

# On the design of the G-section signs of the Convention using the “nesting and stacking” technique



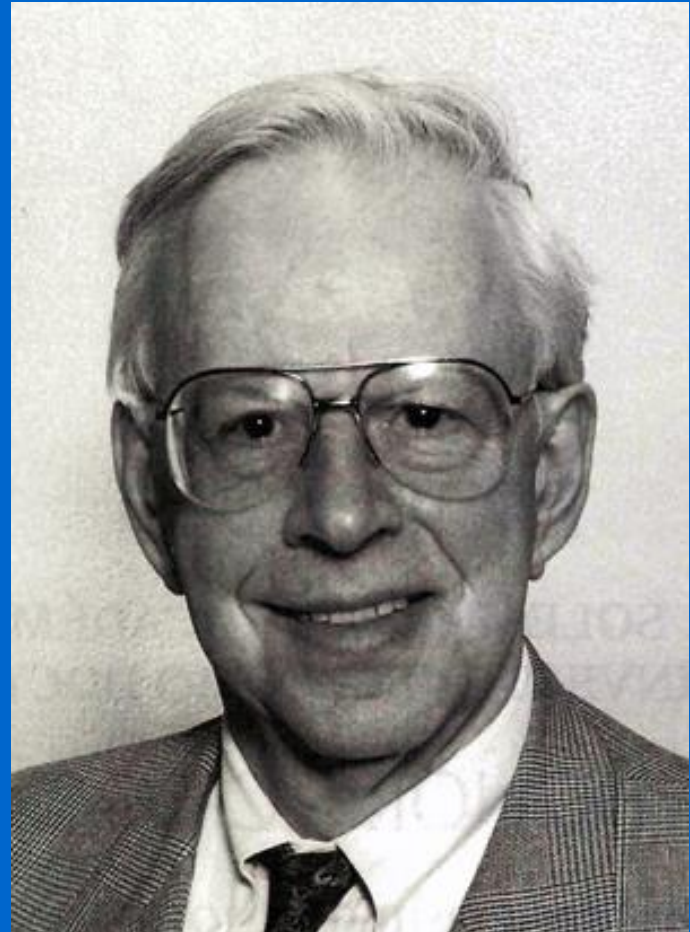
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Ana Hernando,  
M<sup>a</sup> Teresa Blanch*



*Universidad de Zaragoza, Spain*

# Philip N. Johnson-Laird

- *Professor at Princeton University's Department of Psychology*
  - *1983: Mental Models. Toward a Cognitive Science of Language, Inference and Consciousness.*
  - *2006: How we reason*



# Discourse comprehension: 3 phases

1. There is an **utterance** coded into a phonemic or **graphic representation** (here, the judgement of an official engineer is coded into a road sign)
2. The driver codes that into a **propositional representation**, that is still similar to the information conveyed by the road sign. But there are two types in the 1968 VC:
  1. **Stacked signs** (“translated”, verbal like)
  2. **Diagram signs** (“recognized”, map like)
3. There is a **Mental Model** build up to confirm what has been understood. For some sign to be true, this should be the mental model of the world that holds

# Helping international drivers' expectations and interpretation of complex traffic signs

- **Anticipation**: a prior action that takes into account or forestalls a later action
- **Prospect**: a mental picture of something to come
- **Scheme**: a systematic or organized configuration
- ...



