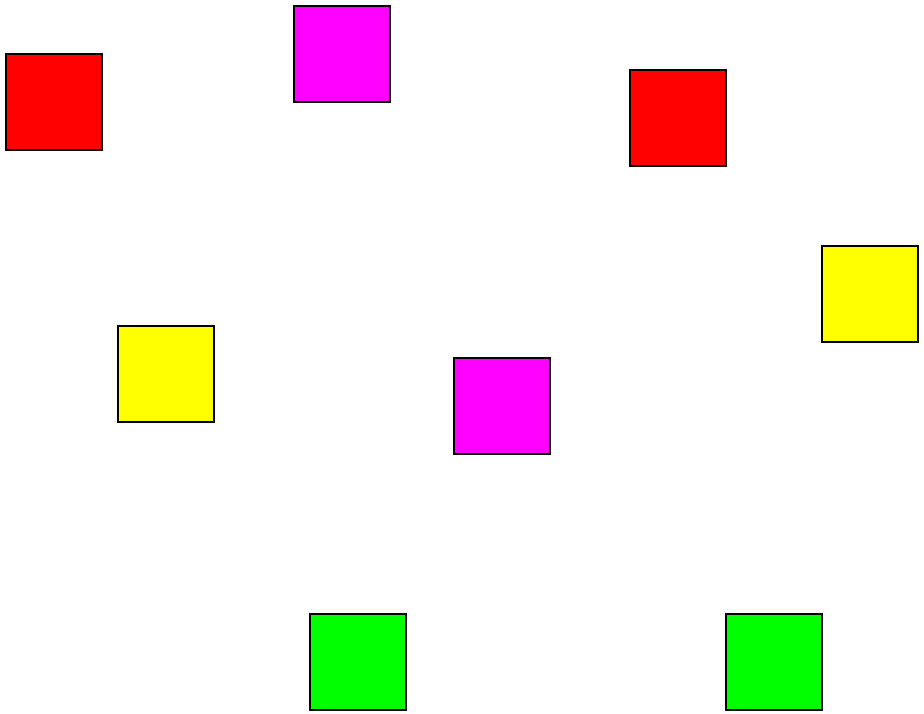
Remember these



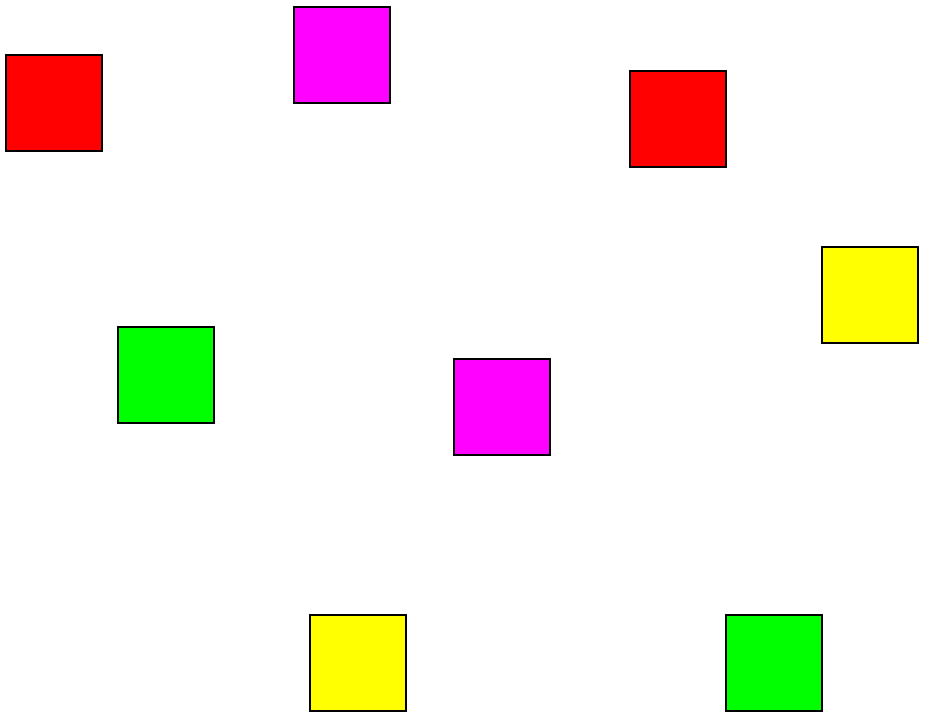
Did anything change



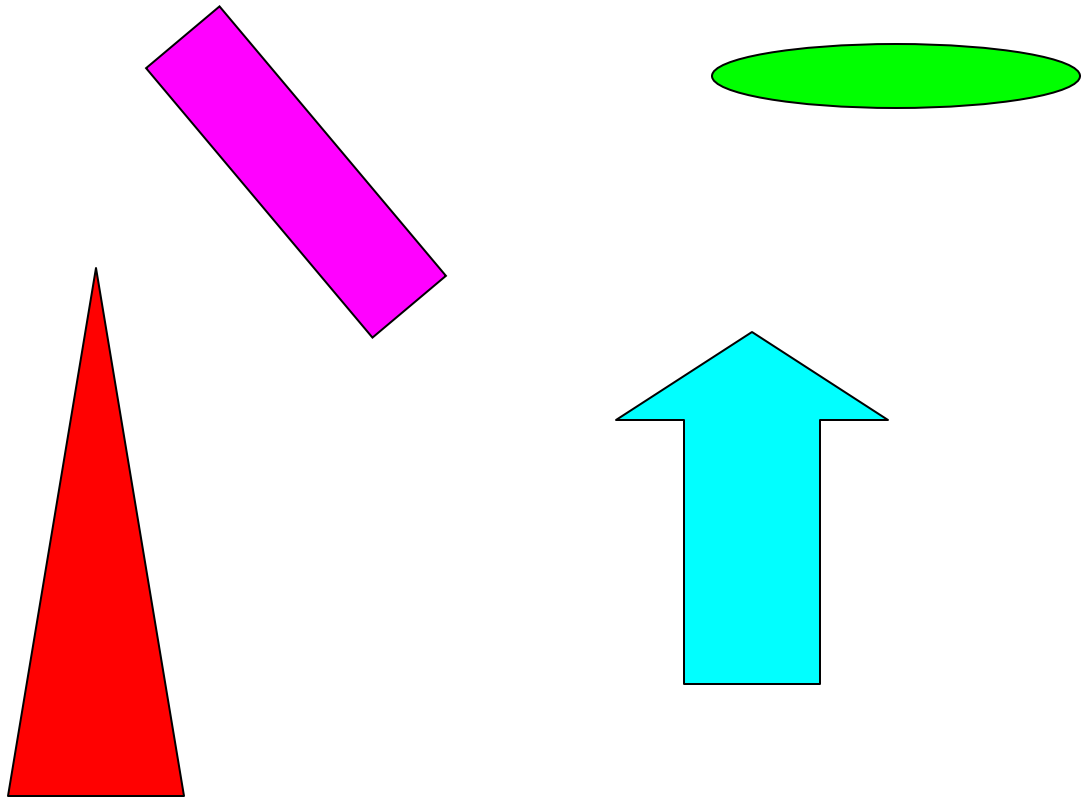
How about now



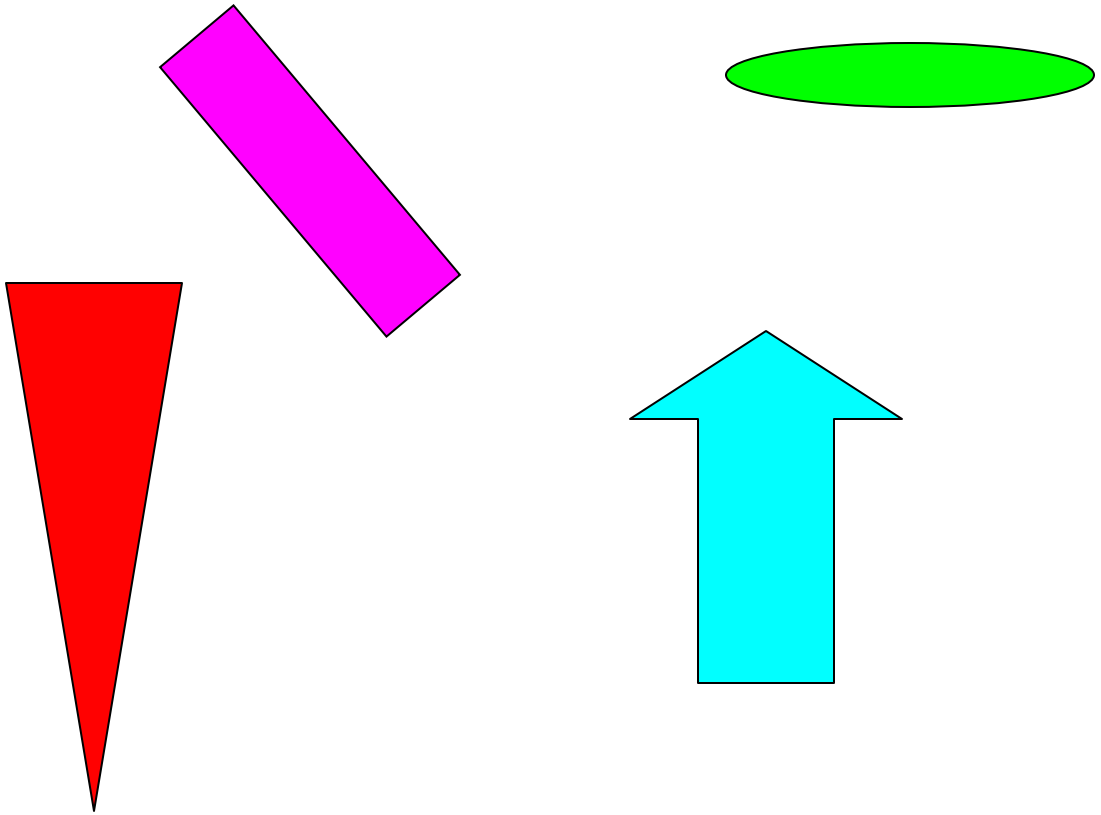
Any change?



What if we combine color, shape and orientation?



What if we combine color, shape and orientation?



Note: That is 4 objects but 12 features.

How much do we *really* see?

Change Blindness:

What are you really seeing right now?

