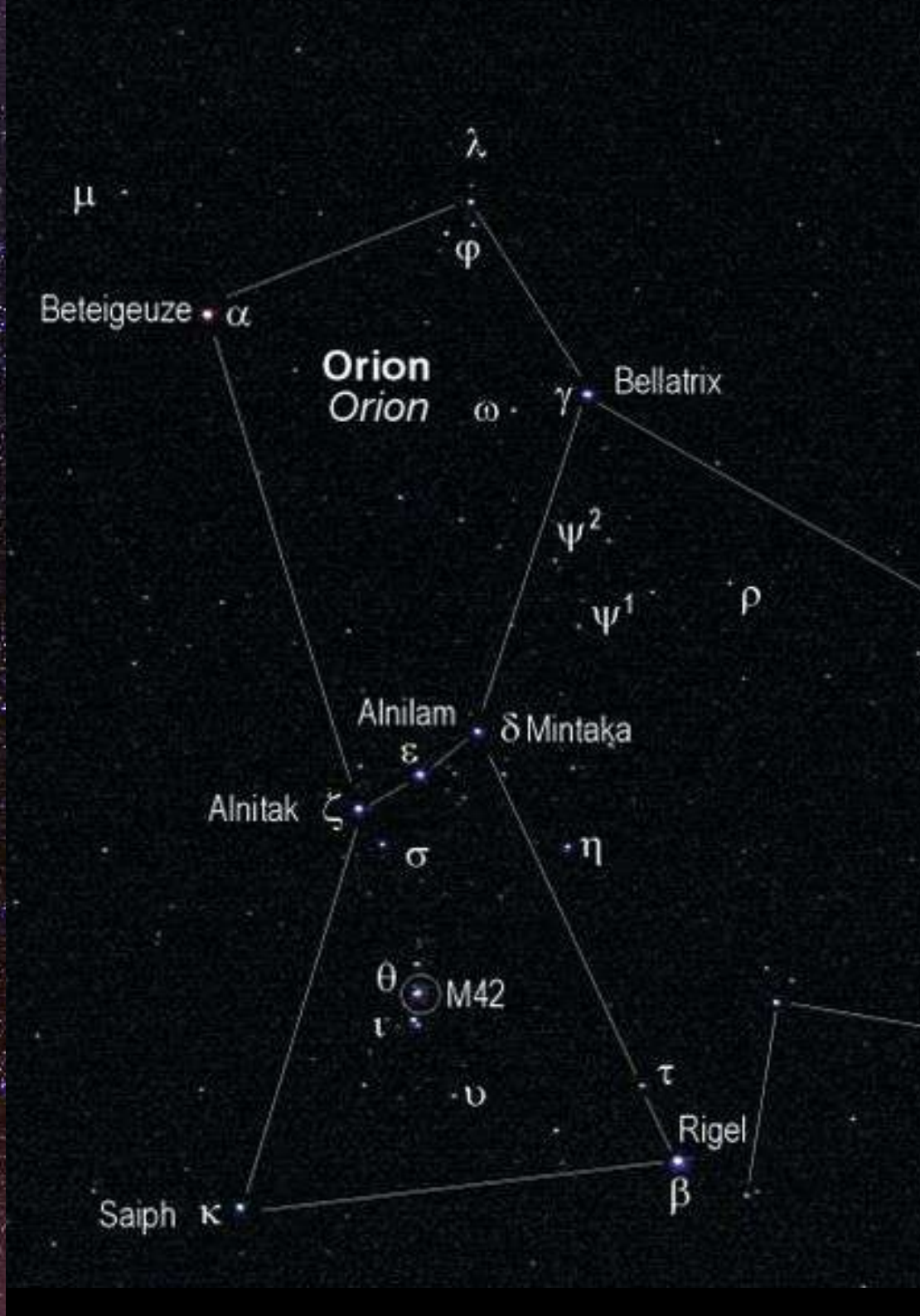
Patterns in Nature 9
Miscellaneous topics

Stephan Matthiesen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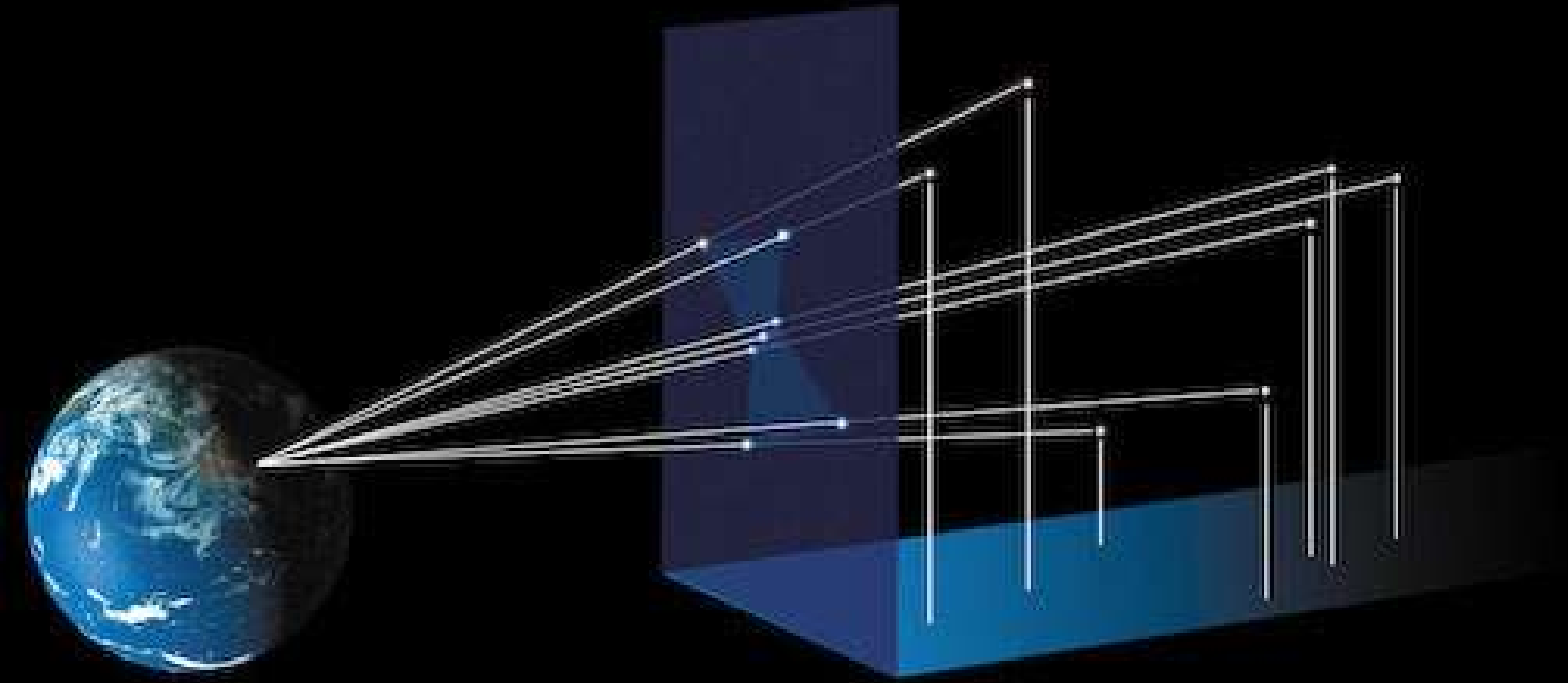
ORION.

