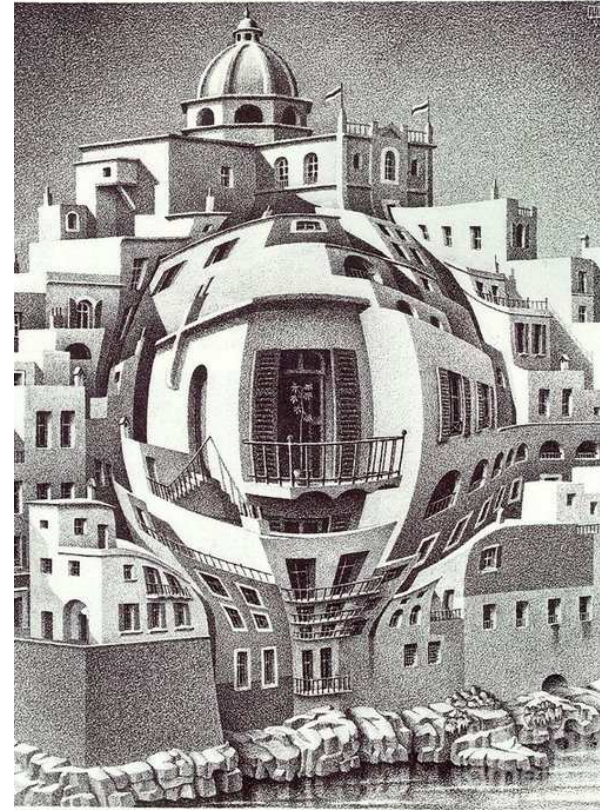


## 2a. Zoom

(Difficulties in the visual determination of Size)



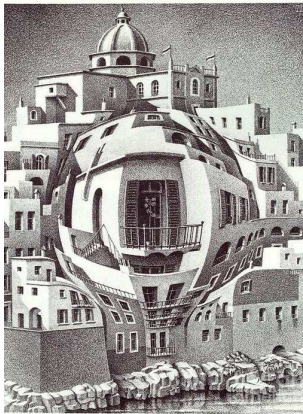
*M.C. Escher – The Balcony -- 1945*

## Zoom

**Focusing attention on a detail in our general view, the detail seems to enlarge while everything else seems to dim.**

This seems to be a basic action of eyesight: our eyes continuously scan about, “zooming” from detail to detail. The effect is more than a matter of lensed focus, because when the lenses of my eyes harden with age the mental visual effect remains. The subject viewed seems to enlarge with enhanced detail and articulation, while the surrounding view remains, but somehow everything else appears dimmer and diminished in mental presence.

A human eye’s light receptive cells are more numerous (more densely packed together) at the center of view -- a small region called (among other terms) the “fovea”; and our zoom effect is also sometimes called “foveal vision”, or “central vision” – a concentration of sight centered by our direction of gaze.



I think this Escher drawing is (perhaps) his attempt to depict the zoom effect, but its bulging curves looks a bit odd and unnatural.

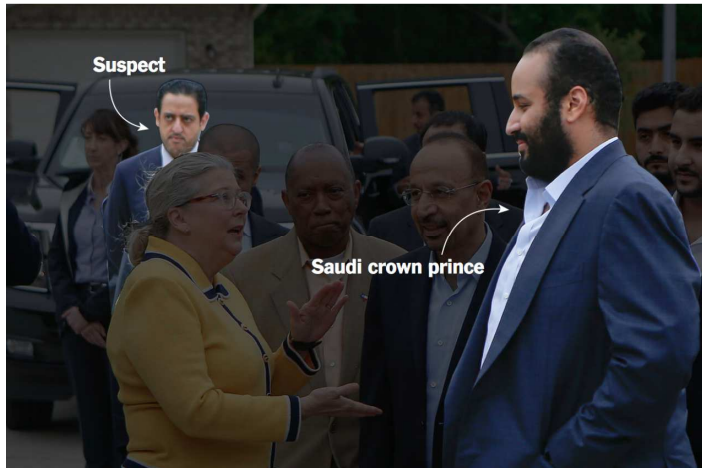
**At present, I know of no method of drawing (or photography) that completely simulates the effect of “zoom” eyesight.** There is no correct illustration of “zoom”.