# Simple and complex signs, and signs that are bad altogether (?)

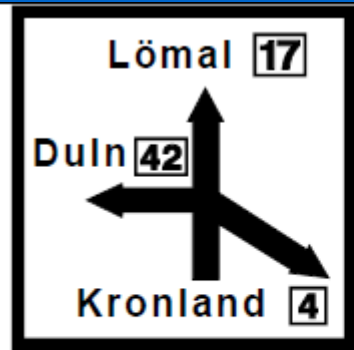
## Hiper-complex stacked



## Hiper-complex diagrammed



# Departure point: footnote on page 51 of the 1968 Convention



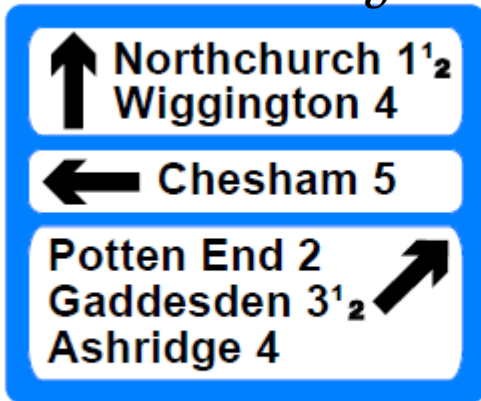
G, 1<sup>a</sup>

*diagramming*



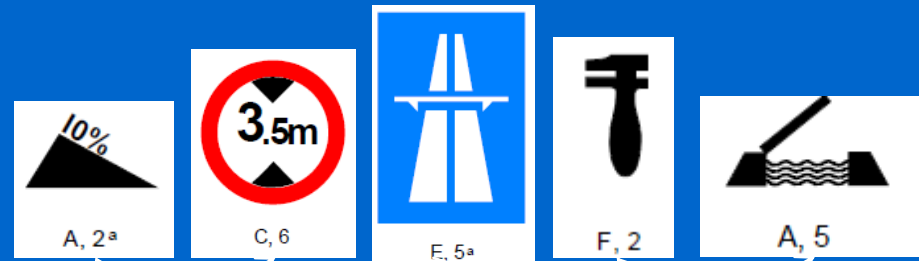
G, 1<sup>b</sup>

*stacking*



G, 1<sup>c</sup>

How?



permanent

changeable; variable

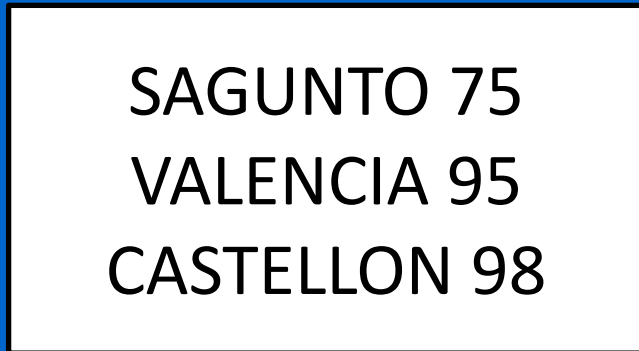
NOTE: Advance direction signs G, 1 **may bear** the symbols used on other signs informing road users of the characteristics of the route or of **traffic conditions** (for example: signs A, 2; A, 5; C, 3e; C, 6; E, 5a; F, 2).





# TWO EVOLVING STRATEGIES (I)

*“They were walking together”*



*“She was walking by his left”*



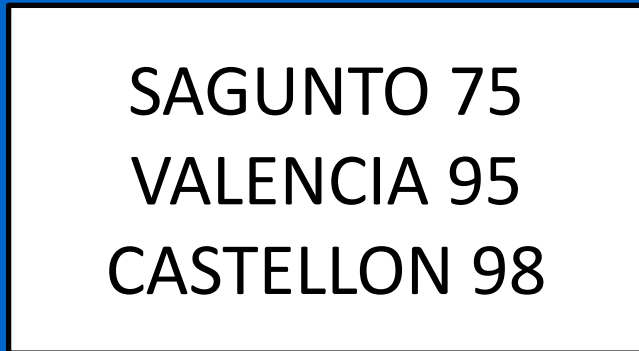
- Stacked information
- Propositional verbal-like representations
- Spatial **indeterminacy**
- **COMFORT**

- Diagrammed information
- Images-Mental Models
- Spatial **determinacy**
- **ACTION**