Orion in 3 dimensions



Worm constellations („convermations“)?

Which sequence is more likely?

You toss a coin 20 times and get the sequence:

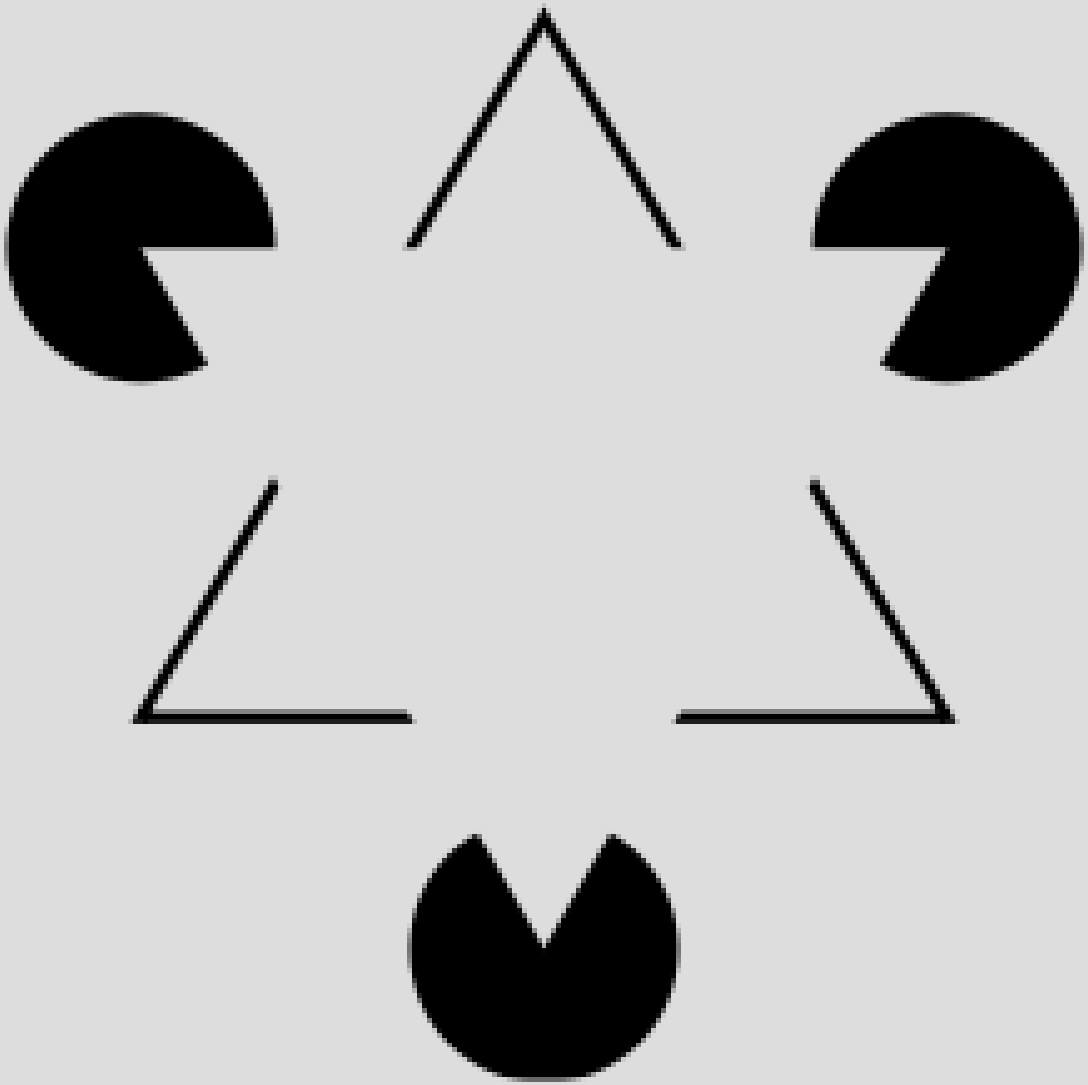
HHHHHHHHHHHHHHHHHHHH

You do it again and get:

