

# Animation

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FIT3179 Data Visualisation

# Animation

Latin animare = “to bring life”

**Sequences** of static graphic depiction (frames), the graphic content of which, when shown in rapid succession, begins **moving in a fluid motion**.

# Types of Animation

## Temporal animation

- Shows change of spatial patterns in time
- Direct relation between display time and world time
- Transition between frames implies change in location or change in attributes of shown spatial data

### Examples:

- maps (weather, wildfire spread, etc.)
- temporal attributes in diagrams

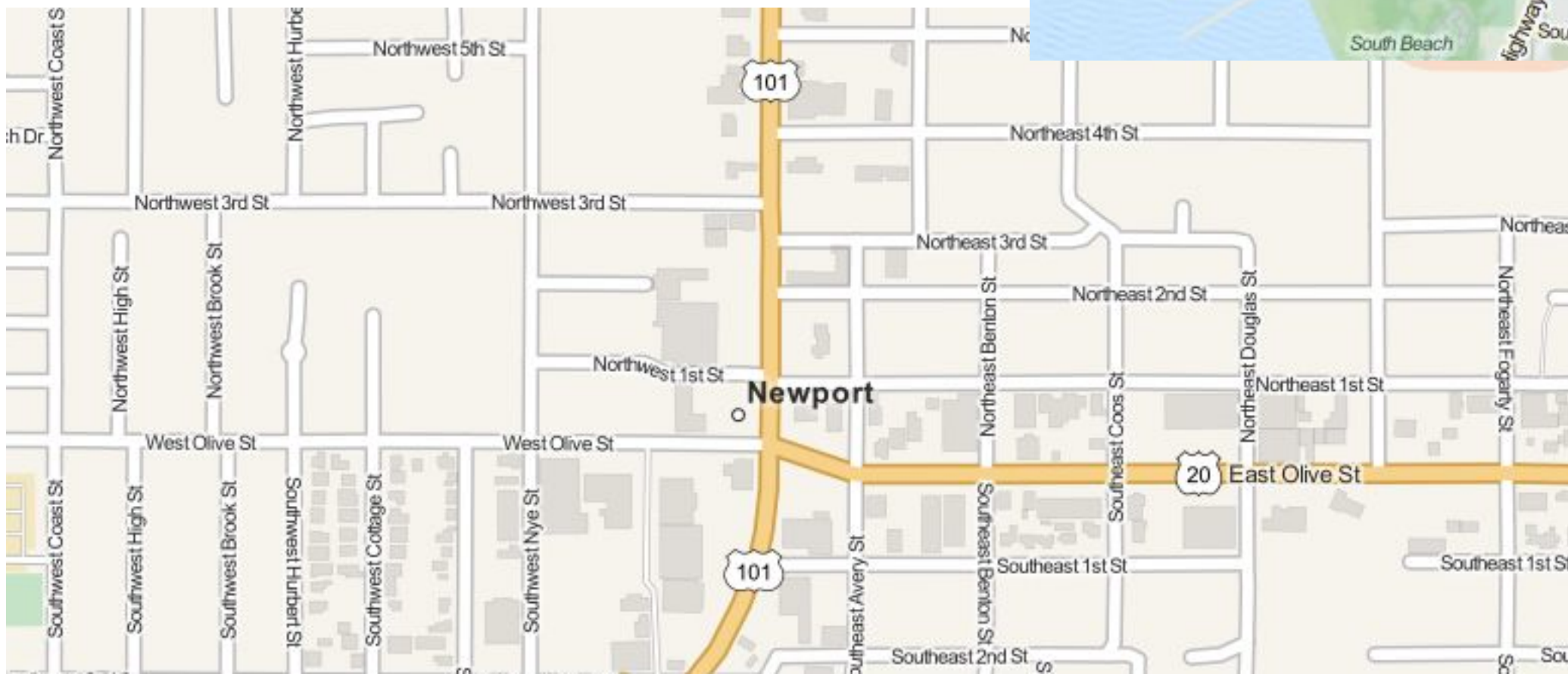
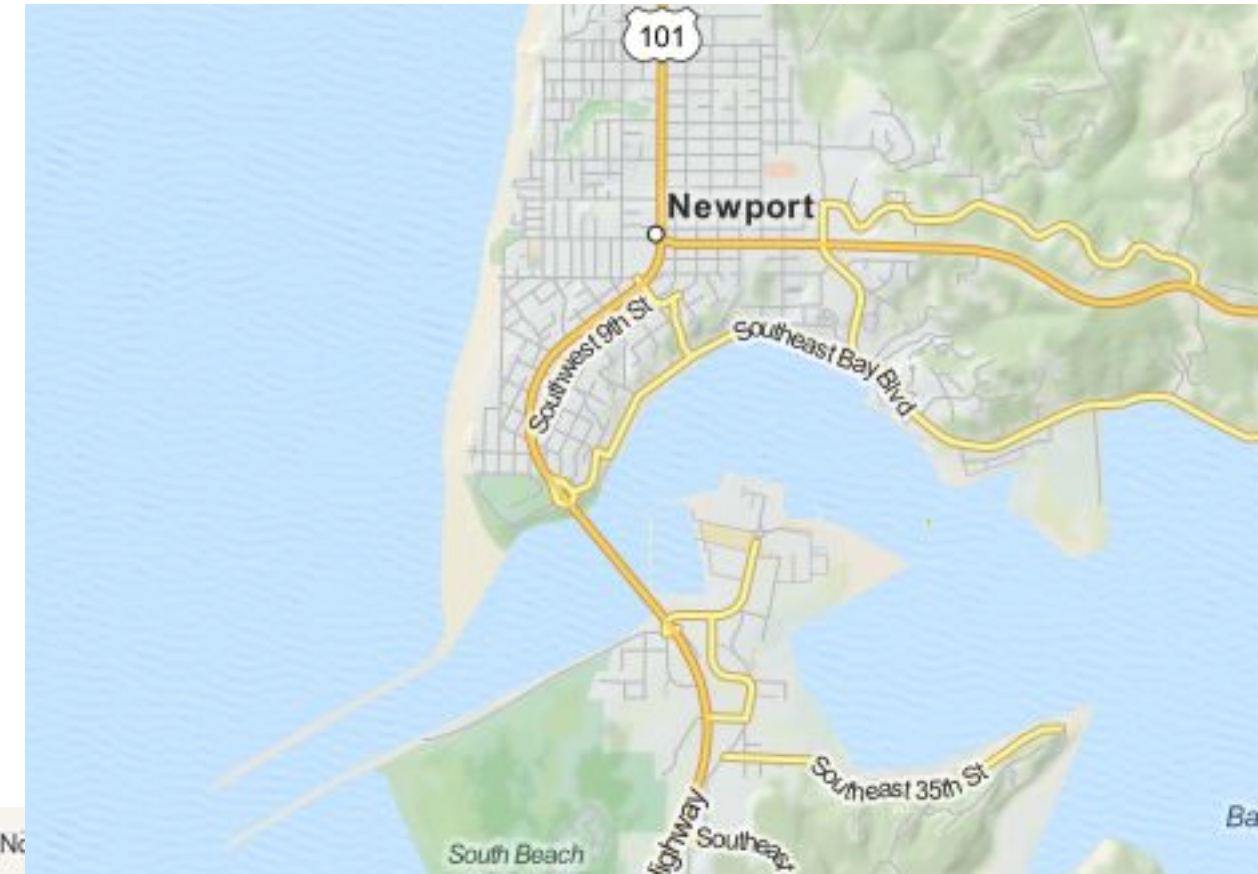
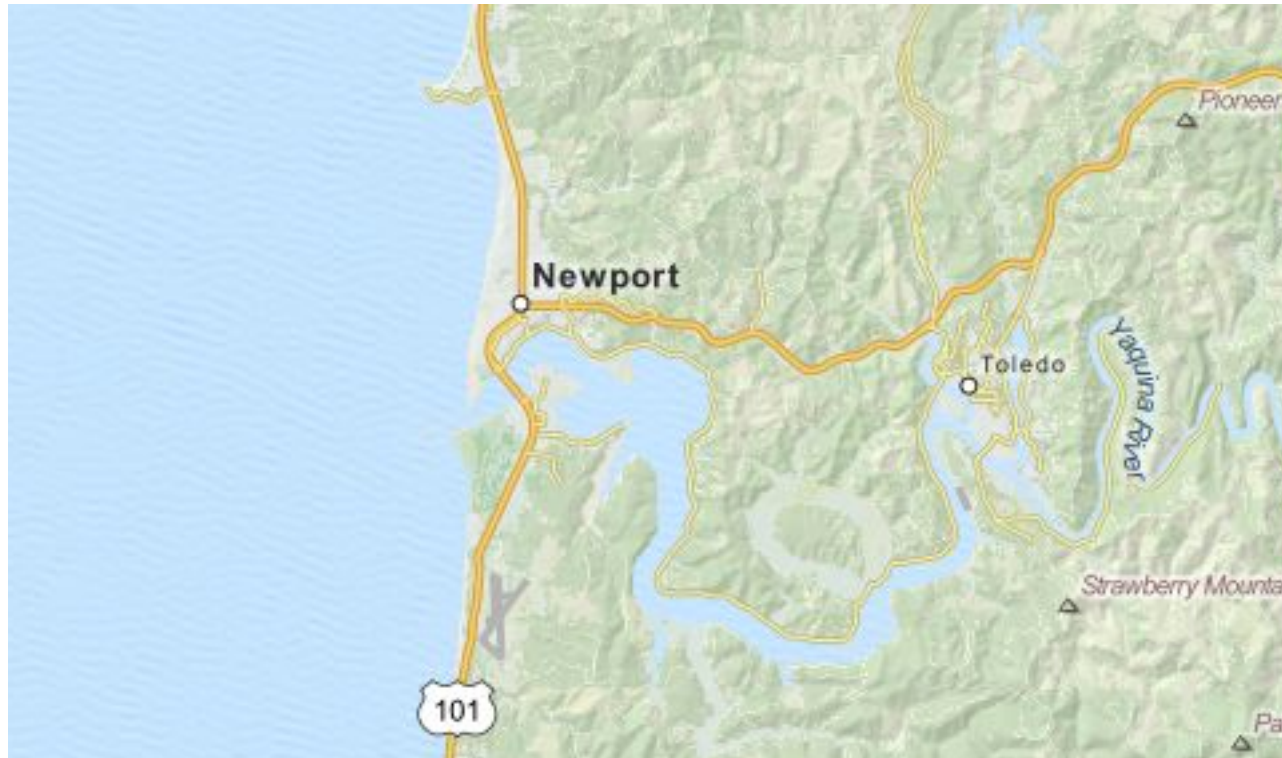
## Non-temporal animation

