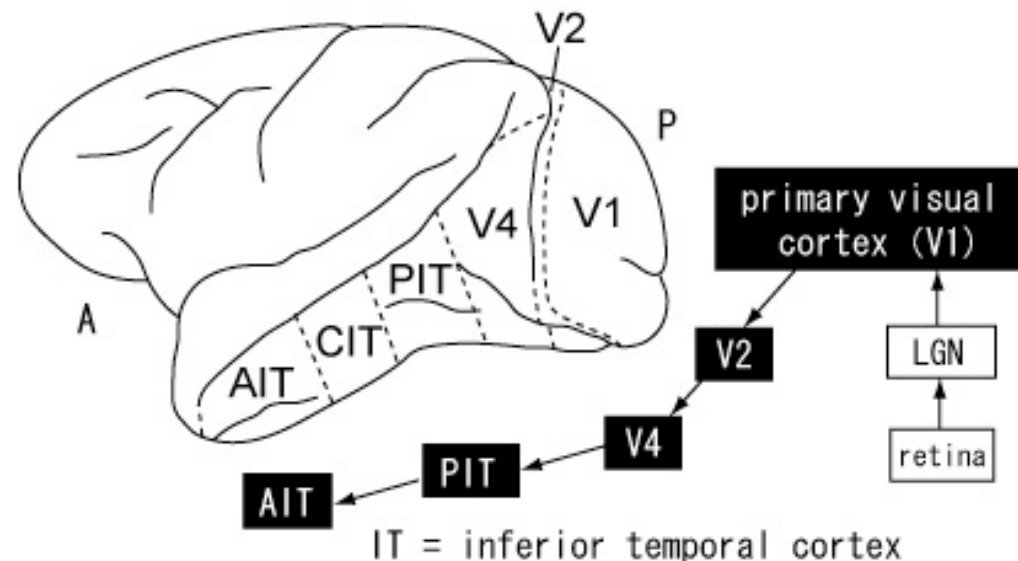


Visual Thinking

Visual objects, words and meaning

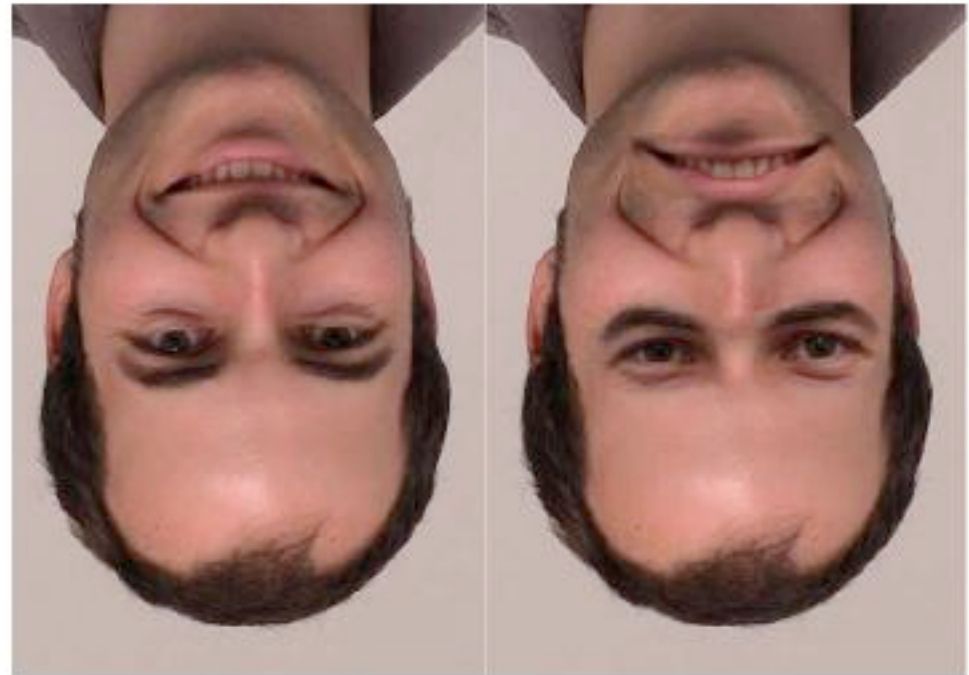
Meaning from objects

- activation of meaning from an image generally occurs in a fraction of a second
 - much less time than it takes to read a paragraph of text
 - a picture is worth a thousand words
- The *what* channel consists of a series of brain areas that respond to increasingly complex patterns
- end in the inferotemporal cortex – recognizes visual objects and scenes



Meaning from objects

- object recognition is a very difficult problem