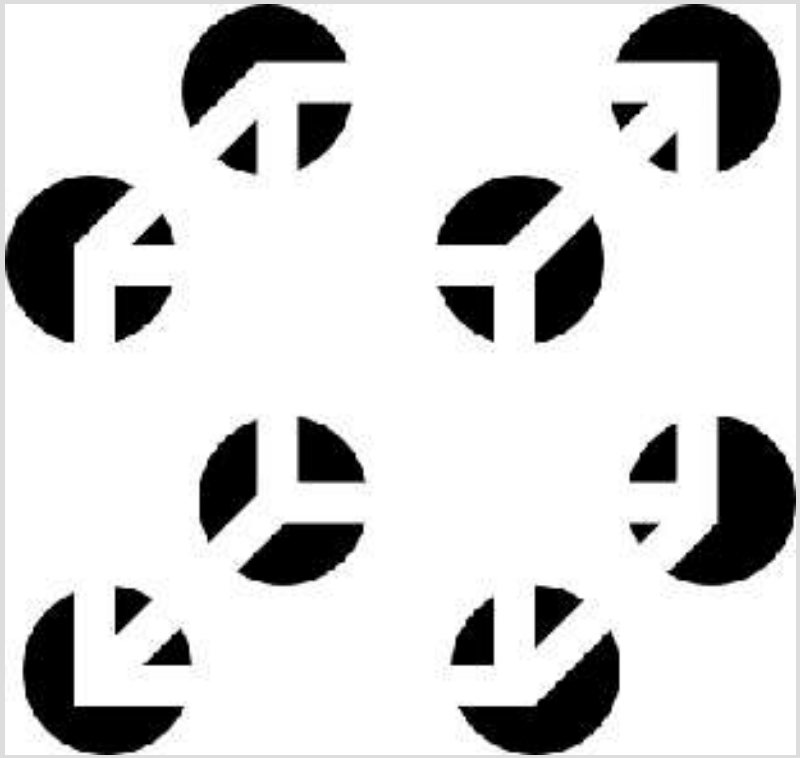
HFHHFFHHHFFFFHFHFHFFHF

Which sequence is more likely?