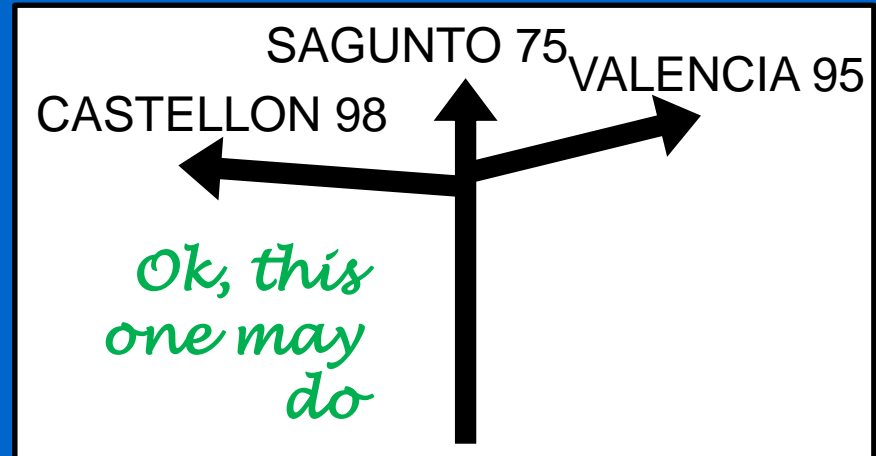


# TWO EVOLVING STRATEGIES (I)

*“They were walking together”*



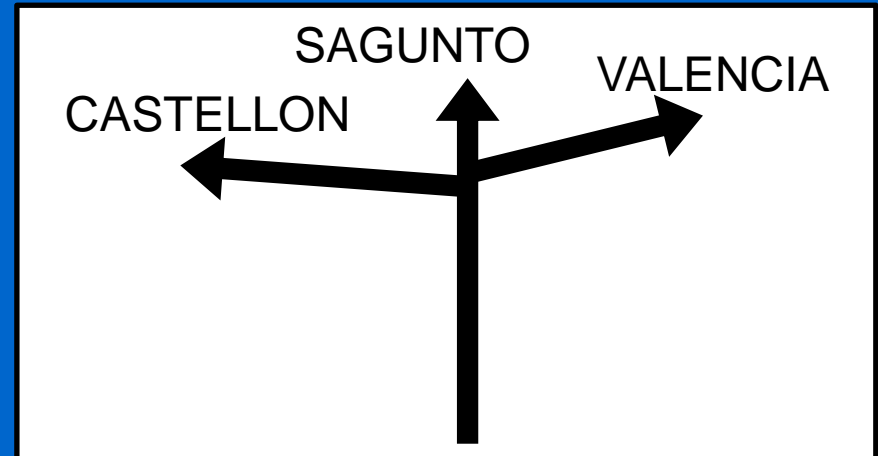
*“She was walking by his left”*



- Stacked information
- Propositional verbal-like representations
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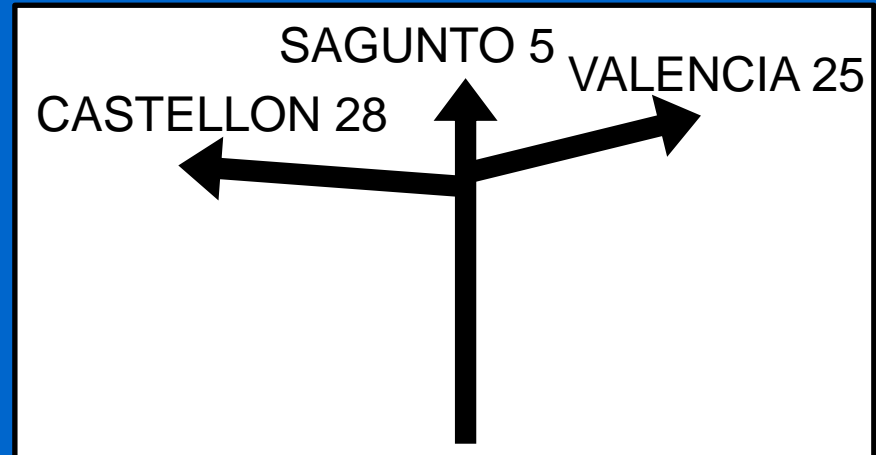
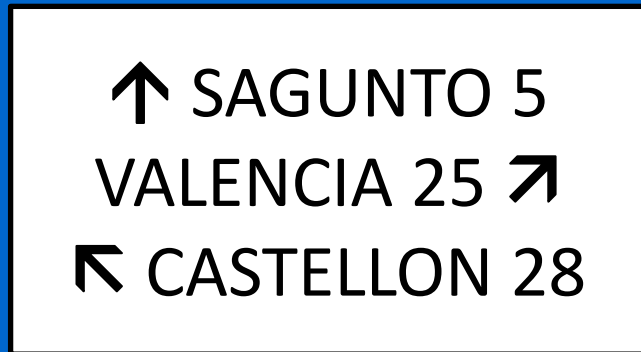
# TWO EVOLVING STRATEGIES (II)



- Stacked information
- Propositional verbal-like representations
- Spatial **determinacy**
- **ACTION**

- Diagrammed information
- Images-Mental Models
- Spatial **determinacy**
- **ACTION**