- e.g for face recognition, the brain is much better at solving the problem from a familiar viewpoint...



The thatcher Illusion

Meaning from objects

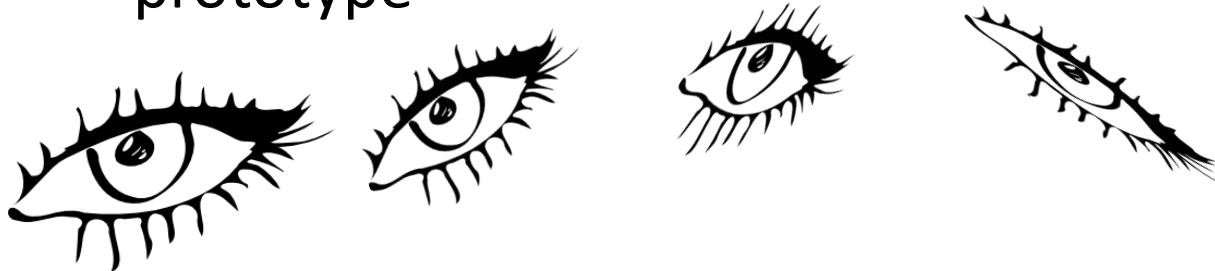
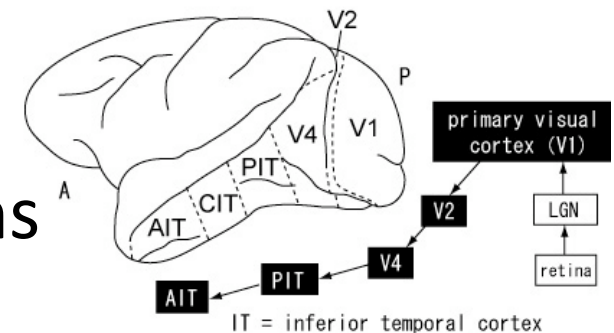
- recognizing an upside-down face is difficult!
- Spatial memory for scenes is also viewpoint specific
- however, we can generally rotate an object by 20 degrees, of scale it by a factor of 3 and still identify it rapidly



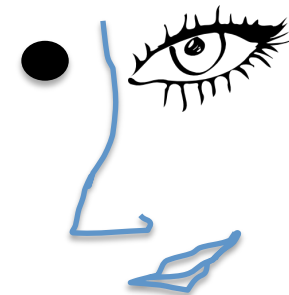
The thatcher Illusion

Generalized views from patterns

- V4 is the pattern processing region
- V4 neurons can respond to patterns that are rotated or distorted from a prototype