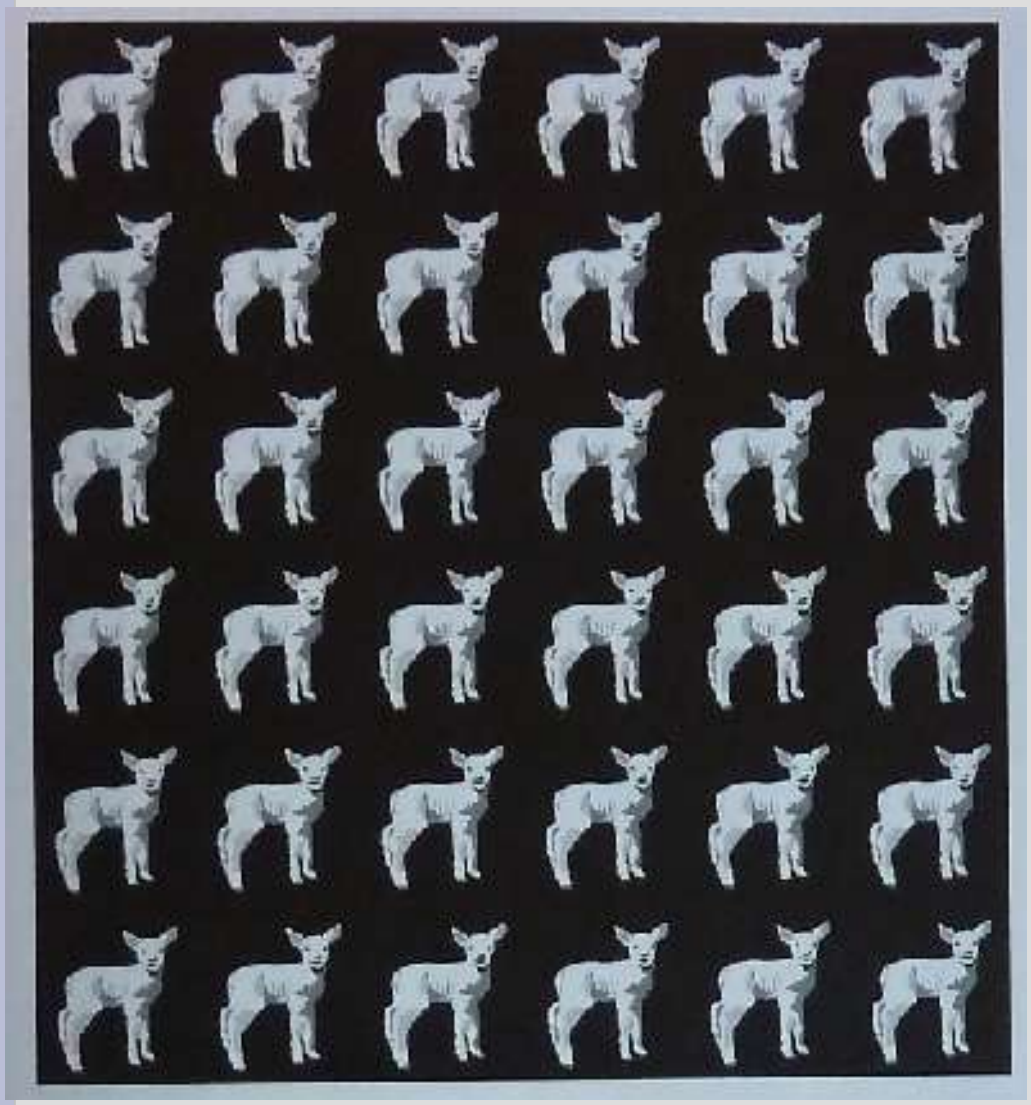
Kanizsa figures



Imaginary figures



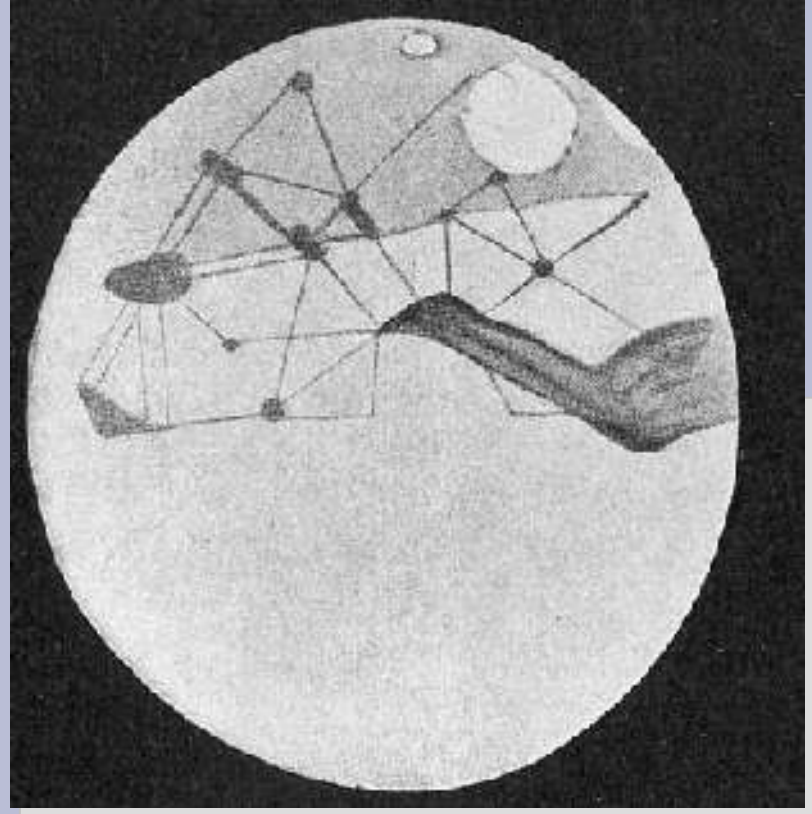
Principle of similarity

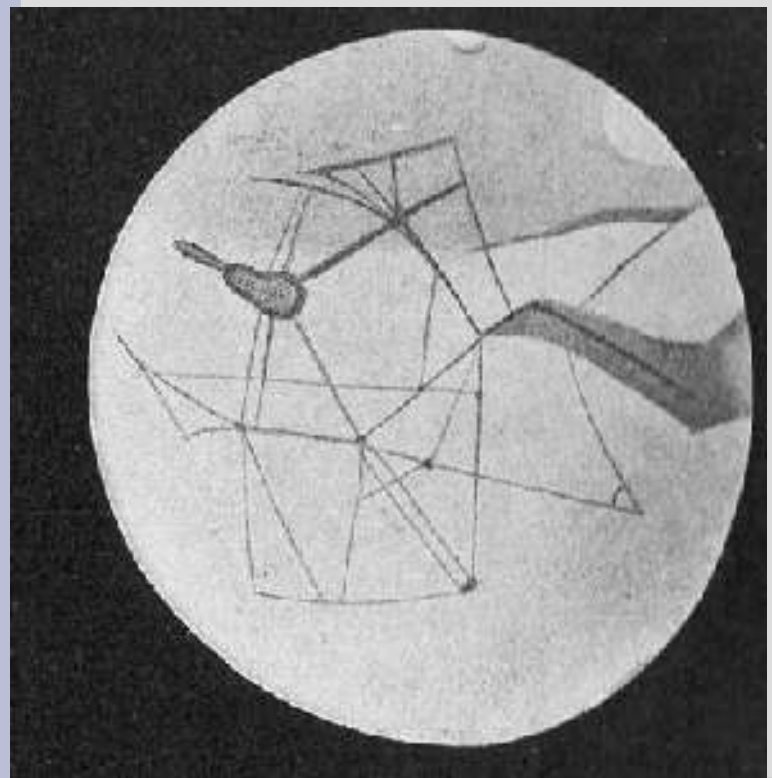


Gestalt perception (gestalt = the whole)