# TWO EVOLVING STRATEGIES (III)

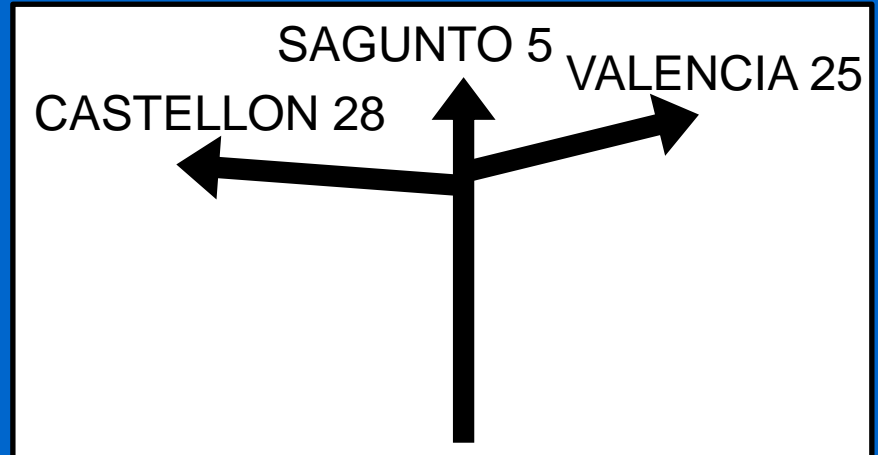
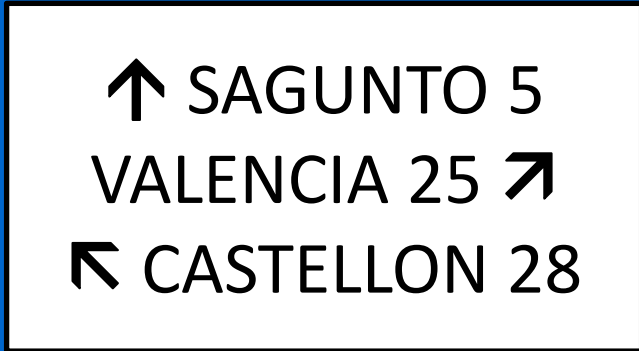


- Stacked information
- Propositional verbal-like representations
- Spatial **determinacy**
- **ACTION**

- Diagrammed information
- Images-Mental Models
- Spatial **determinacy**
- **ACTION**



# TWO EVOLVING STRATEGIES (IV)

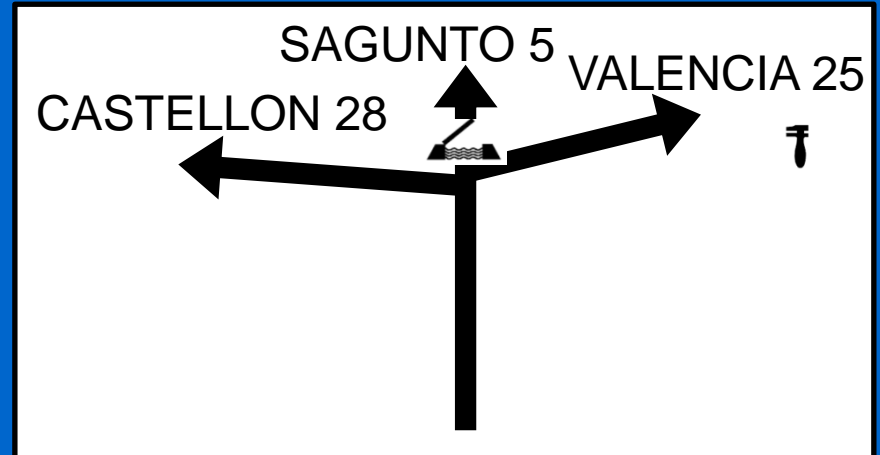
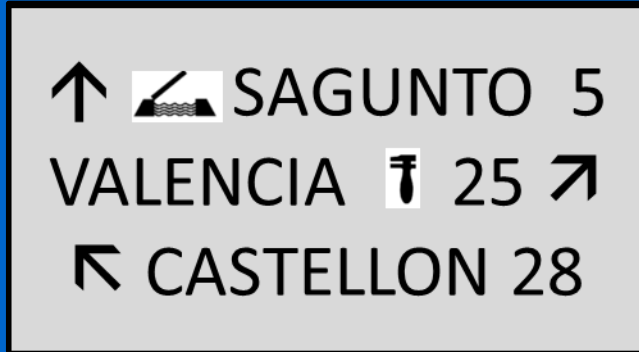


- Stacked information
- Propositional verbal-like representations
- Spatial **determinacy**
- **ACTION**

- Diagrammed information
- Images-Mental Models
- Spatial **determinacy**
- **ACTION**



# TWO EVOLVING STRATEGIES (IV)



- Stacked information
- Propositional verbal-like representations
- Spatial **determinacy**
- **ACTION**

- Diagrammed information
- Images-Mental Models
- Spatial **determinacy**
- **ACTION**

# Some conclusions

## Stacked signs

- It is not clear where to place the additional event in the stacked panel:
  - Before city
  - After city
  - Between city and distance
  - Etc.
- But stacking information needs less surface on the panel

## Diagrammatic signs

- It is easy to know where to place the additional event, service, traffic issue and the like
- The problem is that we need more space on the panel... or we need to focus on just one part of the diagram



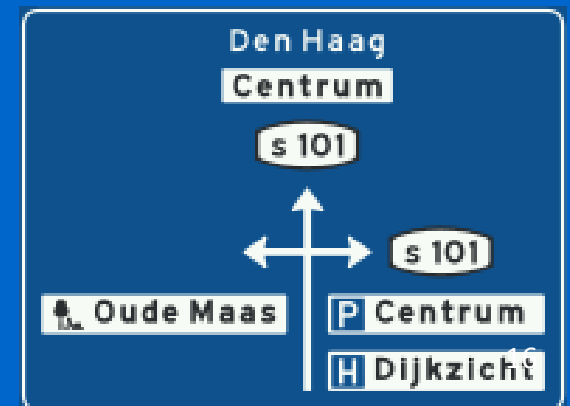
# Some examples

# G, 1 signs Netherlands

## Stack



## Diagrammatic



# G, 1 signs Norway

New arrows

Stack



Indeterminacy perhaps useful?



