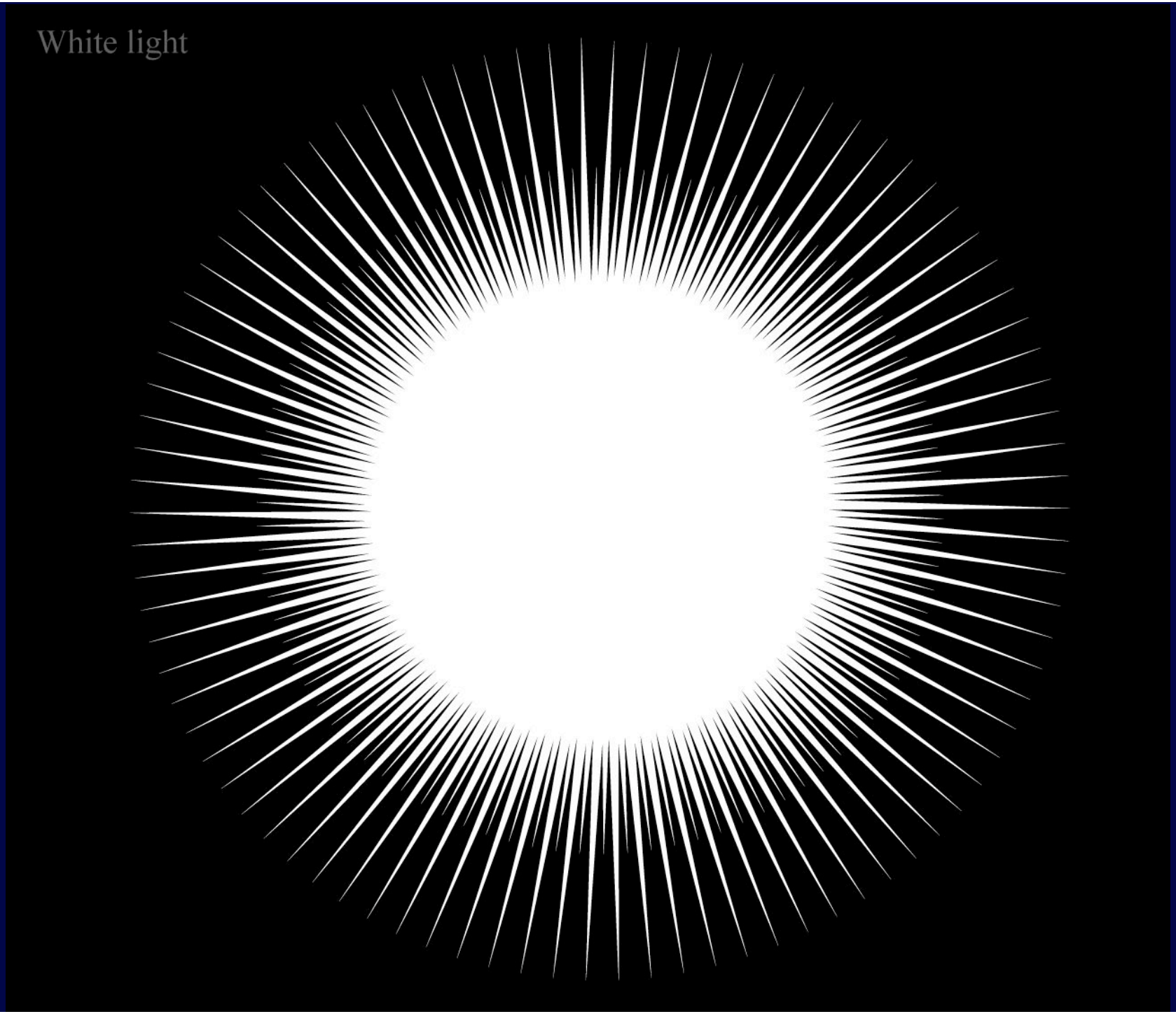
Photography for Art Historical Field Research and Documentation