- **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



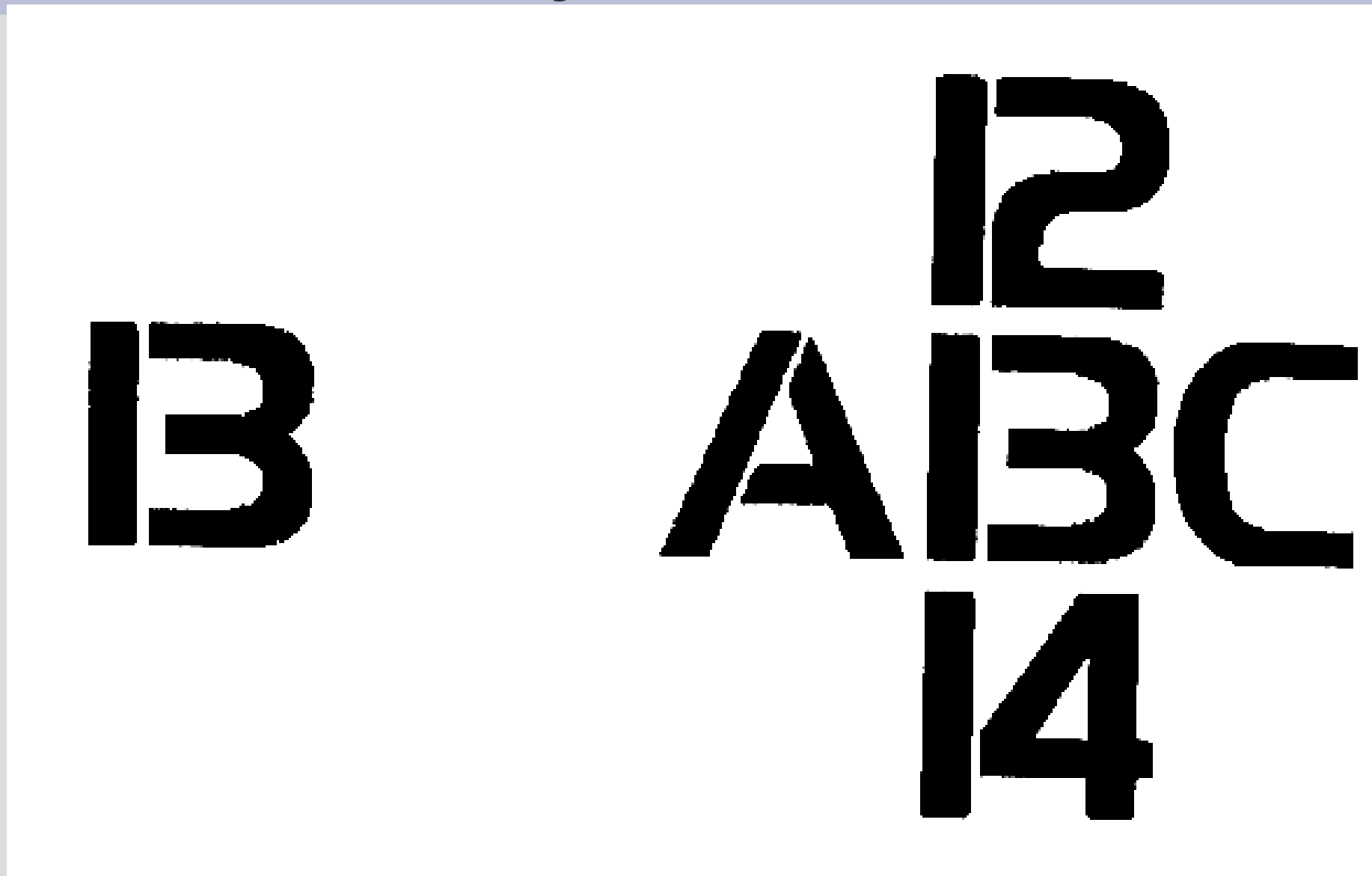


Percival Lowell (1855-1916)

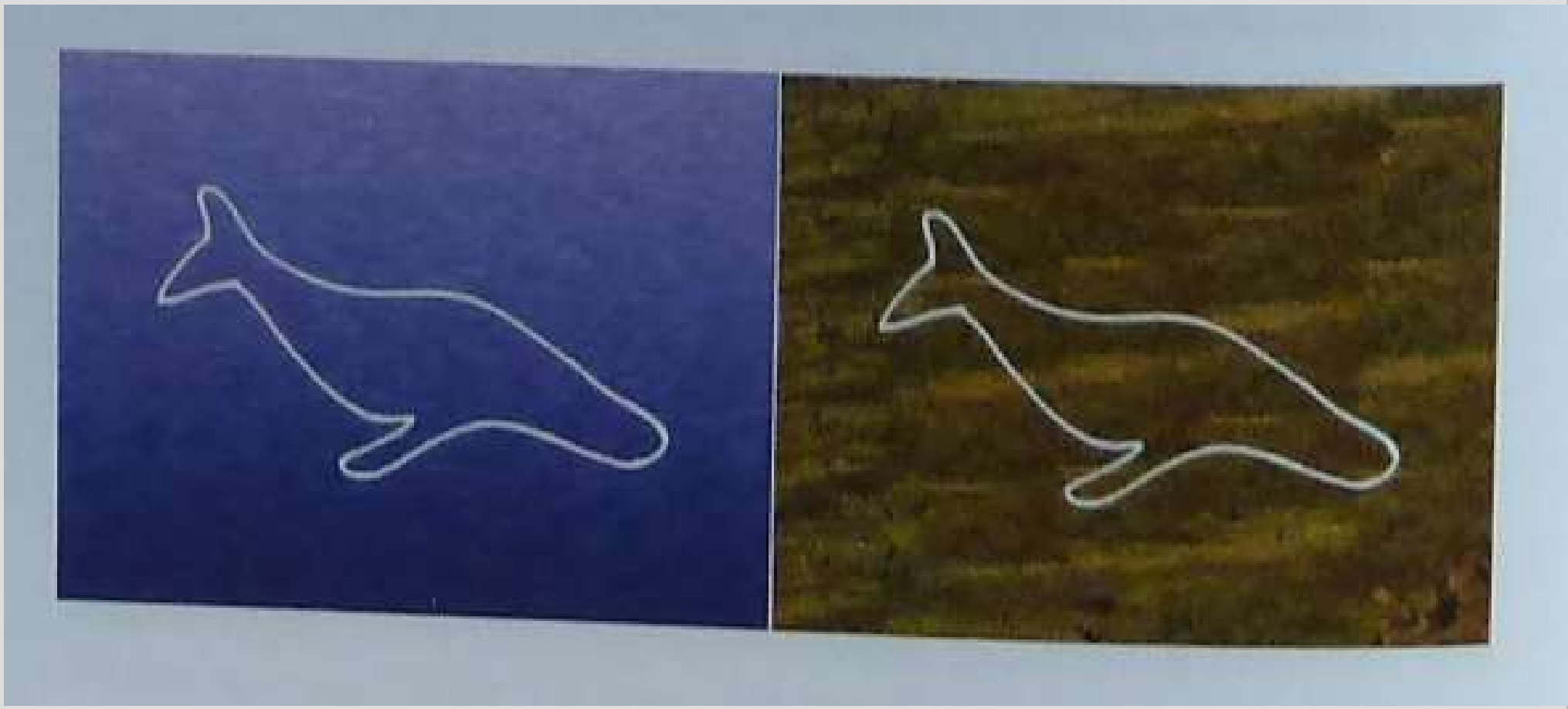
Hubble Space Telescope

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

Living and nonliving things
Faces

- It seems that our perceptual system uses a fundamental categorization of all objects into:
  - Living objects
  - Nonliving objects
- Faces are also special
  - Prosopagnosia (Face blindness) good analogy (Cecilia Burman): www.prosopagnosia.com/main/stones/)
- There is (possible) a bias towards seeing living things and faces in ambiguous stimuli