Nevertheless, there are several techniques replicating various aspects of “zoom” vision.

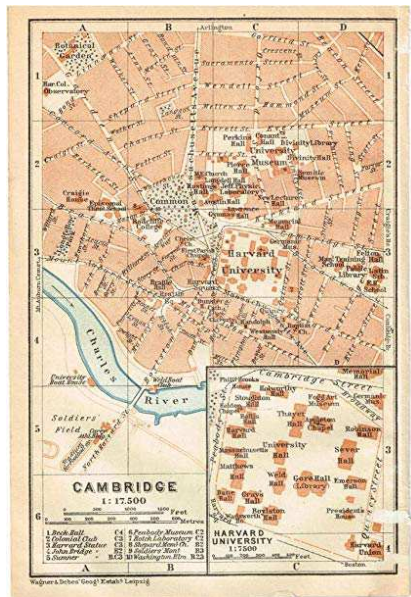


### **Telescopic (telephoto) lenses:**

With a “zoom lens” a photographer can enlarge the view of a small region inside a larger general view; but the surrounding view is then lost.



There are also techniques where the subject of interest is brightly illuminated while the surroundings are darkened (or paled).



On maps, details of special importance are often depicted in separate side windows.

Perhaps related to all this “zoom” magnification is the diminishment of our eyes’ ability to calibrate the size of images.

## SIZE

**Contrary to the precise Perspective system, eyesight is unable to calibrate precise angles filled by images.** While eyesight’s estimate of size and distance seems to be a crucial role of its function, such estimates are neither as consistent nor as precise as the predictions of Perspective geometry.

The oldest recorded “optical illusion” is a full moon appearing larger near the horizon than high in the sky.



We can measure that the width of the angle filled by the full moon is the same when high or low; nevertheless, near the features at the horizon, the moon appears larger. Ancients came up with a logical-sounding explanation attributing this larger appearance to atmospheric refraction, but in fact the lensing effect of the denser atmosphere near the horizon is not the cause of this illusion.

Misjudgment of size is not unique to the full moon, as the following simple experiment demonstrates:

I hold my hands out at about 90 degrees separation, with one at about twice the distance from your face as the other, thus:



What I see with my eye(s) is not what this Perspective (photograph) illustrates. My eyes sense that the farther hand appears somewhat smaller, but the size difference is much less distinct.

But when I move my two hands where the nearer overlaps the one twice farther:

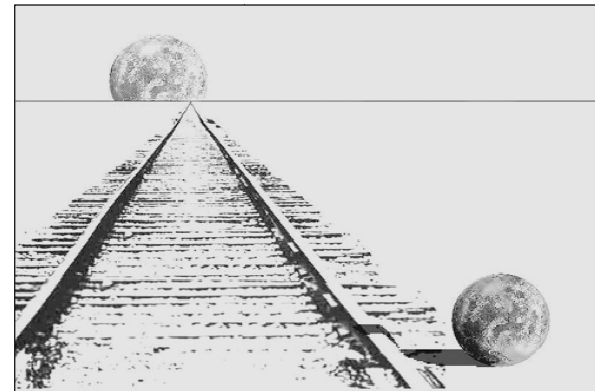


... now the size difference of the images of my hands is visible to my eyes.

There are procedures to deal with such misjudgment. Artists are taught to start with an outline of the overall picture, because if they concentrate observation on a single element, there is a tendency to enlarge it.



Artists sometimes use these exaggerations for caricature or abstraction.



There seem to be all sorts of conditions where my eyes misread the context of surroundings to misgauge the relative size of images.