Image of painting removed for copyright reasons.

What changed?

Image of painting (slightly different than previous slide) removed for copyright reasons.

Go back

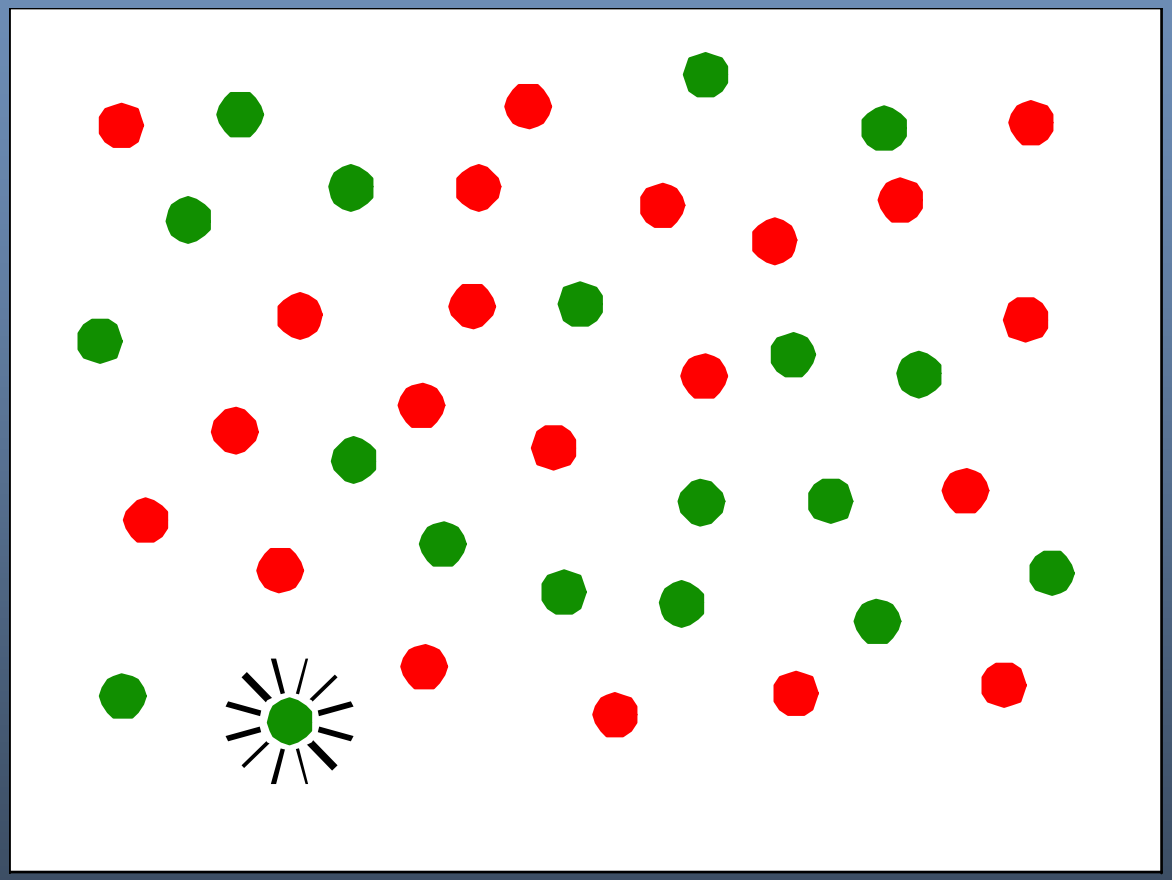
Change Blindness:

Low level visual transients attract attention.

Image of painting removed for copyright reasons.

See?

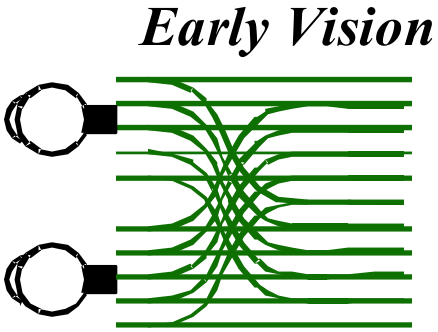
Image of painting (slightly different than previous slide) removed for copyright reasons.