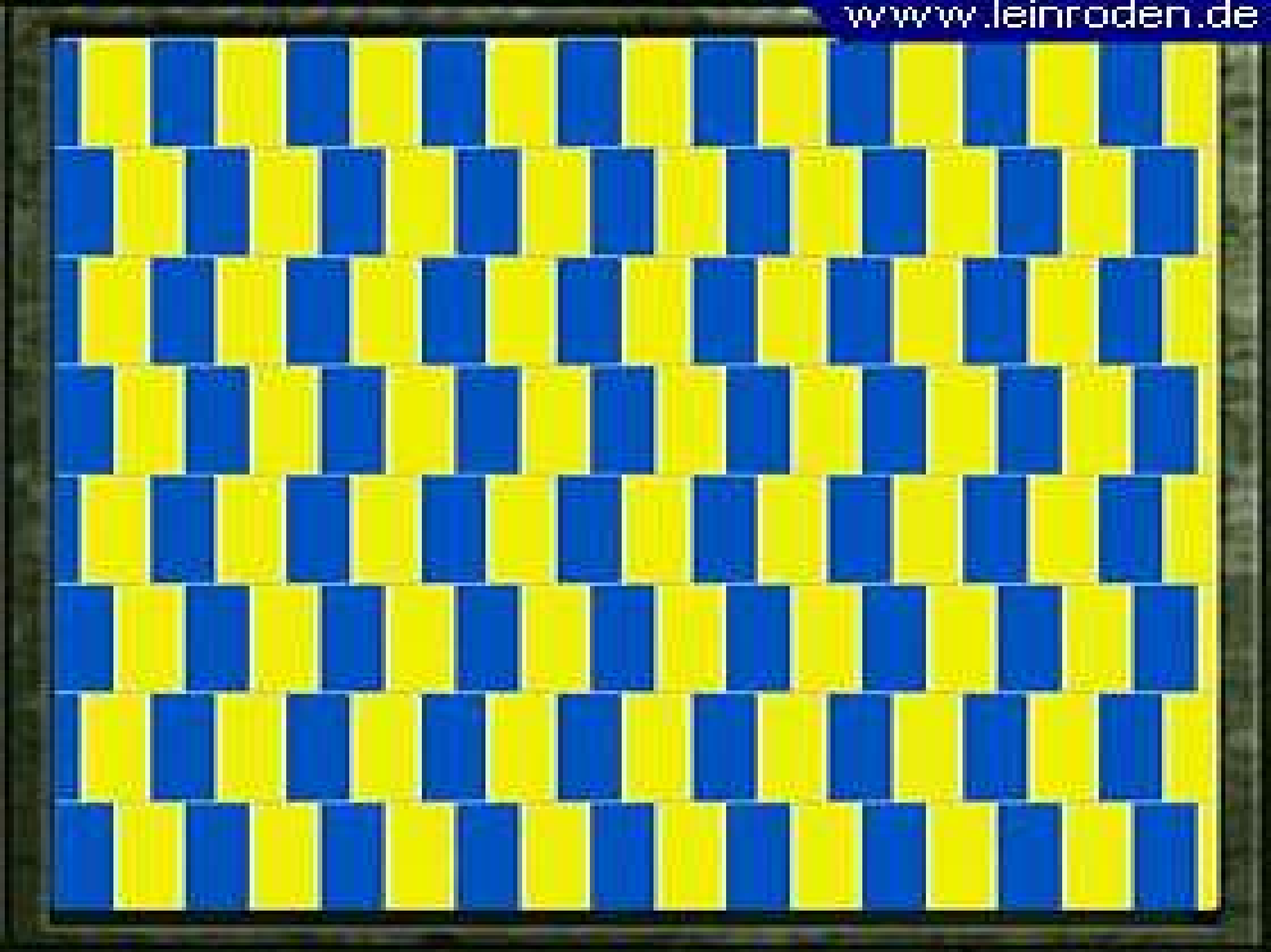
NewsBiscuit
The news before it happens...

Image of a piece of toast seen on face of the Virgin Mary

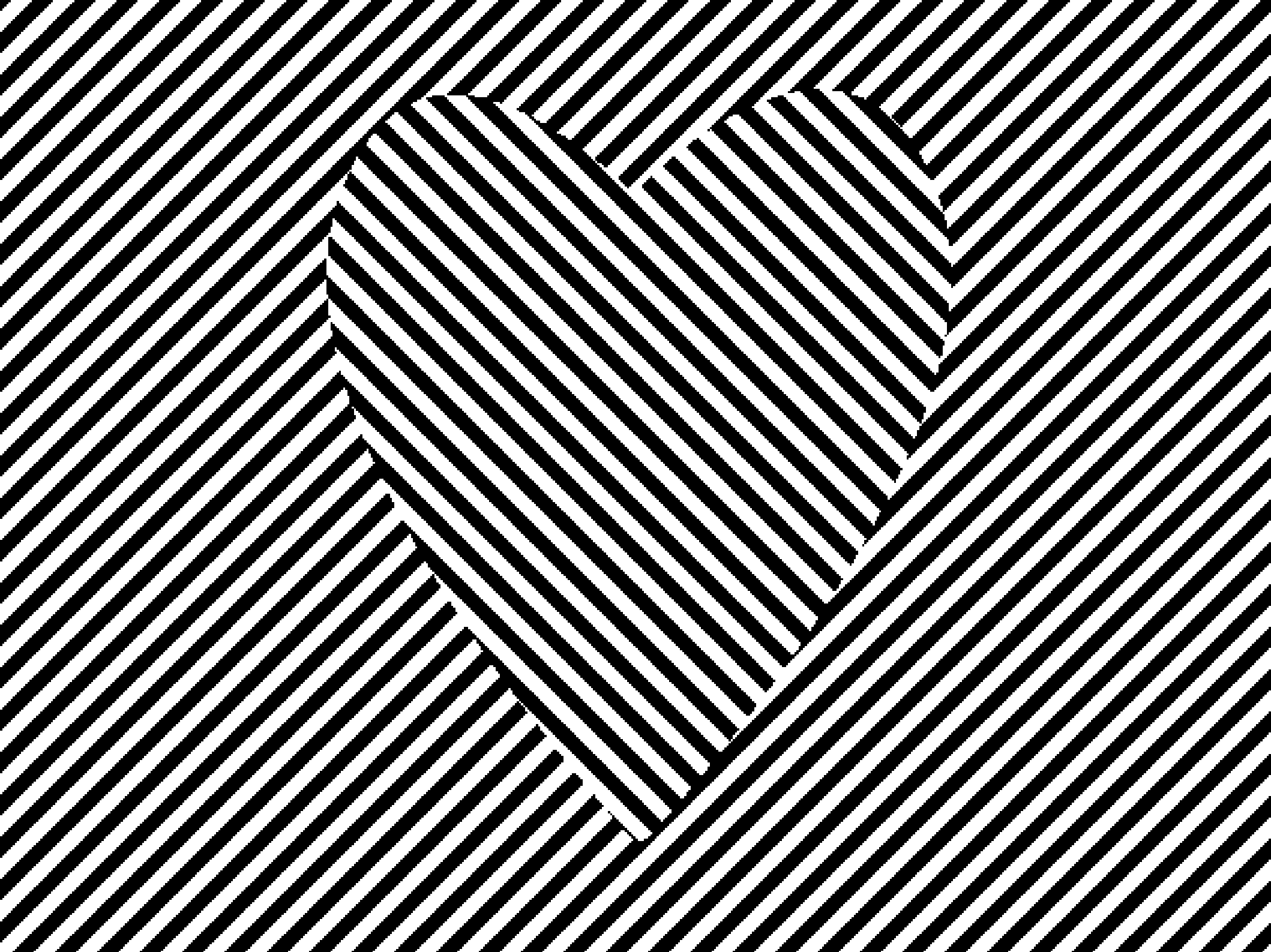
Pilgrims were flocking to the Hampshire town of Basingstoke today after a local woman claimed to have seen a vision of a piece of toast on a picture of the Virgin Mary at her local church. Betty Tilley, 42, was praying silently at the Sacred Heart Catholic church when she looked up to see a ray of light slanting in through the window, illuminating a reproduction painting of the Virgin Mary and as she moved closer she was amazed by what she saw.