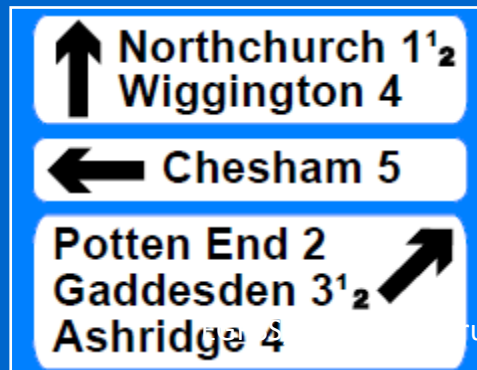
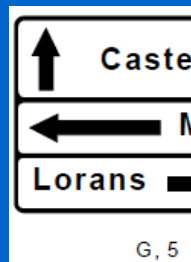
Diagrammatic

New arrows



how many elements per stack?

3 stacks



# G, 1 signs Sweden

## Stack

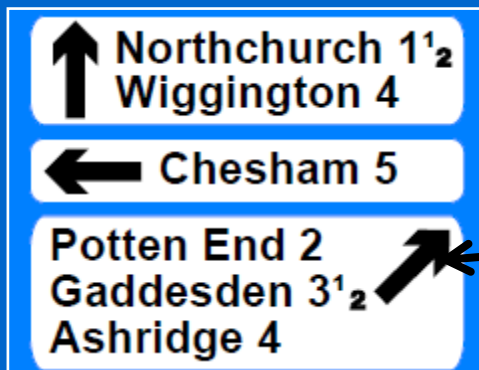


Same  
arrows

## Diagrammatic



## 3 stacks



Differing  
arrows



# Where to place additional information? Why?

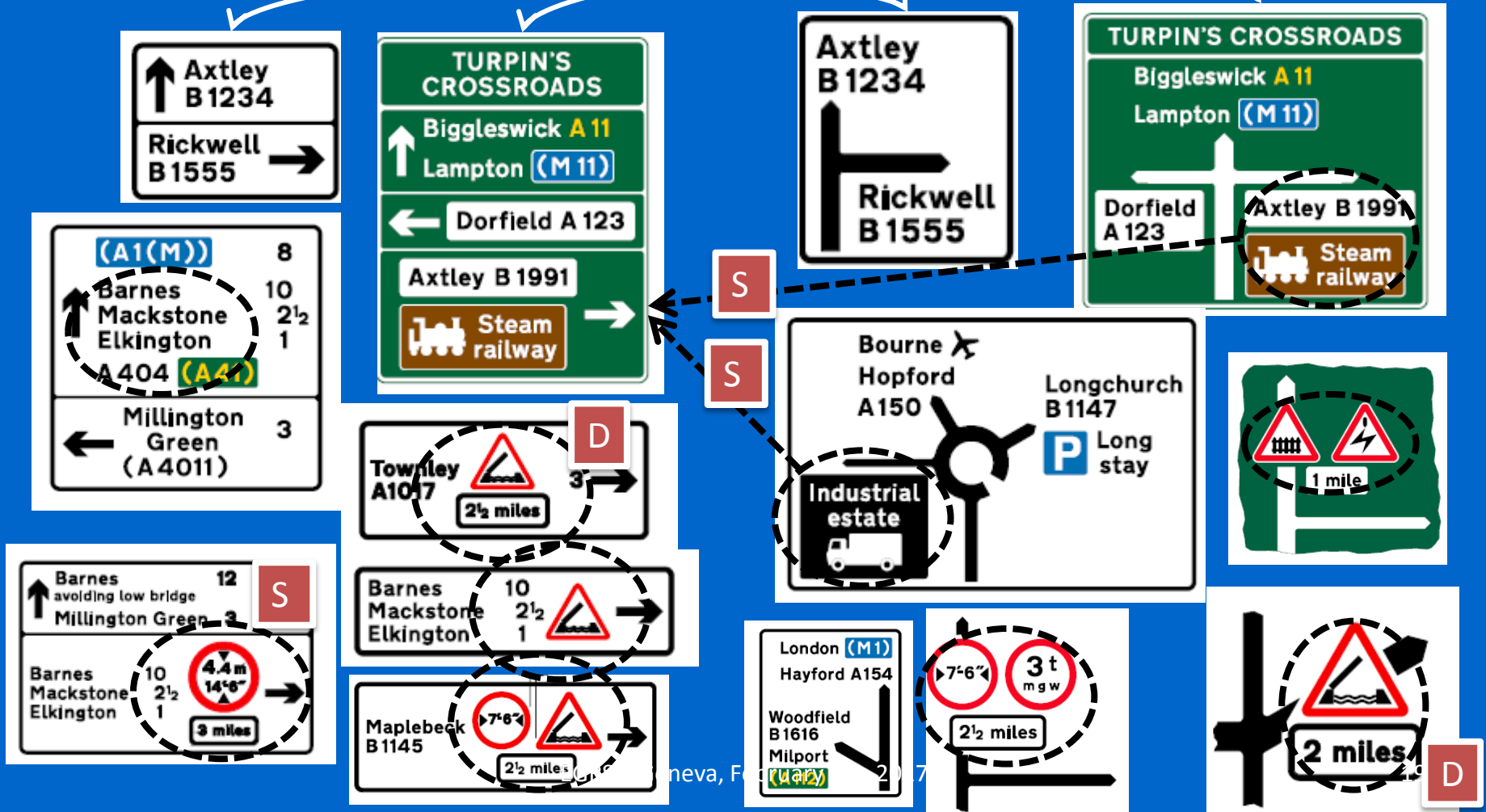