Why are we so bad at this?

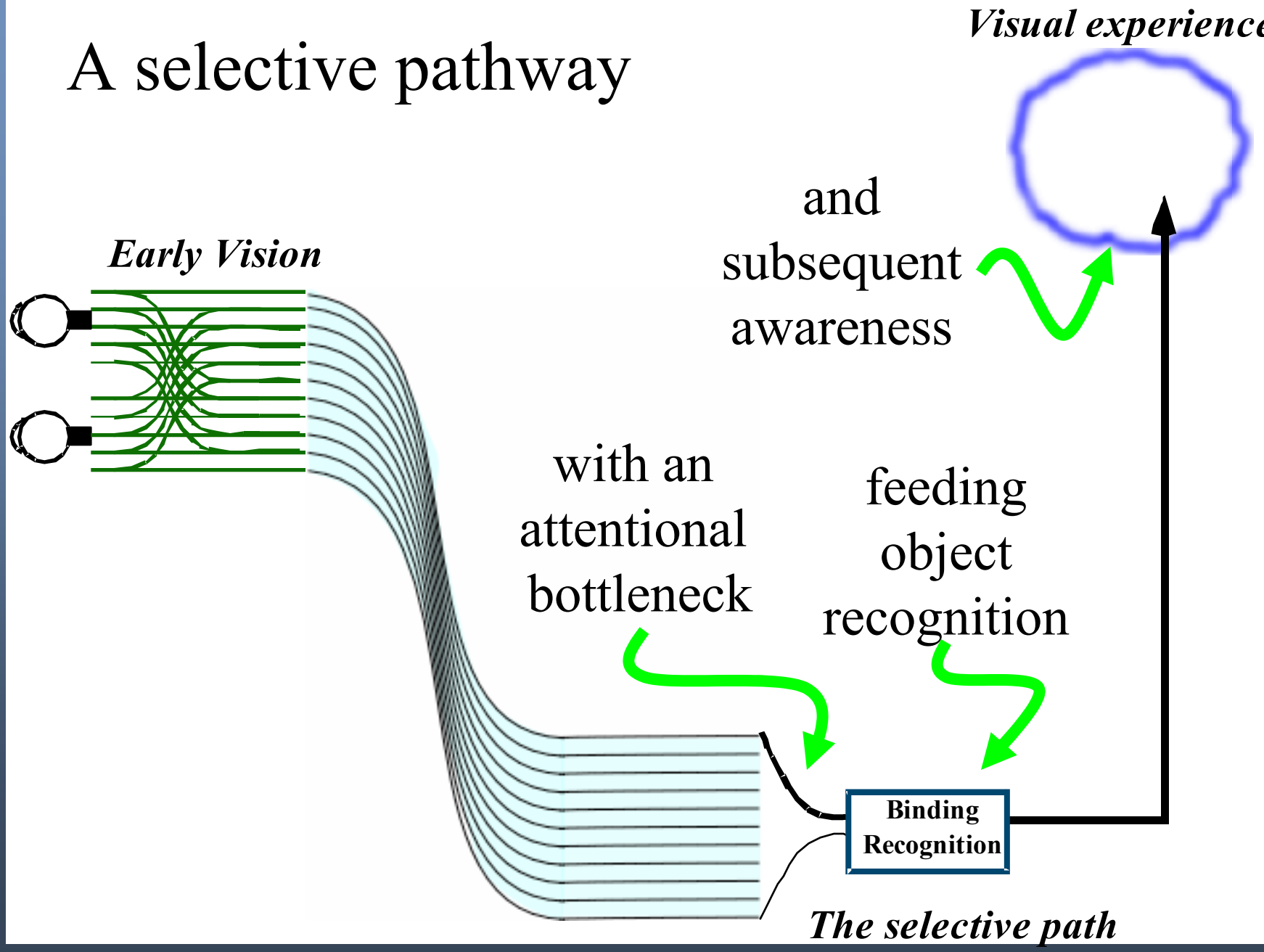
And why are surprised that we are so bad?

The answer lies in the architecture of visual processing.

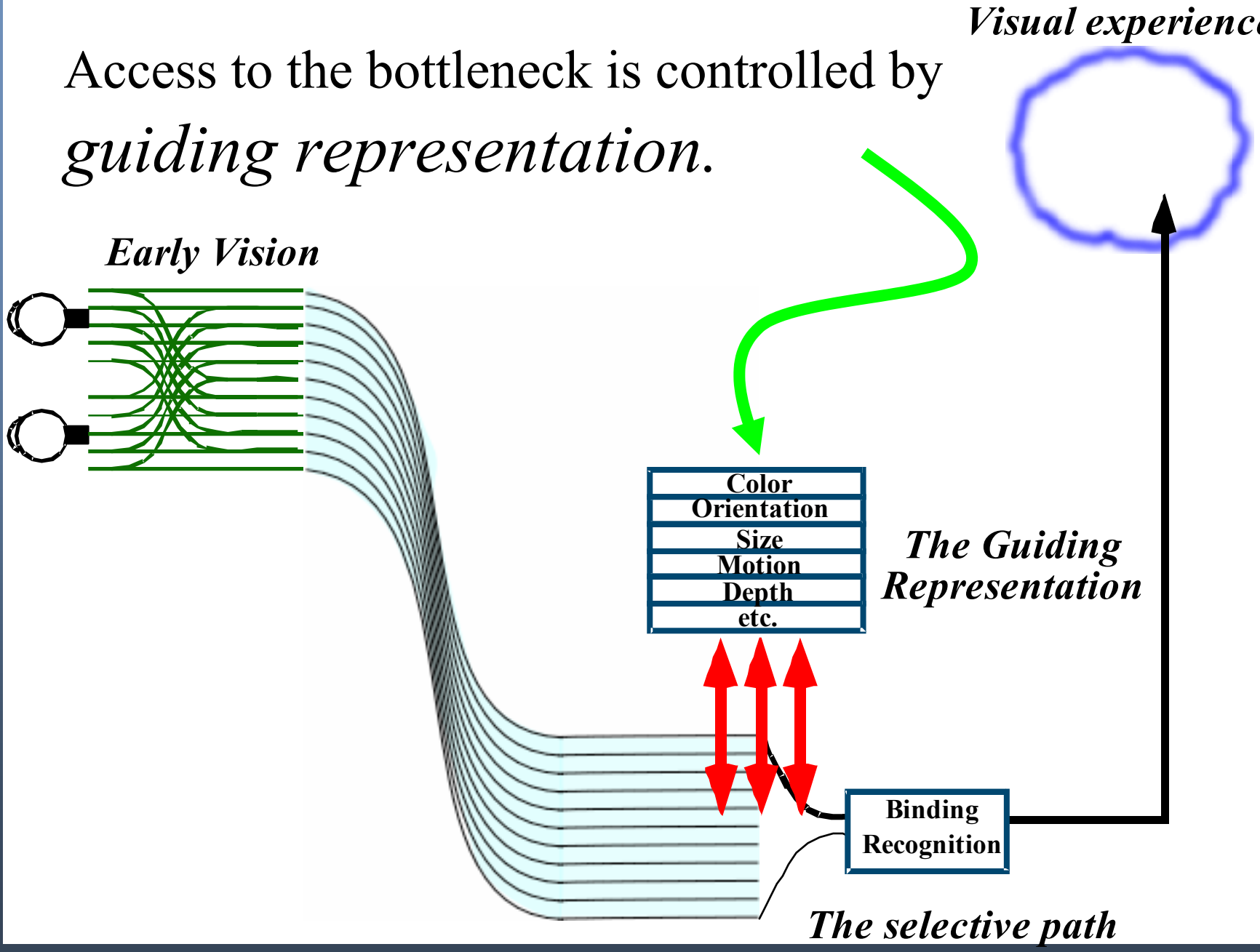


Recognition of objects (and their color) starts when early visual processes feed a selective processing pathway.

