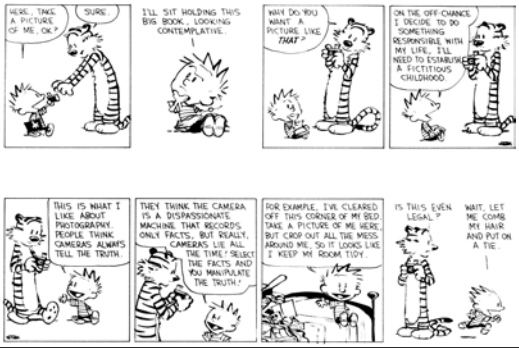
Perceptual and Artistic Principles for Effective Computer Depiction



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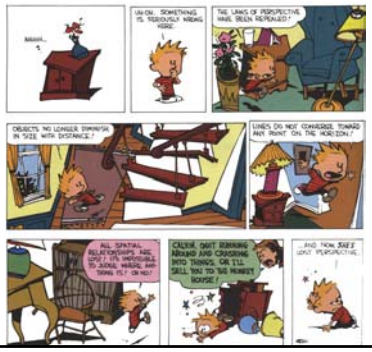

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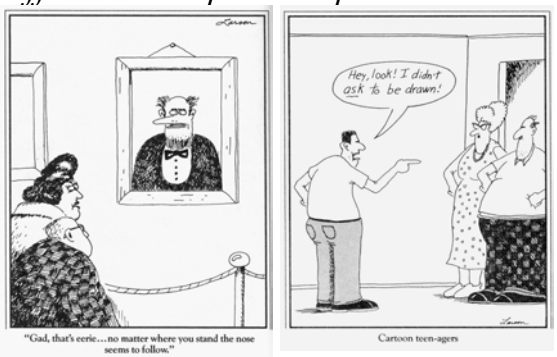


"Gad, that's eerie... no matter where you stand the nose seems to follow."

Cartoon teen-agers

Gaze Movement and Focal Points

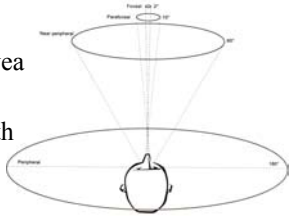
Frédo Durand
MIT- Lab for Computer Science

Focus, gaze

Kathe Kollwitz
Self Portrait
1891-92

Delacroix

Need for exploration



- Acuity not uniform
- Concentrated in the fovea (~2 degree)
- Need to align fovea with relevant features
- Explore our visual environment with gaze movements
- How we then stitch all these observations together is still a mystery

Saccade

- Used to scan the visual field
- Can be controlled
- Two phases
  - Ballistic movement: 30 ms and up to 900°/s
  - Fixation ~300ms
- Saccadic suppression
  - No blur is experienced during the ballistic movement
  - We "suppress" our vision while the gaze moves

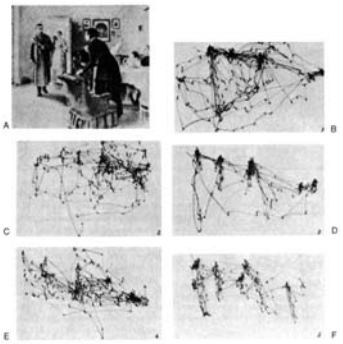
Saccadic exploration

- Reading: Javal, 1878
- Images: Yarbus, 1965

- Two important issues:
- Path
- Fixation time

Depends on task

- painting by Repin
- B: free
- C: economic level
- D: ages
- E: what were they doing
- F: remember cloth



Gaze and image cognition

- Similar to scientific method
  - Make hypothesis (mental model of the scene)
  - Perform experiments (gaze)

David Hockney's collages

- Temporal too

Gaze movement & cubism

- George Bracque
  Le Portugais
  1911-1912

Gaze attraction

- Bottom-up (stimulus-driven)
  - Contrast
  - Color
  - Patterns
- Top-bottom (High-level, potentially conscious)
  - Semantic information, familiarity
  - Human beings, eyes
  - Task
  - Personal context

Focus via contrast

Foveal zone

- Eugene Delacroix
  Study for a portrait of
  Chopin

Focus through perspective

- Raphael, The School of Athens

Focus on human

- Chardin 1735
- Compensate high-level with low-level
- [Baxandall *Patterns of Intention*]

Figure/ground and comics

- Background more detailed
- Low-level gaze attraction (details) conflicts/compensate for the high level (interest for the character)

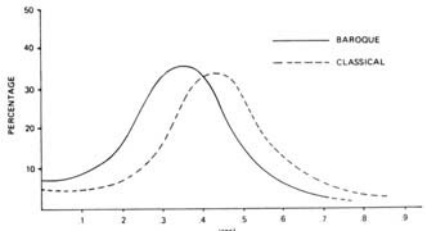
From

Diversive vs. specific

- Different strategies (Berlyne 1971)
- Diversive exploration
  - Hunt for new stimulation
  - Dispersed
  - Shorter fixation (<300ms)
- Specific exploration
  - Seeks specific information
  - Longer fixation (>400ms)

Fixation time & style

- Depends on style "complexity"
- Shorter fixation for more complex style



Number of focal point

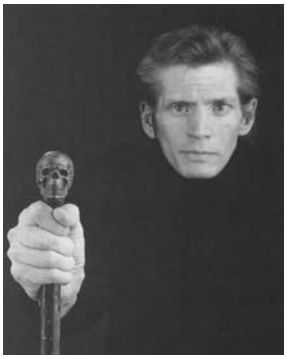
- The number of focal points is a crucial aspect of composition
- Dynamics of the image
- One region: imitates One foveation, striking
- Many regions: the gaze is transported, dynamism
- Path

Focus through contrast

- Rembrandt

Two focal zones

- Robert Mapplethorpe *Self-portrait*, 1988



Triple focus and subject gaze

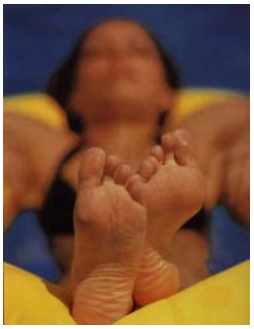
- Robert Doisneau Les Gosses de la place Hebert
- The path of our gaze follows their gaze direction

Turner's Loire journey

- The gaze follows the journey
- [See part on motion depiction page 27]

Focal point conflict

- Bottom-up (more detail on the foot) is different from top down (attraction to faces)
- Makes image dynamic



Advertisement and focal points

- Evolution of saliency

Further reading

Vision Science, from photons to phenomenology
Stephen E. Palmer, MIT Press, 1999
- Excellent reference on all aspects of vision

Cognition and the Visual Arts
Robert Solso, MIT Press, 1996
- Introduction to visual perception and relation with the visual arts