John C. Huntington

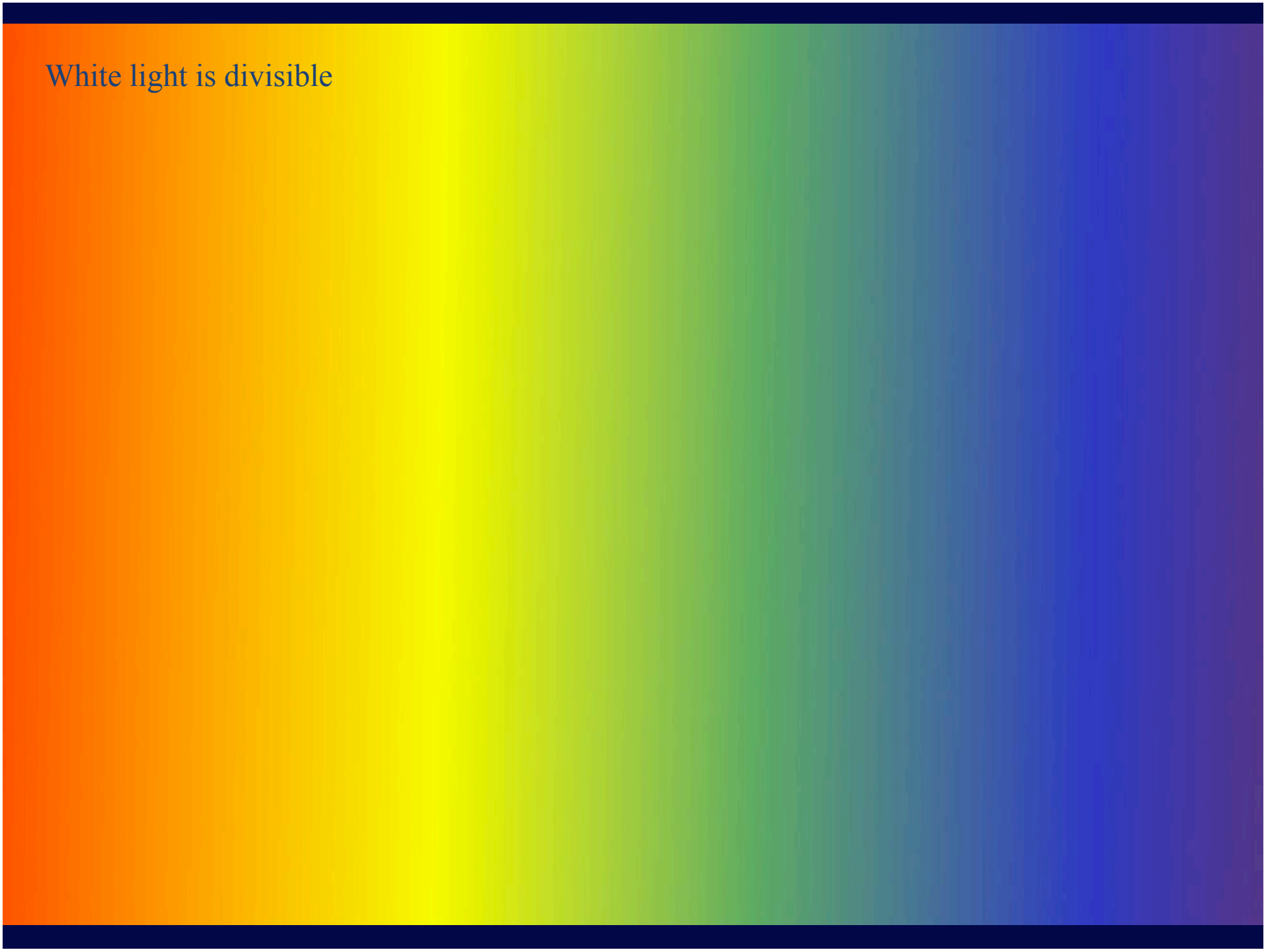
Photography is
about one thing
and nothing else!