3 stacks

# G, 1 signs UK

S = stacking  
D = diagrammatic

## Stack

## Diagrammatic



# Two tools for communicating

## Stack road signs

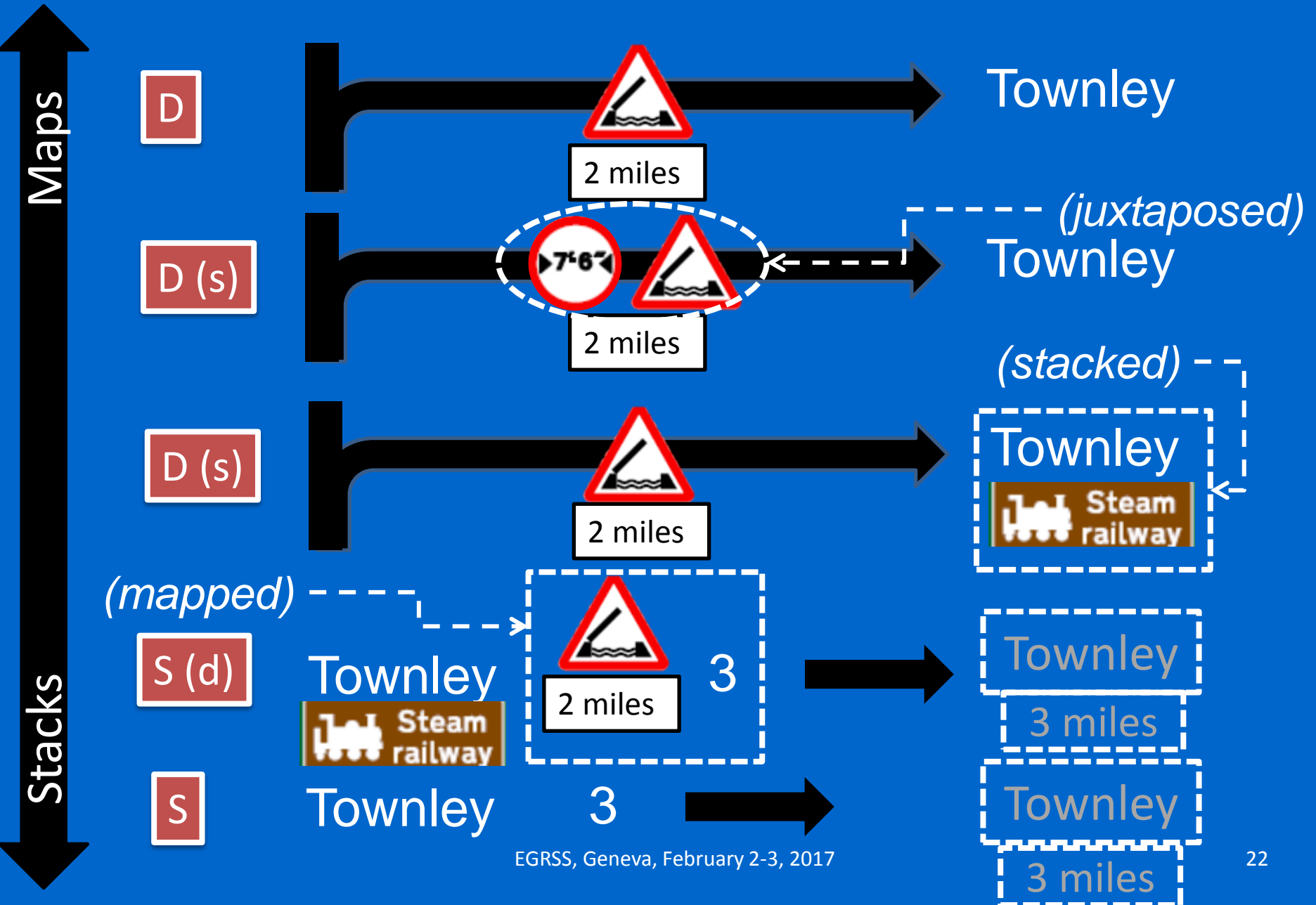
- *[Propositional representations]*
- Drivers don't know their **syntax structure** (the structure that give sense to the elements on the sign) it is not clear, must be inferred