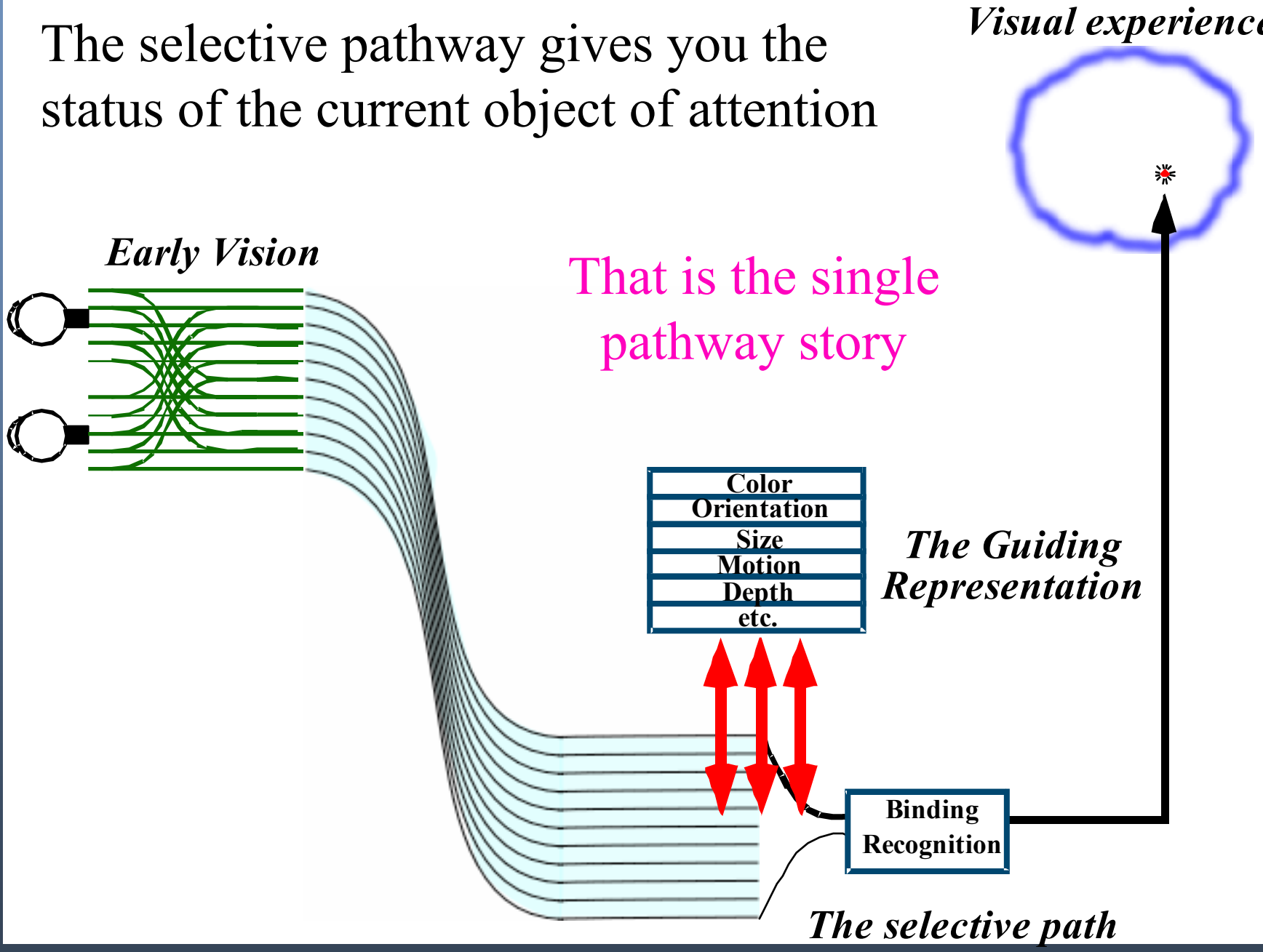
A selective pathway

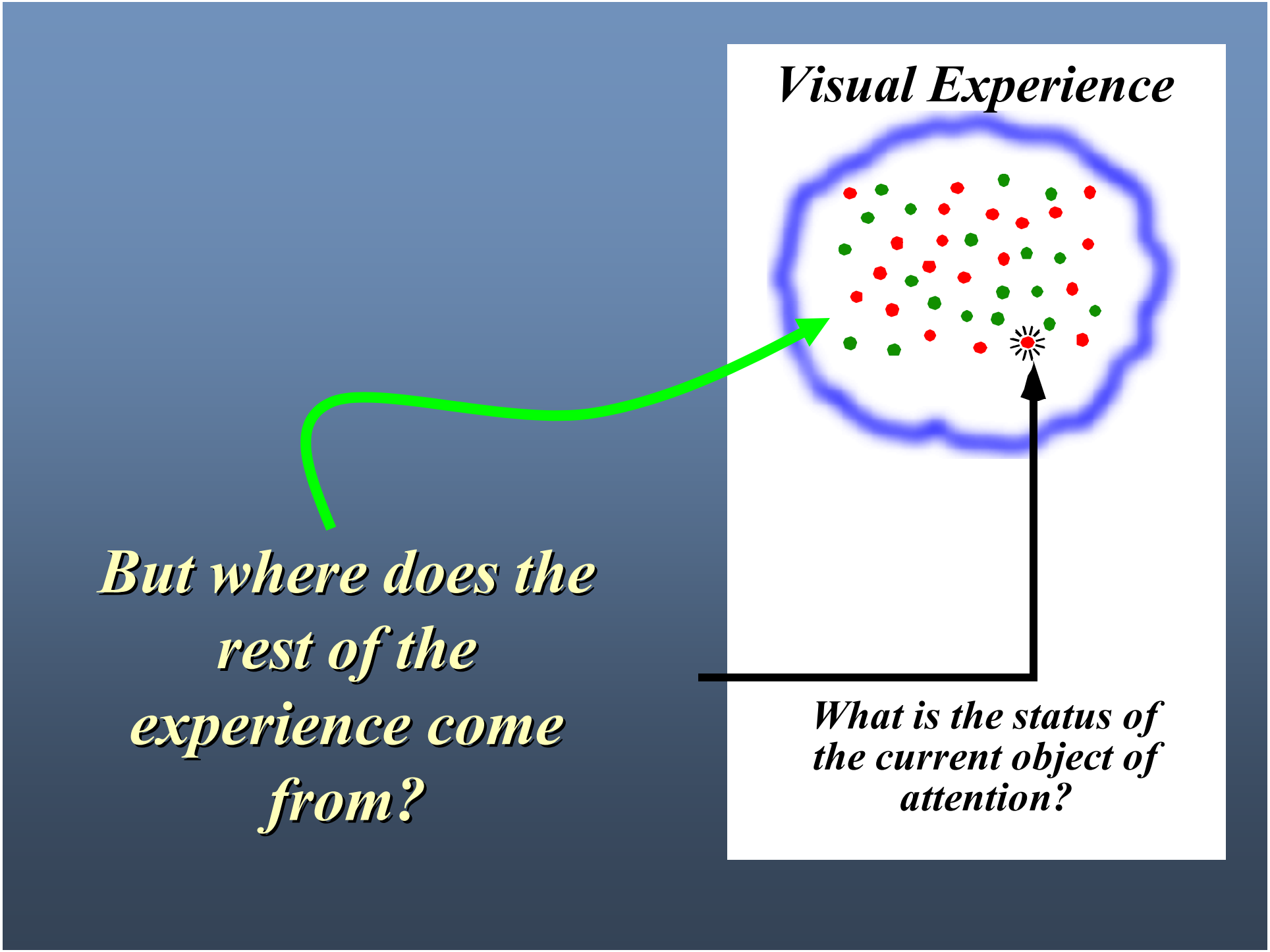


Access to the bottleneck is controlled by *guiding representation.*

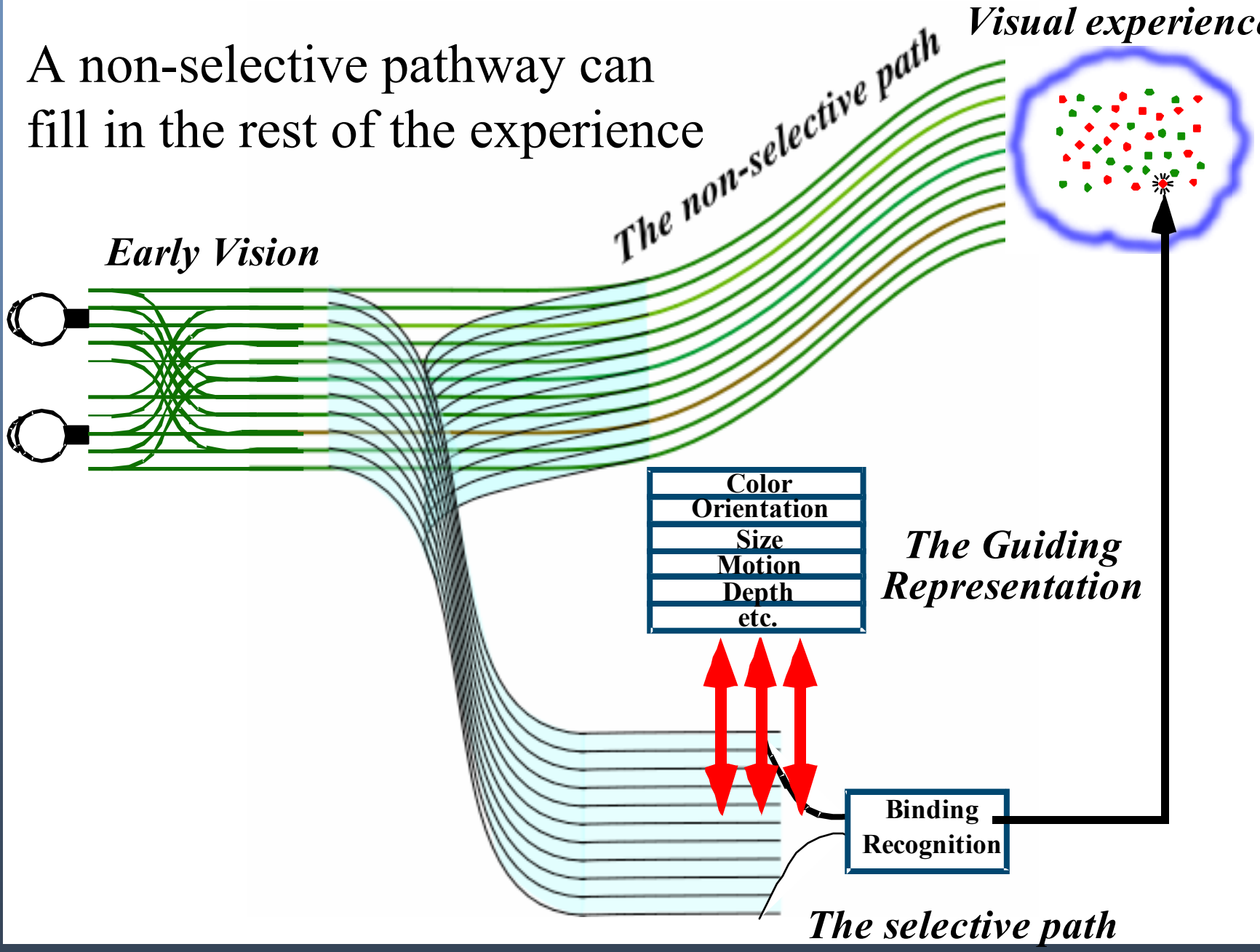