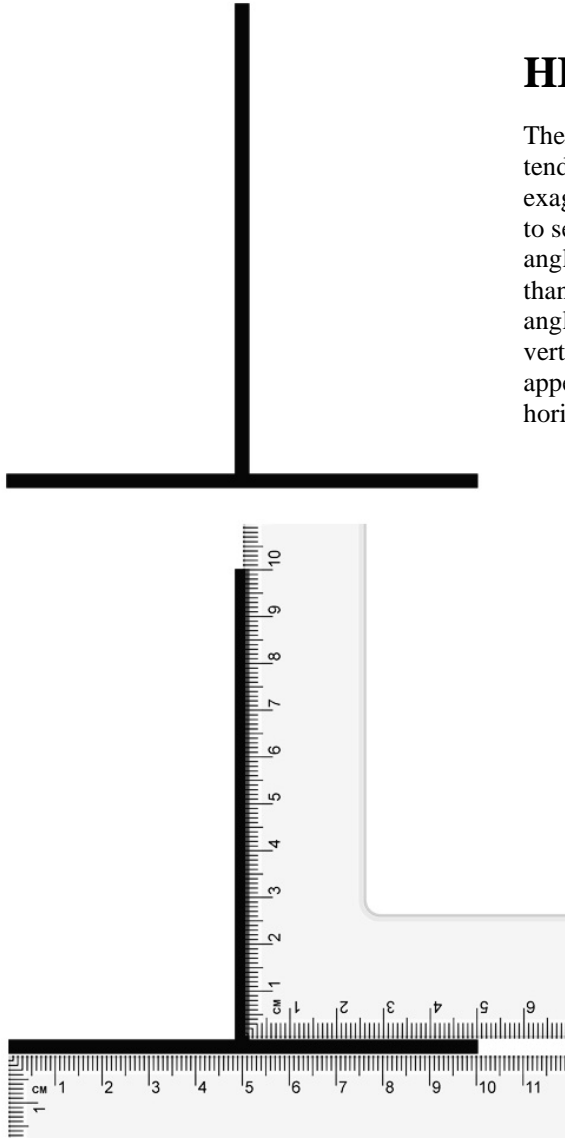
## 2b. Height (and illusions of “vertical”)



St. Louis *Arch* – surprisingly, its width is equal to its height

## HEIGHT

There is a natural tendency to exaggerate height – to see vertical angles as greater than horizontal angles, and for vertical distances to appear longer than horizontals.



76.

Standing outdoors looking at the slope of a hill, there is a tendency to exaggerate the angle of its upward grade. Indoors, there is a tendency to see the stairs climbing at a steeper slope than they actually are.

Nothing in Perspective theory predicts this prevalent sensation.

Our body's physical sense of "vertical" somehow affects eyesight.



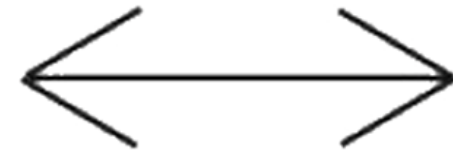
And our sense of balance is not particularly precise – it seems to depend on visual clues – such as vertical walls and trees.

When we tilt the walls of a room, our sense of vertical is easily tricked. Tilting the walls and the camera's frame, it appears that the man in this "funhouse" room is leaning at an impossible degree.

77.

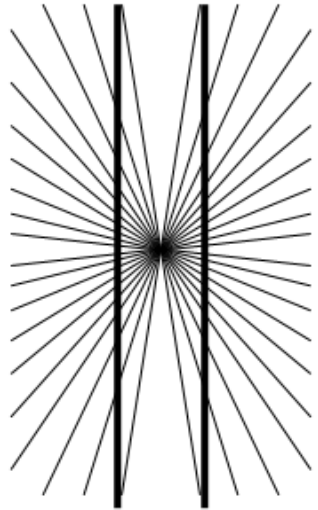
## 2c. Distortions

(Stretching the visual field)