- Explains spatial relationships by presenting individual images in a sequence that is not related to time
- Shows attribute changes of a real phenomenon with display time

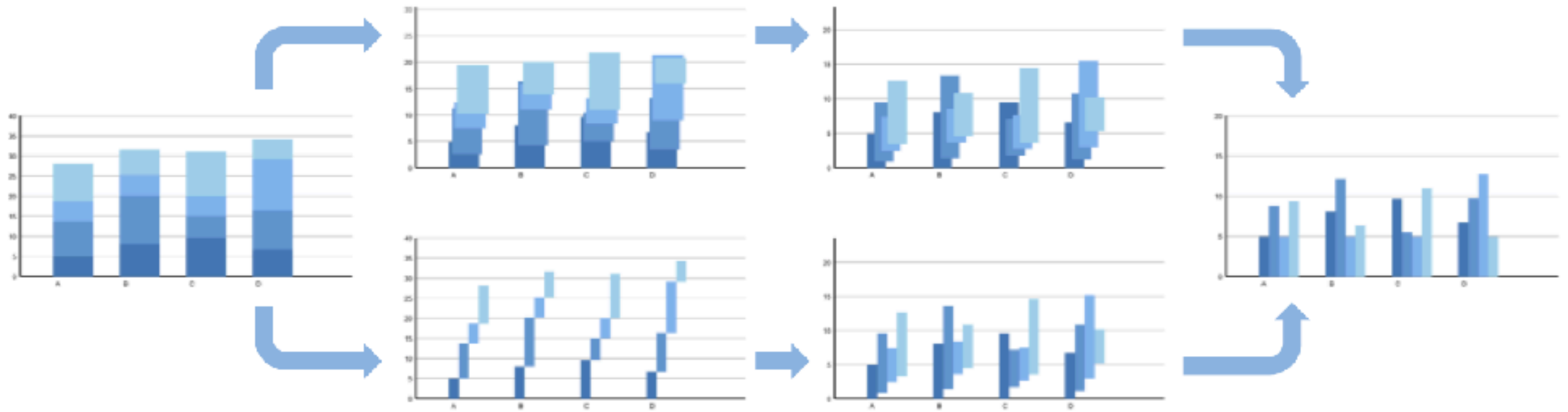
### Examples:

- transition between idioms
- animated zoom and pan in maps and other large images
- fly-through for 3D vis
- etc.

# Animated Zoom (increasing detail)



# Animated diagrams



Heer and Robertson 2007

Animated Transitions in Statistical Data Graphics

<https://www.youtube.com/watch?v=vLk7mlAtEXI>

# Some Optimistic Cognitive Research

Preliminary research has shown that animation can reveal subtle space-time patterns that are not evident in static representations, even to expert users who are highly familiar with the data.

Example from Dorling and Openshaw (1992):

In an animation of leukaemia rates in England, experts discovered new hot spots in space and time as well as a peculiar oscillation between leukaemia rates in 5-year cycles between two cities. In the perviously used static map, time was collapsed in the representation and the details where hidden.

Dorling, D., & Openshaw, S. (1992). Using computer animation to visualize space-time patterns. *Environment and Planning B: Planning and Design*, 19(6), 639-650.



# Potential Pitfalls of Animated Visualisations

- Animations are not suitable for all purposes:  
e.g., home ownership registry change on map  
“Nothing. Nothing. Nothing. Something. Nothing.”
- Cognitive limits of complexity depend most likely on:
  - length of animation (running time)
  - complexity of patterns (spatial heterogeneity)
  - complexity of the patterns of change (temporal heterogeneity).