## Diagram road signs

- *[Mental Models]*
- Drivers know their syntax structure because diagrams/maps are structural analogues of reality, so the syntax structure is clear, and can be easily recognized



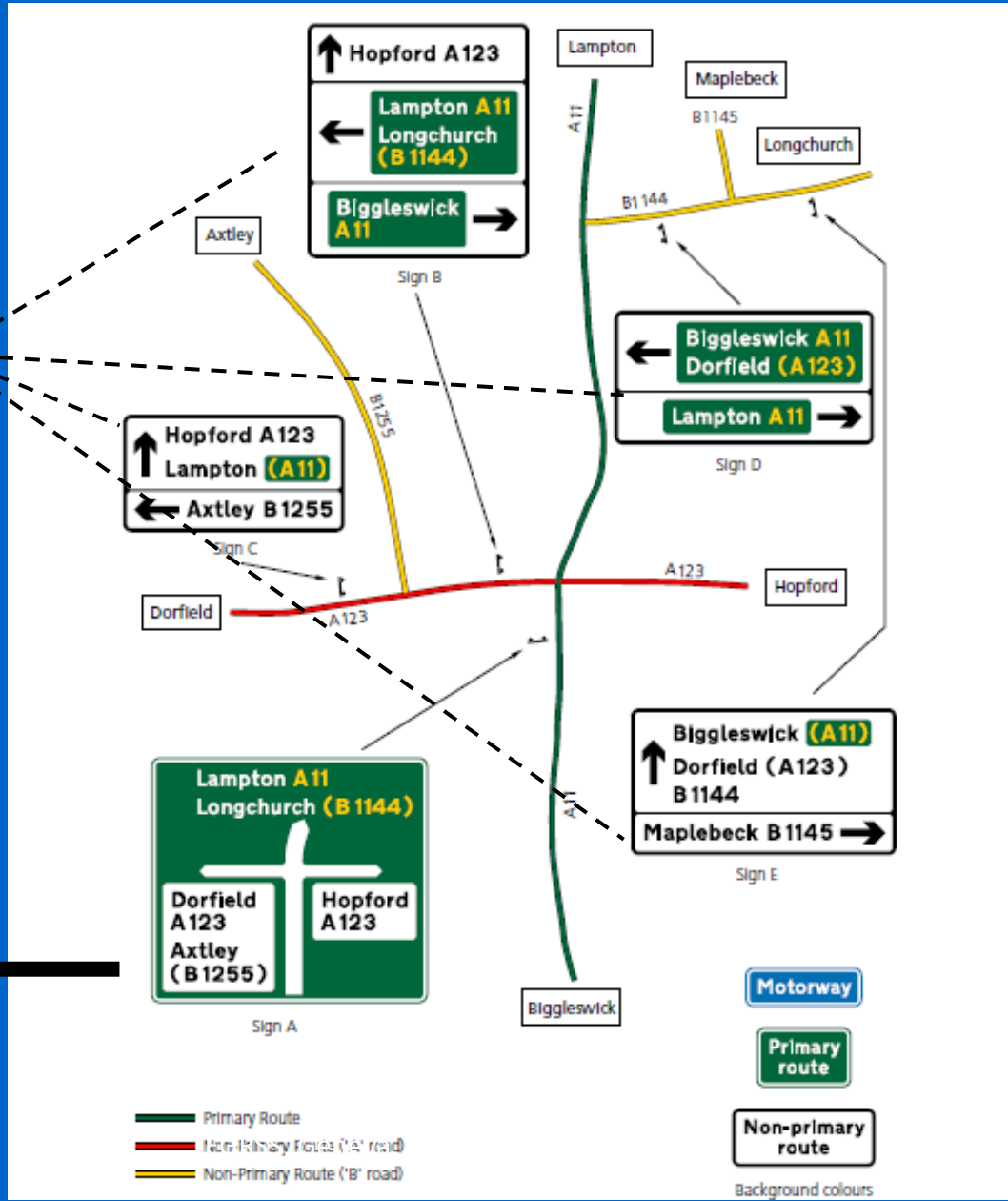
# Diagrams - Stacks nesting



# G, 1 signs (UK)

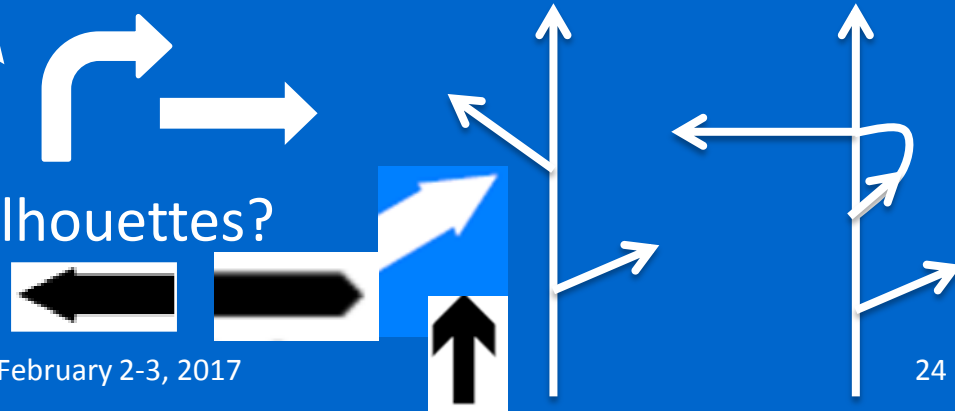
...to non primary routes (a, b) showing stacks

From primary routes picturing places in diagrams...



# Elements on G, 1c: overview

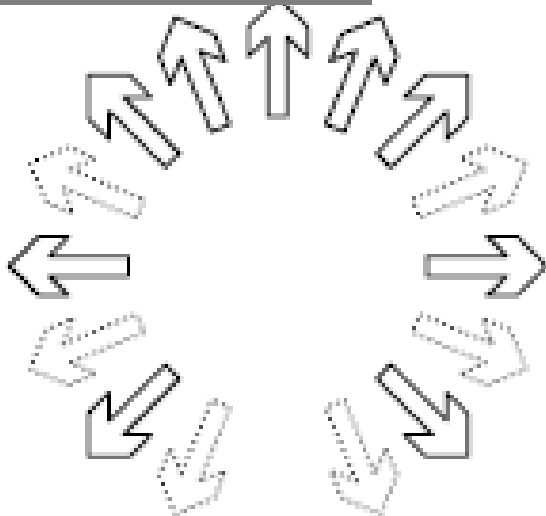
- Number of stacks 1 to n (max. 4) “the no more than 3 stacks rule”
- How many locations per stack? 1 to n (max. 4) “no more than 6 elements overall rule”
  - Always placing miles/kilometers: depends on desire for (in)determinacy
- Where to place the arrow indicating advance direction:
  - Arrows placed in coincidence with real directions? (next page)
  - Arrows placed in panel in coincidence with exits to places?
  - Assign a fixed place for arrows (left, right) on panel?
- Which type of arrow to indicate direction of exit:
  - Straight vs bended
  - Which arrow head?
- Where to place the symbols/silhouettes?
- How many per stack?



# Play with arrow angles for an easier recognition and differentiation

4.5 Figure 4-5 shows how the arrow may be inclined to suit the direction being indicated. Arrows may be vertical or horizontal or at any angle between in increments of 22.5°. Arrows shown in broken outline are used only in special circumstances. A special arrow may be used to indicate U-turns (e.g. at a roundabout on a dual carriageway); further details are given in section 14.

“the 22.5° rule”



x. 4)  
k? 1 to n  
rs: Yes, ne  
dicating a  
with real di  
with exits to  
ht) mappin



(silhouett



True layout of junction 22.5°

This sign may reflect the true layout of the junction, but the two arrows are only 22.5° apart



Not true layout of junction but clear 45°

This arrangement is preferred as the two arrows are 45° apart and give clearer indication of the turning movements at the junction ahead

# Other parameters that count: overview

- Road type:
  - motorways
  - Rural, single lane roads
- Road section:
  - Info on main trunk
  - Info on exit, entrances, nodes, roundabouts
- Trip goals:
  - From A to B (long trips)
  - Short stops
  - Diversion, detours to B

To be continued...



# THANKS FOR YOUR ATTENTION

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**Universidad  
Zaragoza**