'There's just no question in my mind that it was a miracle. Right there, on the face of the Holy Mary, Mother of God, I could see a nice piece of toasted sliced white bread. The amazing thing is that it was just like the one I had had for breakfast, so clearly this must be some kind of message from God.'

When news of the apparition spread, a crowd of pilgrims rapidly flocked to the church to witness the toast miracle for themselves. A tented camp sprang up and around two thousand people from all over the UK started queueing for a chance to view the holy snack solution.



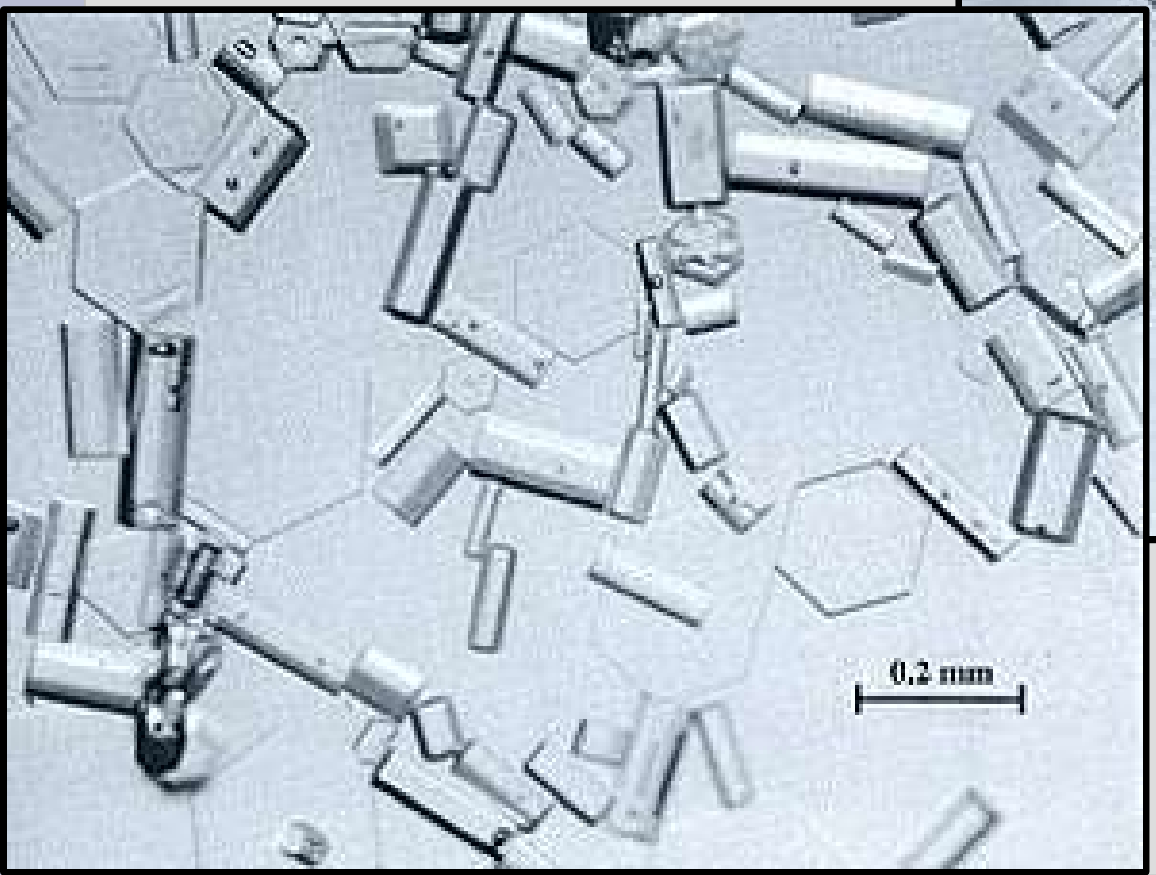

CAFE
OPEN

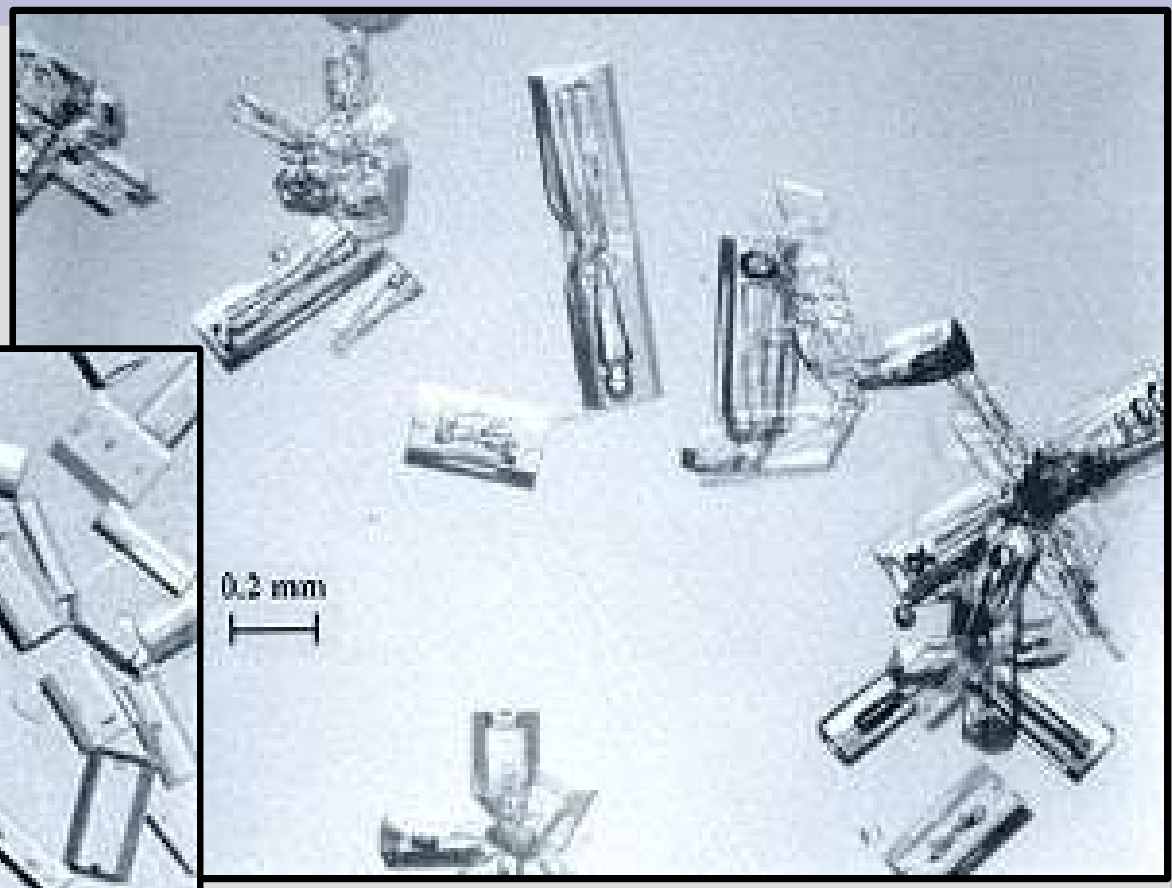