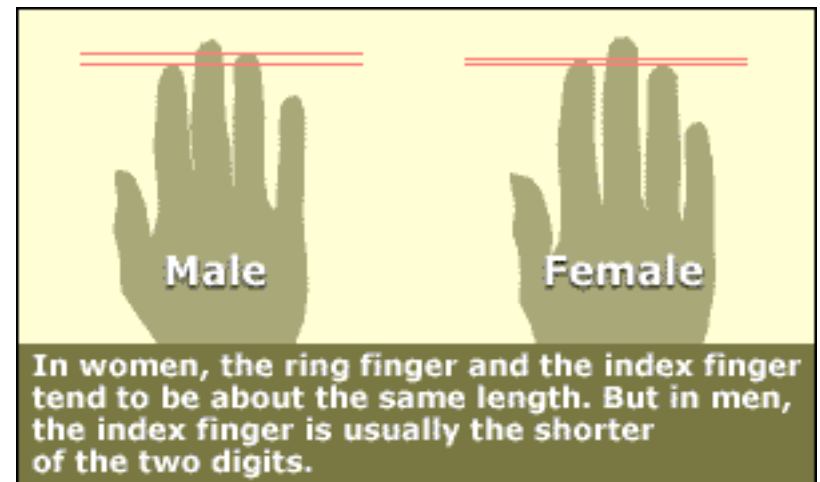


- **complex objects**, like faces, can be thought of as **patterns of patterns**



Structured objects

- most evidence suggests that most people do not have 3D models in our mind
 - some people do develop special skills for manipulating 3D structures
 - there are VERY large individual differences in this skill
- clear evidence that we all have some limited ability to perceive the 3D structure of objects



Gist and Scene Perception

- people are able to rapidly characterize scenes:



Gist and Scene Perception

- people are able to rapidly characterize scenes:



“tropical beach”



“busy street”



“forest”

Gist and Scene Perception

- people are able to rapidly characterize scenes:



“tropical beach”

- we can get the **gist** of a novel scene in **less than a tenth** of a second, independent of its complexity



“busy street”

- this is as fast as we can identify **objects**, so it’s can’t be the individual objects that we are identifying

