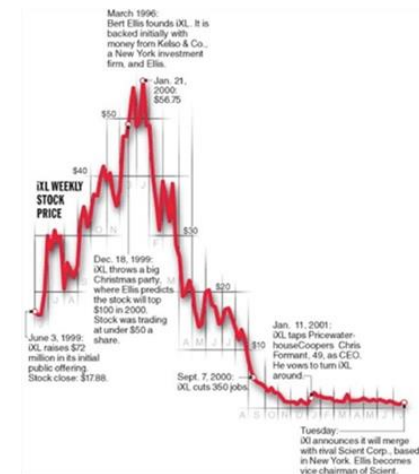
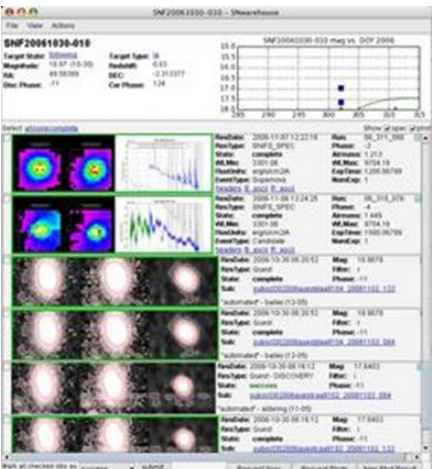


# Visual Perception 2: Preattentive Processing

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[illegible]

# How many 5's?

385720939823728196837293827

382912358383492730122894839

909020102032893759273091428

938309762965817431869241024

[Slide adapted from Joanna McGrenere <http://www.cs.ubc.ca/~joanna/>]

# How many 5's?

38**5**720939823728196837293827

3829123**5**8383492730122894839

9090201020328937**5**9273091428

93830976296**5**817431869241024

[Slide adapted from Joanna McGrenere <http://www.cs.ubc.ca/~joanna/>]

# Preattentive Processing

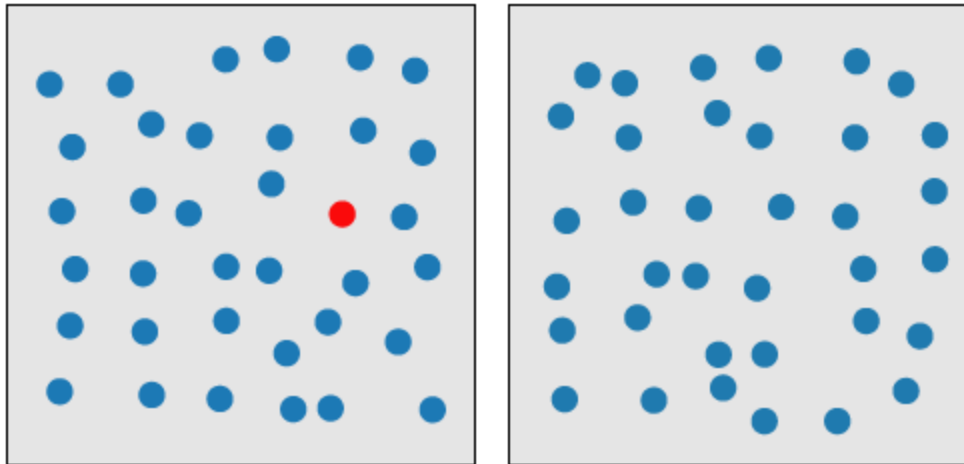
- Certain basic visual properties are detected immediately by low-level visual system
- “Pop-out” vs. serial search
- < 200 - 250ms qualifies as preattentive
  - eye movements take at least 200ms
  - yet certain processing can be done very quickly, implying low-level processing in parallel
- If a decision takes a fixed amount of time regardless of the number of distractors, it is considered to be *preattentive*.

# Preattentive Processing

- A limited set of visual properties are processed preattentively
  - (without need for focusing attention).
- This is important for design of visualizations
  - What can be perceived immediately?
  - Which properties are good discriminators?
  - What can mislead viewers?