The selective pathway gives you the status of the current object of attention

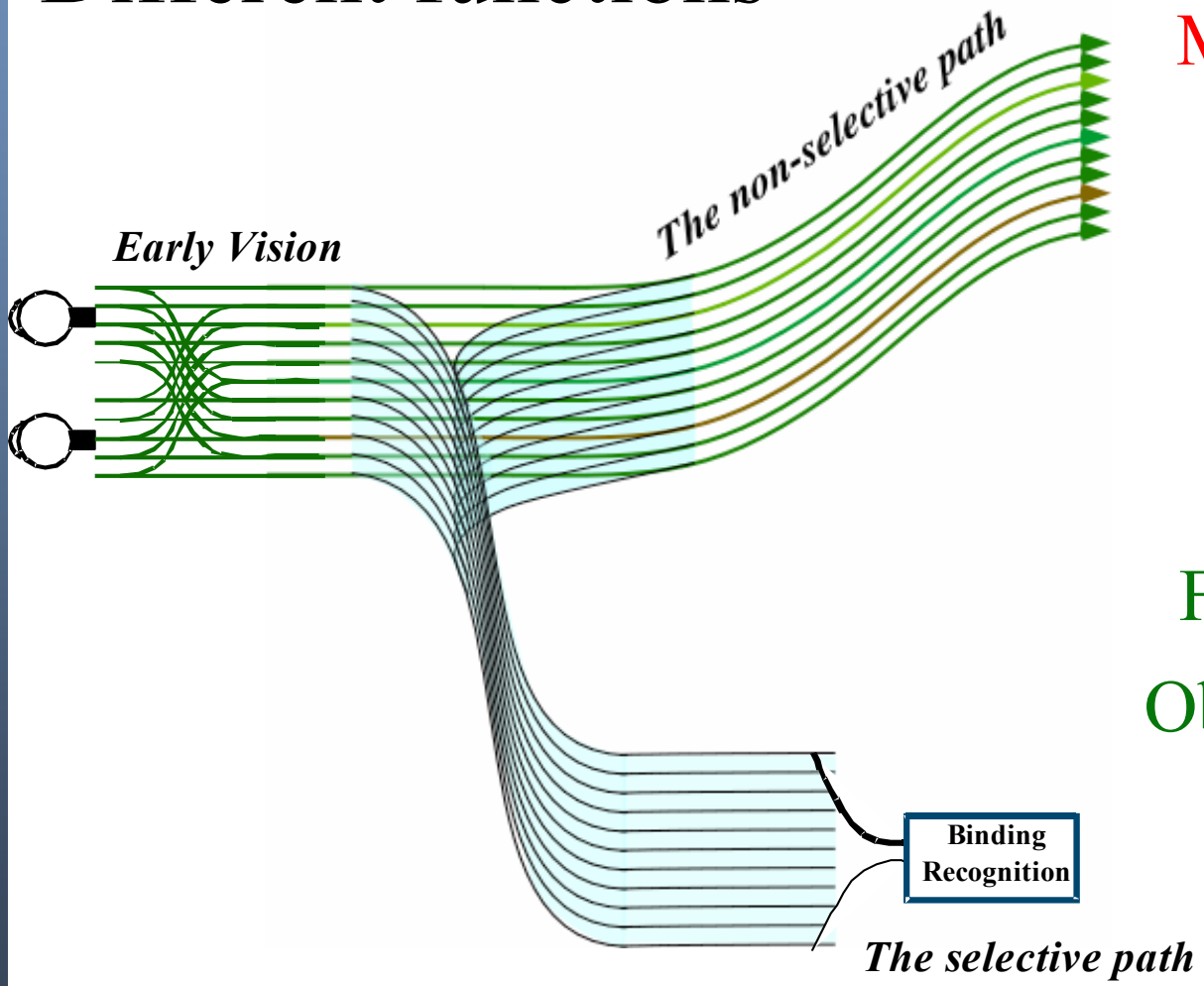



Visual Experience
But where does the rest of the experience come from?
What is the status of the current object of attention?