White light

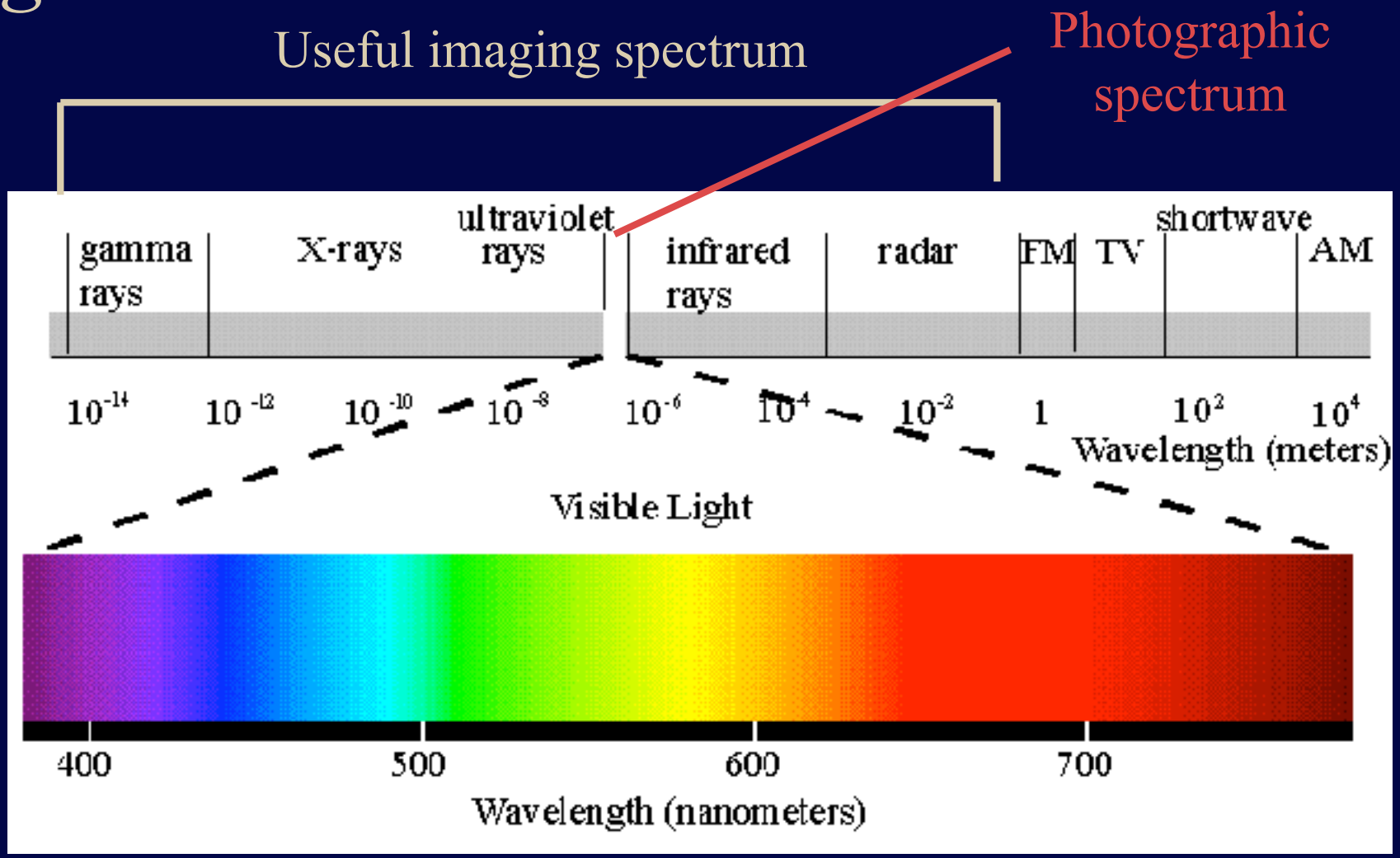


No Light—
No Photography!

