Patterns in Nature 9 Perception

Stephan Matthiesen









Orion in 3 dimensions









Worm constellations ("convermations")?



Which sequence is more likely?

You toss a coin 20 times and get the sequence:

ннннннннннннннн

You do it again and get:

НТННТТНННТТТТНТНТНТТНТ

Which sequence is more likely?

Kanizsa figures



Imaginary figures



Principle of similarity



Gestalt perception (gestalt = the whole)

• Proximity:

group items close together

- Similarity: group items of the same kind
- Closure:
 tendency to complete patterns

Continuation:

tendency to see shapes that continue smoothly





Martian canals

Percival Lowell (1855-1916)

Hubble Space Telescope



What is this?



Perception is influenced by context



Which animal is this?



Top-down and bottom-up perception

Bottom-up: relatively "raw" sensory input from primary sense organs flows to "higher level" processing areas

Top-down: information from memory or expectation influences the interpretation of sensory input

Seeing is believing ... and believing is seeing

Inanimate, animate things and things with mind

- It seems our perceptual system uses a fundamental categorization of all objects:
 - Inanimate things (don't move on their own)
 - Animate things (move on their own)
 - Things with a mind (complex intentions)
- Faces are also special
 - Prosopagnosia (Face blindness)
- There is (possible) a bias towards seeing living things and faces in ambiguous stimuli







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Real Ice Crystals

Crystals collected during a superb South Pole display on 17th January 1986.



0.2 mm

Crystals from a mediocre halo display 16 days earlier. They have large inclusions and their faces are imperfect

http://www.atoptics.co.uk

Refraction and reflection in ice crystals

Refraction:

Minimum deflection: 21.6° Also larger angles when crystal is rotated (less intense)

> **(External) Reflection:** Any angle; strongest when rays graze the surface



Internal reflection (multiple)

http://www.atoptics.co.uk

Circumzenithal arc



Upper Tangent arc

22º halo



Parhelic circle

Parhelia (Sun Dogs)



Lower Tangent arc

http://www.atoptics.co.uk







Patterns in Nature Outline

- 1. Introduction
- 2. Waves and oscillations
- 3. Regularity and chaos
- 4. Animal cooperation
- 5. Spatial patterns
- 6. Aggregation and growth processes
- 7. Cellular automata
- 8. Fractals
- 9. Miscellaneous topics10. Concluding session