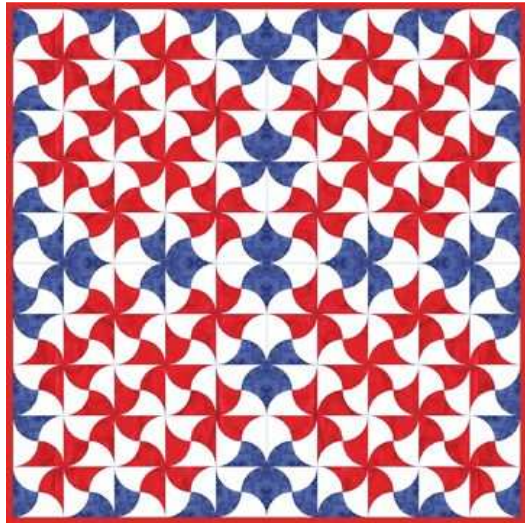


*End-conditions can distort the appearance of a line's length.*

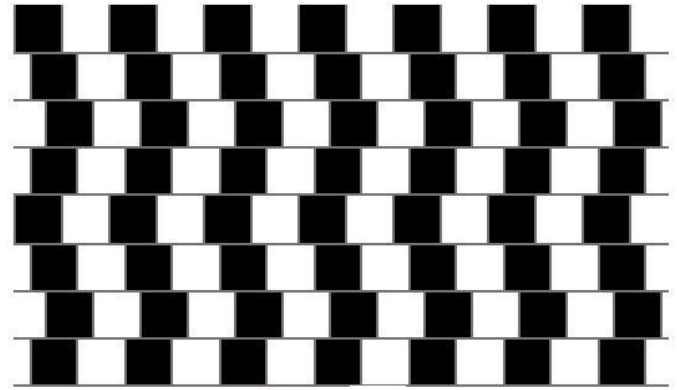
There are various cases of special optical effects which are not predicted by the theory of Perspective. Local conditions will somehow combine together to fool the eye, distorting the view. Somehow the visual field is stretched.



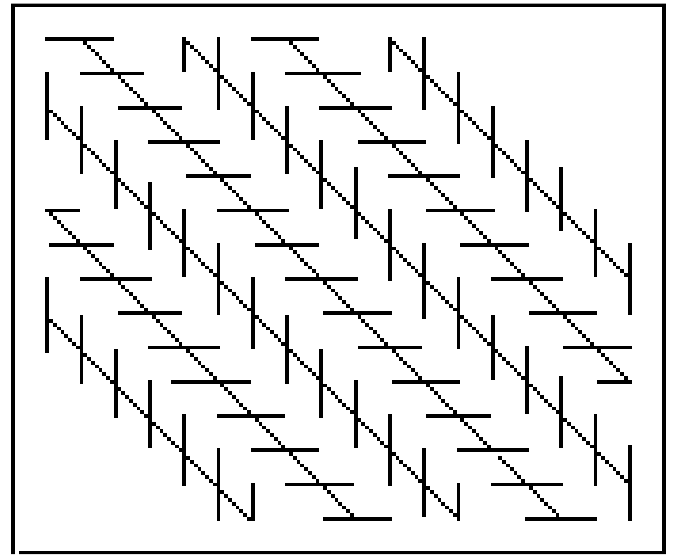
In these two examples,  
straight lines  
appear to curve.



80.

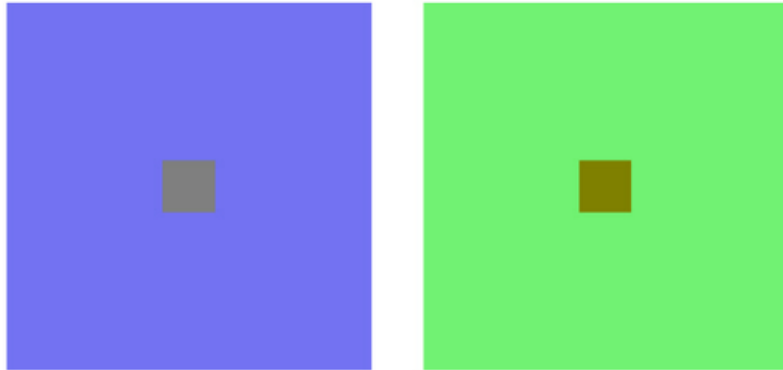


In these two examples, parallel lines  
appear to diverge.



81.





The central color appears different in different surroundings.

The theory of Perspective is perfectly exact; while eyesight seems less interested in such precisions.

My feeling is that these localized distortions go well beyond the isolated examples shown here. I feel that they illustrate a general willingness for the mental procedures of human eyesight to sacrifice exact geometry in its attempt to see patterns, to recognize objects. The human brain's capacity to see is an amazingly lightweight, low energy consuming, biological computer – it is more directed toward tasks other than totally precise quantifications of geometry and photon-light.