A non-selective pathway can fill in the rest of the experience



Different pathways, Different functions



Texture statistics

Minimal semantic analysis

Ambient visual experience

Feature binding

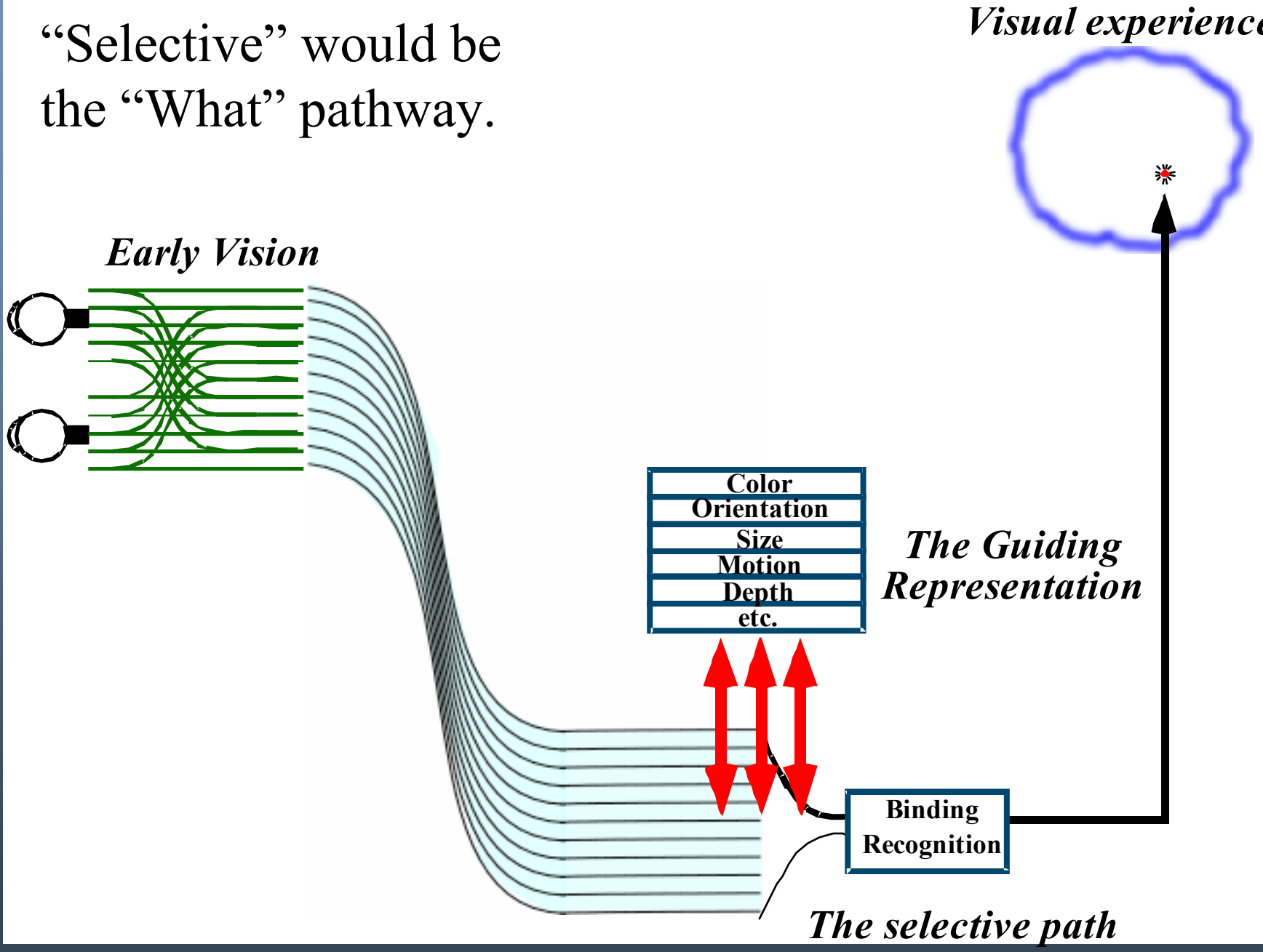