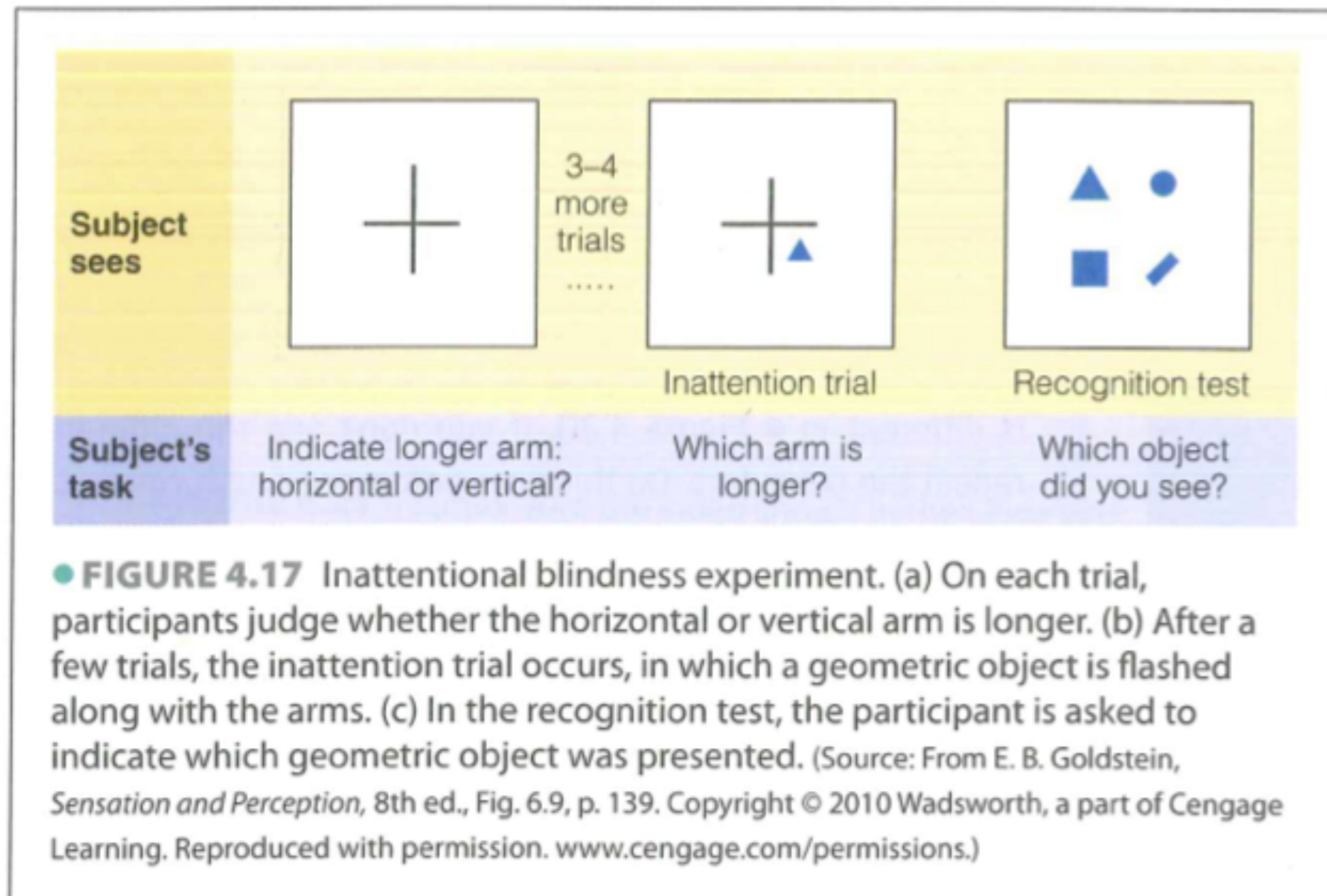
# Cognitive Resources

When a person uses up all their resources, they can become “blind” to unattended objects, noises, changes, etc.

**Cognitive resources** refers to the idea that a person has a certain cognitive capacity, which can be used for carrying out various tasks. **Cognitive load** is the amount of a person's cognitive resources needed to carry out a particular cognitive task. Some tasks, especially easy, well-practiced ones, have low cognitive loads; these **low-load tasks** use up only a small amount of the person's cognitive resources. Other tasks, those that are difficult and perhaps not as well practiced, are **high-load tasks** and use more of a person's cognitive resources.



# Inattention Blindness



When observers were then given a recognition test in which they are asked to pick the object that had been presented, they were unable to do so.

# The Monkey Business Illusion



(c) 2010 Daniel J. Simons

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[https://www.youtube.com/watch?v=IGQmdoK\\_ZfY](https://www.youtube.com/watch?v=IGQmdoK_ZfY)

# Change Detection

Difficulty in detecting changes in scenes, e.g., continuity errors in films.

Motion attracts attention.

Observers have great difficulty noticing even large changes between two successive scenes in an animation when blank images (flickering) are shown in between scenes.  
(Rensink, O'Regan and Clark (1997))

Confirmed for animated choropleth maps: change blindness & blindness to change blindness: overestimation of one's own change detection ability.



# Directing user attention

- Use annotations: viewer is presented with a cue that indicates where a stimulus is most likely to occur.
- Modify saliency of an item, so that attention is directed to important unattended areas. (Saliency = the state or quality by which an item stands out relative to its neighbours.)



Veas, E. (2011): Directing Attention and Influencing Memory with Visual Saliency Modulation

- Use of annotation or salience assumes that the author knows where the user should look.