Halos

Real Ice Crystals

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



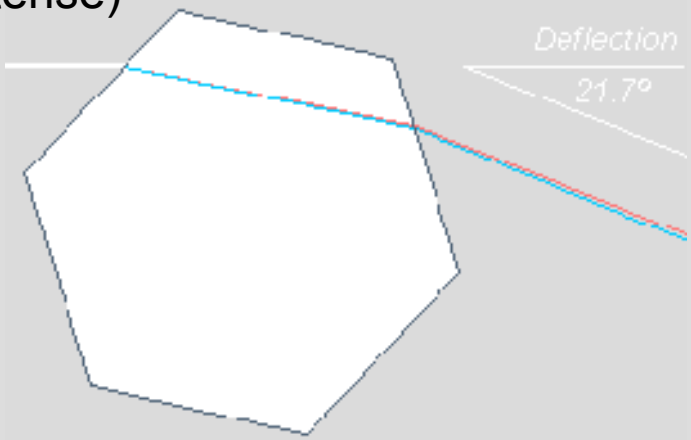


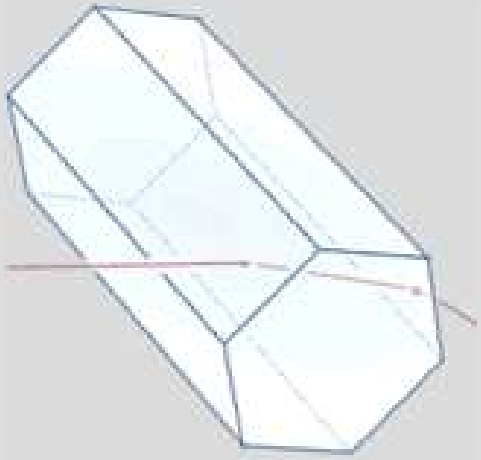
Crystals from a mediocre halo display 16 days earlier. They have large inclusions and their faces are imperfect

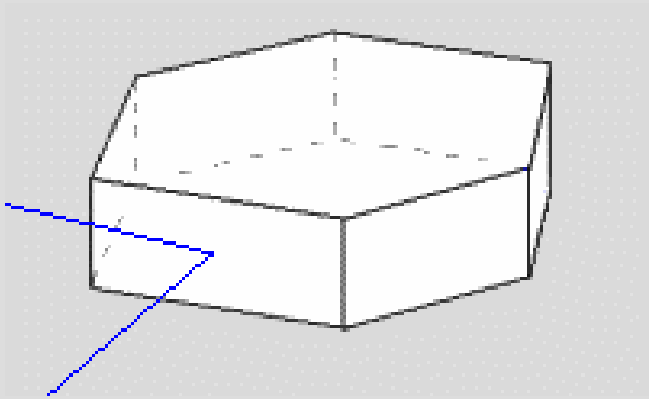
http://www.atoptics.co.uk

Refraction and reflection in ice crystals

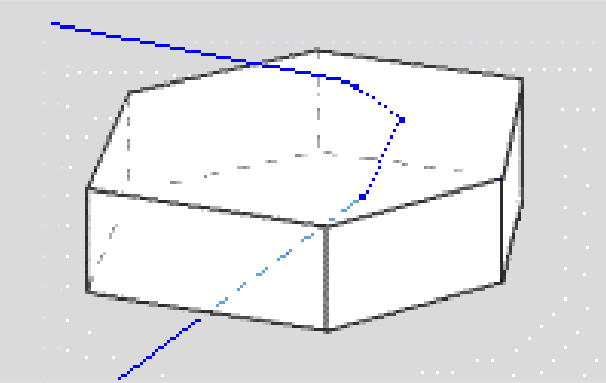
Refraction:
Minimum deflection: 21.6°
Also larger angles when crystal is rotated (less intense)







(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

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 topics
10. Concluding session