Object recognition

Focal visual experience

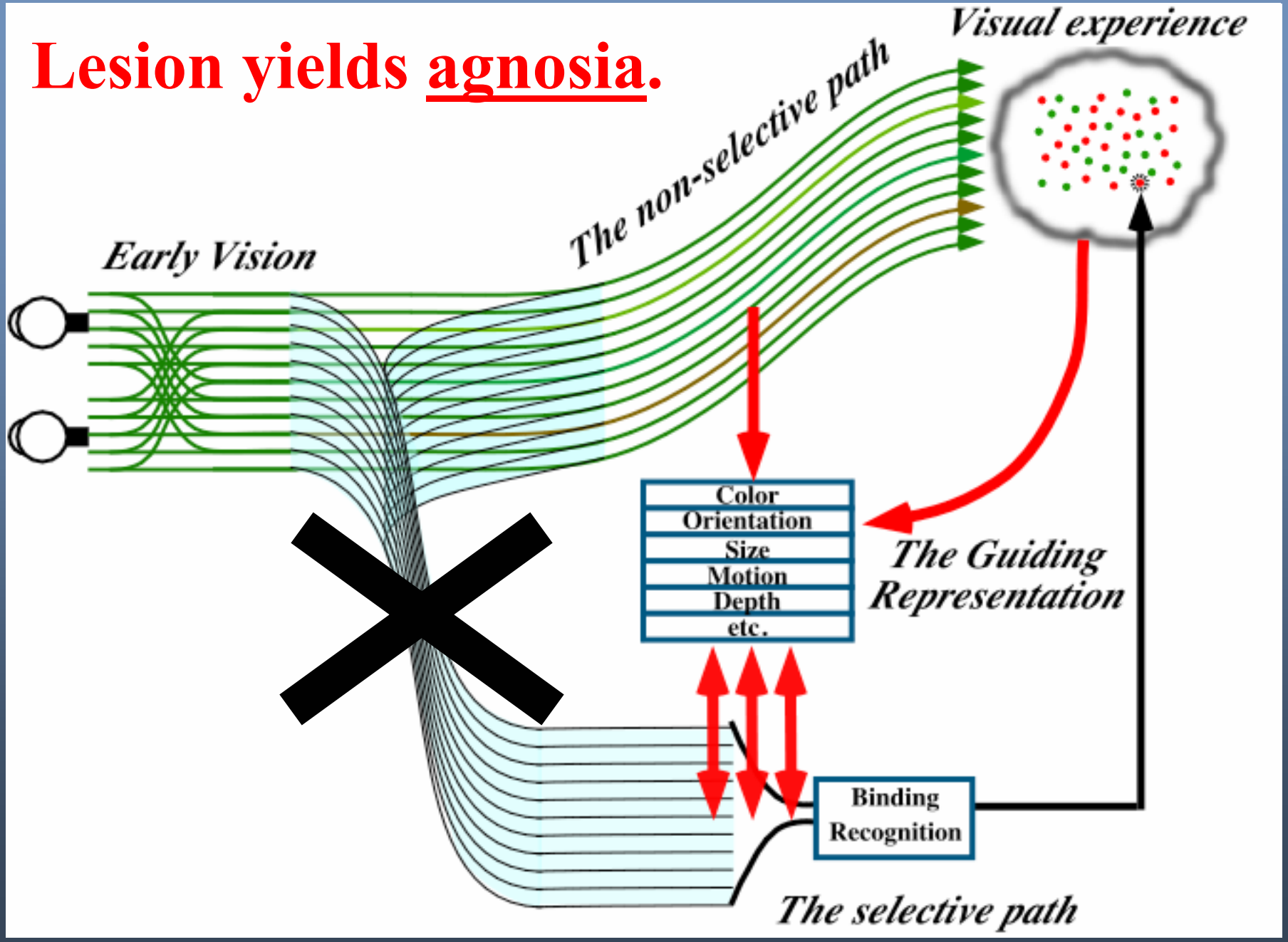
Relationship to other things you know

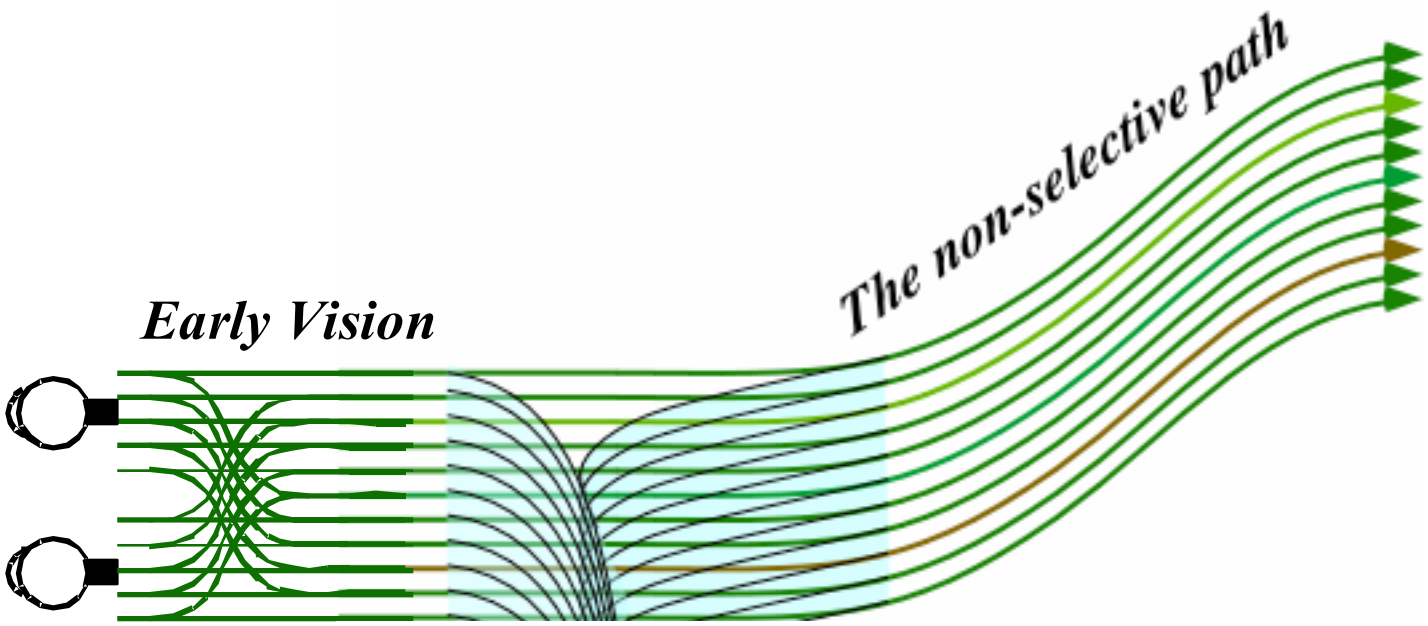
Remember the What vs Where idea?

"Selective" would be the "What" pathway.