- rapid characterization of a scene is called **gist**

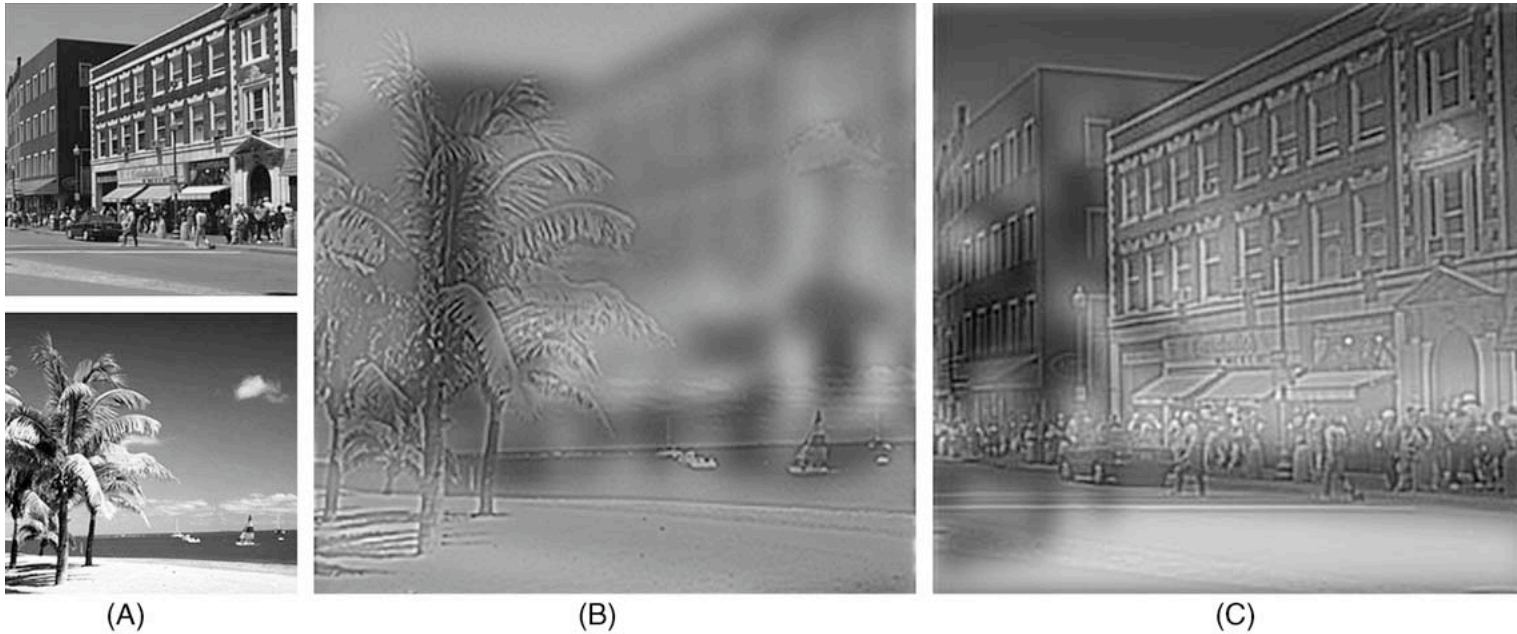


“forest”

Gist and Scene Perception

- Patterns are key in gist perception:
 - common scenes have typical spatial feature components, distributed in characteristic ways
 - e.g. large scale pattern arrangements of textures and colours
 - beach scenes usually have large blue area at top (sky), with striated white and blue-grey patches either to the right or left of the image (sea) and a large beige area (sand)

Building the gist of a scene: the role of global image features in recognition. A. Oliva and A. Torralba. Progress in Brain Research. 155:527-532, 2006



- (A) The two original images used to build the hybrid scenes shown above.
- (B) A hybrid image combining the high spatial frequency (HSF, 24 cycles/image) of the beach and the low spatial frequency (LSF, 8 cycles/image) of the street scene.
- If you squint, blink, or defocus, the street scene should replace the beach
- (C) The complementary hybrid image, with the street scene in HSF and the beach scene in LSF (cf. Schyns and Oliva, 1994; Oliva and Schyns, 1997).

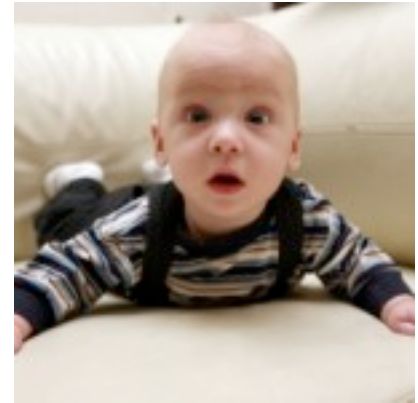
Implications for design: making objects easy to identify

- Objects are patterns of patterns
 - so some will be easier to identify than others
- Typical representatives of a class are easier to identify than outliers
 - typical viewpoints are easier than non-typical
- Showing joints clearly in a structured object will make it easier to identify
 - connections between components of the object should be clear



Implications for design: Novelty

- Humans seek visual novelty
 - novelty seeking in babies is so strong that it has become one of the basic tools to understand how babies' minds work
 - we use free cognitive cycles scanning our environment, seeking mental stimulation
 - we are not usually aware that we do this



Novelty

- Opportunity for advertiser
 - create gist-object conflicts to attract attention
 - very easy to do
 - trick is to add a witty twist



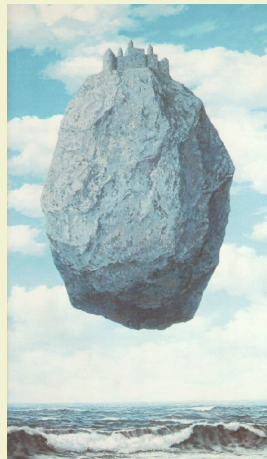
Novelty

- Opportunity for advertiser
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Gist-object conflict is not new:

Rene Magritte
1898 -1967



Salvador
Dali
1904-1989



Visual puzzles

- Another way to hold interest is to create a visual puzzle, often with unfamiliar viewpoints to capture a second glance