## Overcoming visual illusions, with tools

For thousands of years, builders have relied on measuring tools to provide correct geometry in their work. The world is full of strange little optical illusions and “stretched visual fields”. Eyesight alone cannot be trusted.

One prevalent experience is for a dimension viewed outdoors to seem significantly smaller than the same measured distance being viewed indoors. Distances viewed inside a tangled forest somehow can seem greater than on an open plain.



*Measuring Ruler,  
Square,  
and Level*



## 2d. Rotation

(The human eye unconsciously rotates Perspectives)

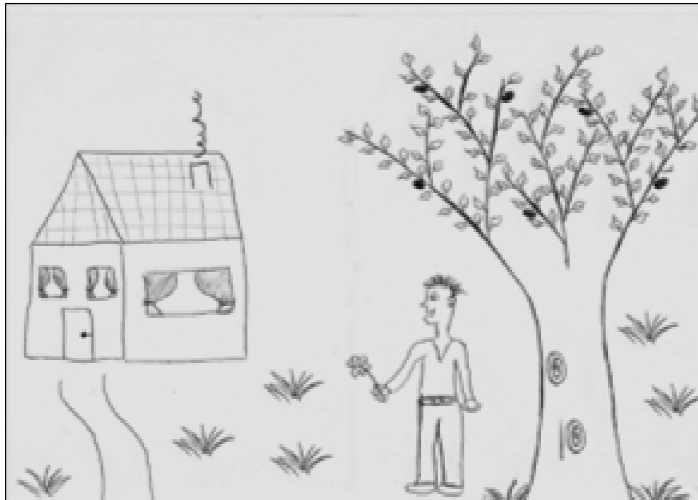
**Relatively inexperienced artists unconsciously tend to rotate surfaces being illustrated in their drawings.**

As our discussions move toward evermore abstract and complicated aspects of eyesight, this is a rather difficult step.

In college, my free-hand drawing professor (Sheldon Helfman) warned my class that there is a subconscious tendency for artists accidentally to rotate visual images of oblique object surfaces. While concentrating on drawing particular angular details, artists will tend to rotate the view into simpler, primitive archetypical views – flat face-on frontal views and perpendicular profile outlines. To avoid such distortion mistakes, it helps if the artist first sketches an overall outline, establishing proportions to their overall picture.



This rotation of complicated angular views toward being flat face-on views is readily seen in children's artwork and in primitive art.



86.

The tendency can also be seen occasionally in artwork by masters ...



'Artist Drawing a Nude with Perspective Device'  
from Albrecht Dürer's *The Painter's Manual* (1525)

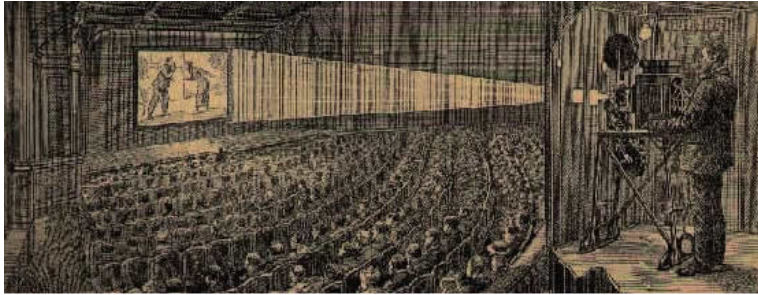


Enlarged, we see the circular top of the flower pot, and various circular edges of the pitcher, rotated slightly toward the observer.

I doubt if either the children or Dürer would say that they saw these rotations, the rotations seem to be 'seen' at a different mental level.

87.

And, somewhat surprisingly, this ability of the human eye to mentally rotate surface images (to see in a non-Perspective manner) is what enables Perspective pictures to appear 'natural' from so many various positions.



In a movie theater, different people can all see a single "correct" Perspective image from many different distances and angles.



Though still far from being understood in 2019, this ability of human eyesight to subconsciously rotate Perspective geometry back into the unique natural view of the Eye's single Point-of-View in Perspective theory has been noted since at least the time of Leonardo da Vinci, 500 years ago.