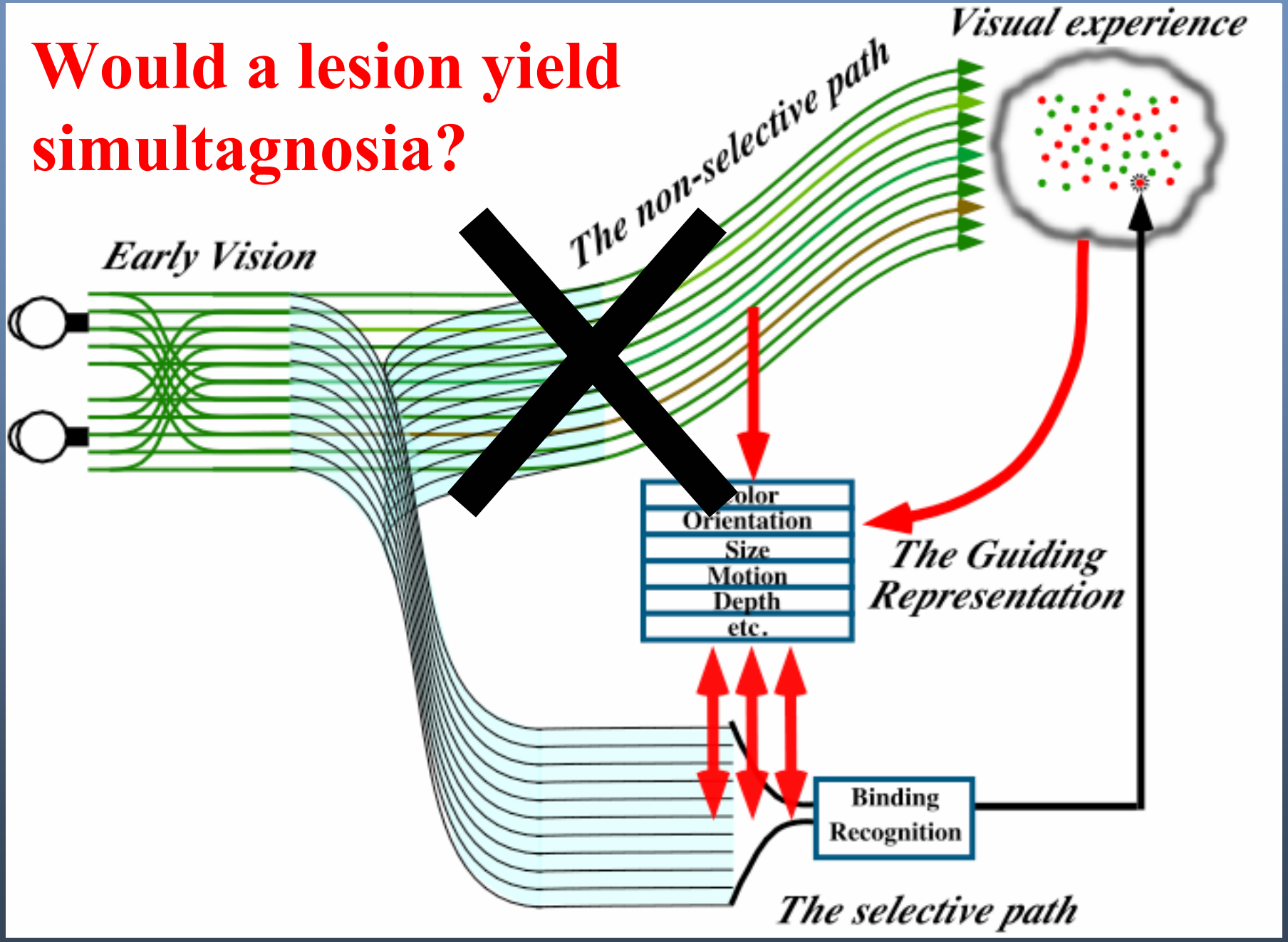
Lesion yields agnosia.



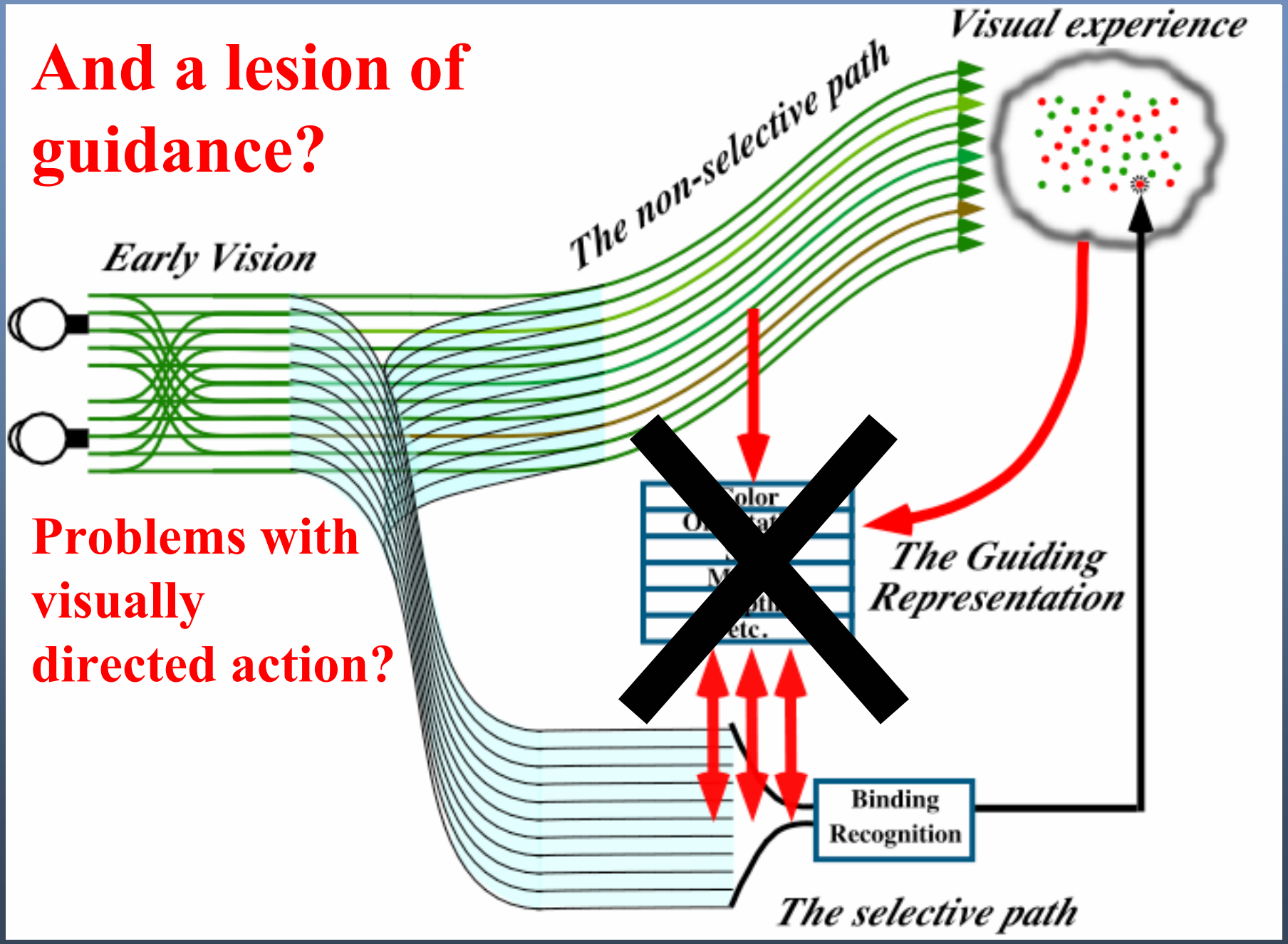


Non-selective pathway would map onto the "Where" pathway.

Would a lesion yield simultagnosia?



And a lesion of guidance?



Problems with visually directed action?