# Color (hue) is preattentive

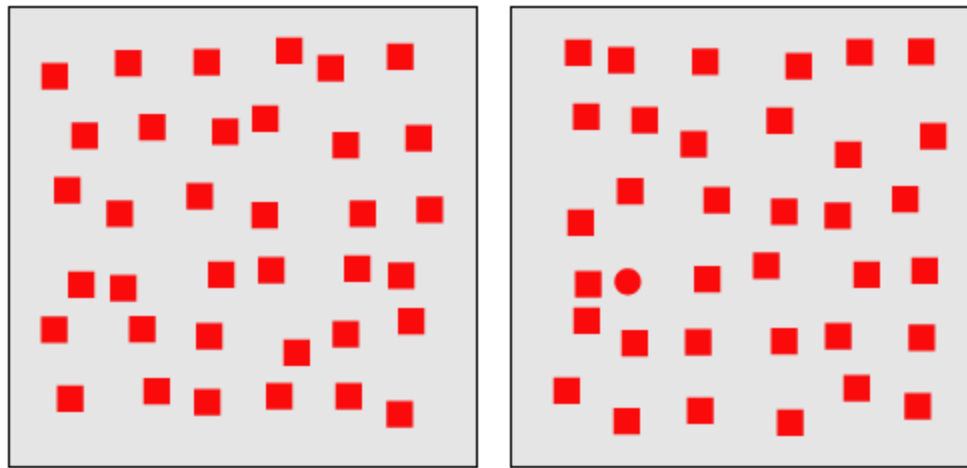
- Detection of red circle in group of blue circles is preattentive



[Perception in Visualization, Christopher Healey,  
<http://www.csc.ncsu.edu/faculty/healey/PP/index.html>, 2005]

# Form (curvature) is preattentive

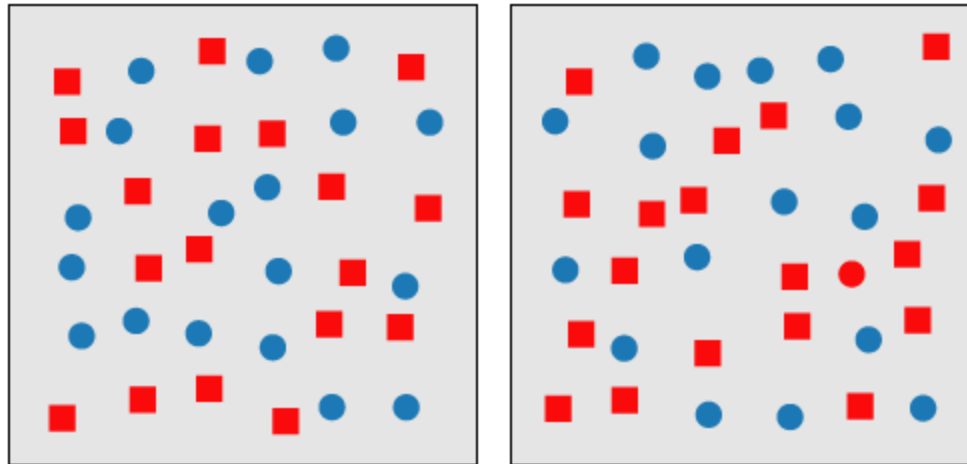
- Curved form “pops out” of display



[Perception in Visualization, Christopher Healey,  
<http://www.csc.ncsu.edu/faculty/healey/PP/index.html>, 2005]

# Conjunction of attributes

- Conjunction target generally cannot be detected preattentively (red circle in sea of red square and blue circle distractors)

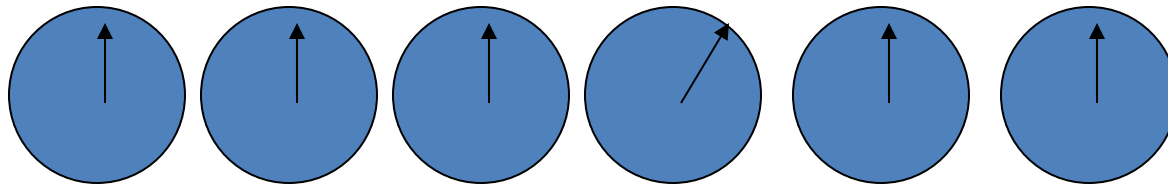


[Perception in Visualization, Christopher Healey,  
<http://www.csc.ncsu.edu/faculty/healey/PP/index.html>, 2005]



# Cockpit dials

- Detection of a slanted line in a sea of vertical lines is preattentive



# Preattentive Visual Properties

(Healey 97)

length	Triesman & Gormican [1988]
width	Julesz [1985]
size	Triesman & Gelade [1980]
curvature	Triesman & Gormican [1988]
number	Julesz [1985]; Trick & Pylyshyn [1994]
terminators	Julesz & Bergen [1983]
intersection	Julesz & Bergen [1983]
closure	Enns [1986]; Triesman & Souther [1985]
color (hue)	Nagy & Sanchez [1990, 1992]; D'Zmura [1991] Kawai et al. [1995]; Bauer et al. [1996]
intensity	Beck et al. [1983]; Triesman & Gormican [1988]
flicker	Julesz [1971]
direction of motion	Nakayama & Silverman [1986]; Driver & McLeod [1992]
binocular luster	Wolfe & Franzel [1988]
stereoscopic depth	Nakayama & Silverman [1986]
3-D depth cues	Enns [1990]
lighting direction	Enns [1990]