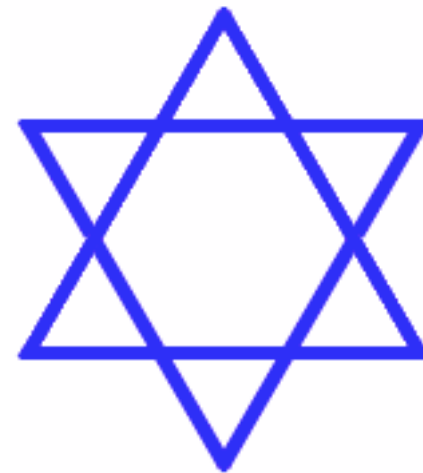
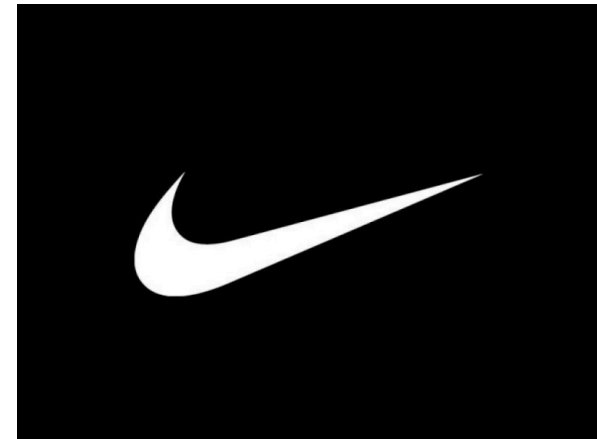
e.g. those by photographer Tim Flach



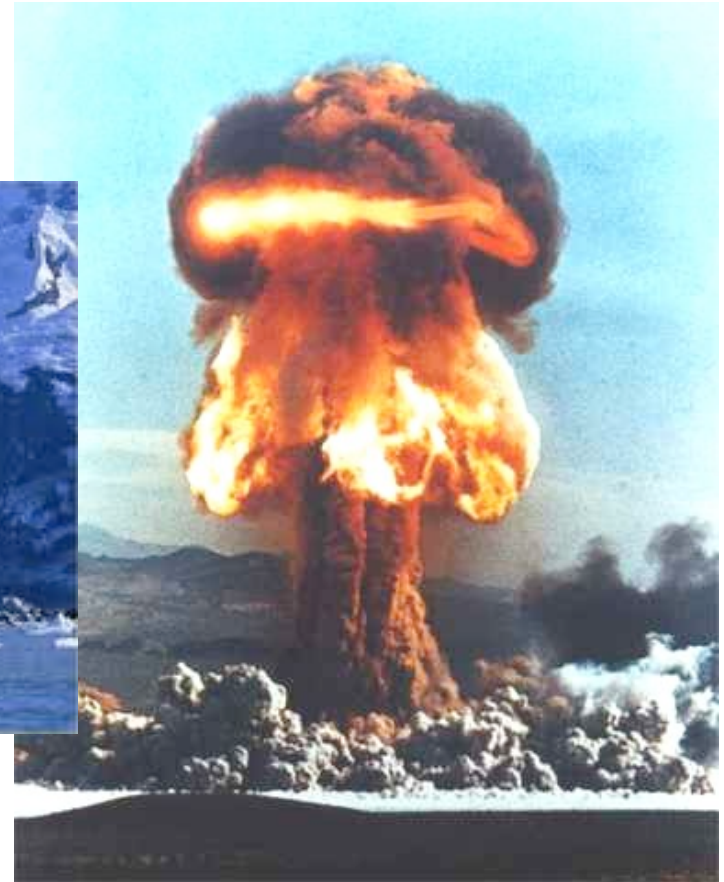
Images as symbols



Some graphic symbols function in the same way as words – bound to a particular non-visual cluster of concepts



Meaning and emotion



- perhaps 95% of what we “see” in the outside world is already in our heads