White light is divisible



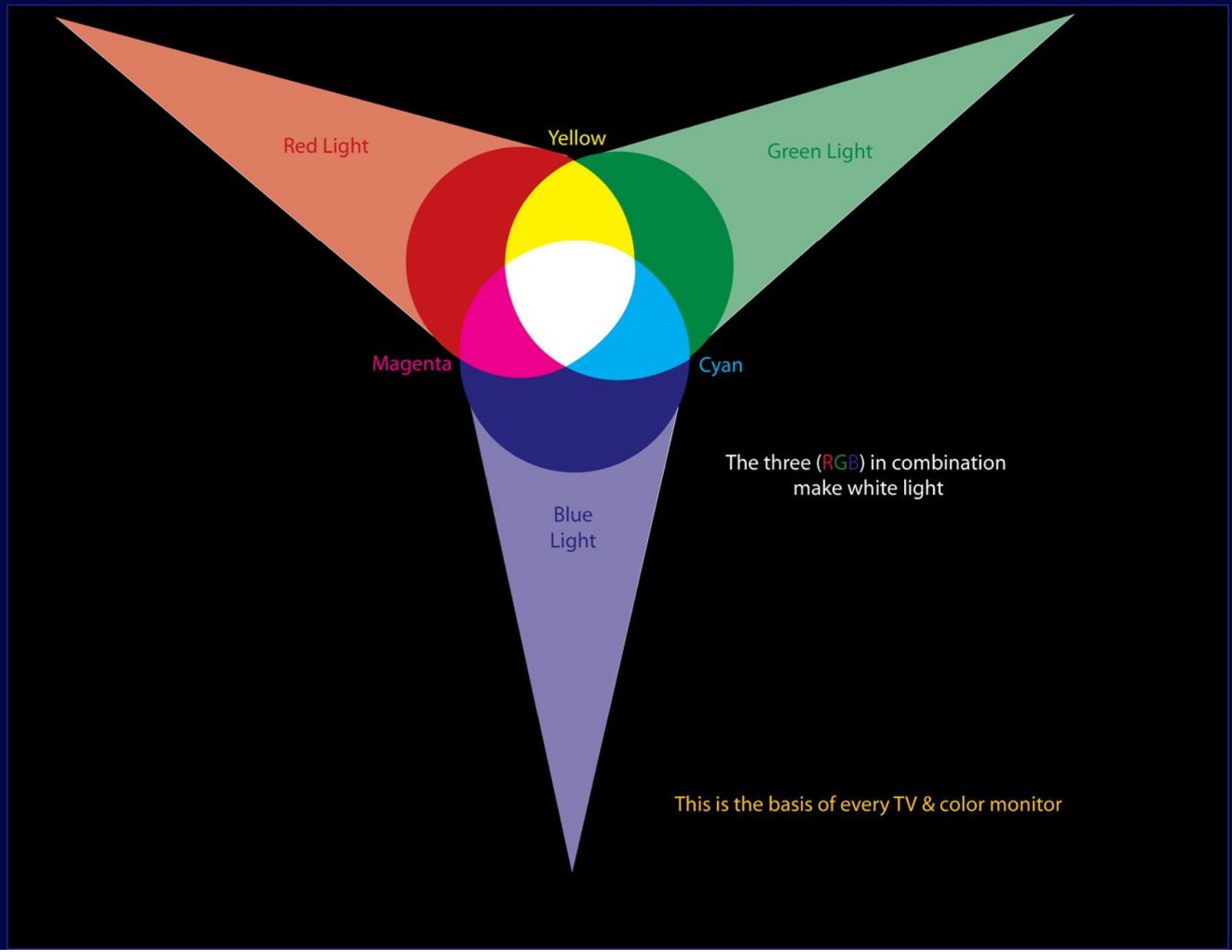
Light


Useful imaging spectrum
Photographic spectrum
gamma rays
X-rays
ultraviolet rays
infrared rays
radar
FM
TV
shortwave
AM
10^{-14}
10^{-12}
10^{-10}
10^{-8}
10^{-6}
10^{-4}
10^{-2}
1
10^{2}
10^{4}
Wavelength (meters)
Visible Light
400
500
600
700
Wavelength (nanometers)

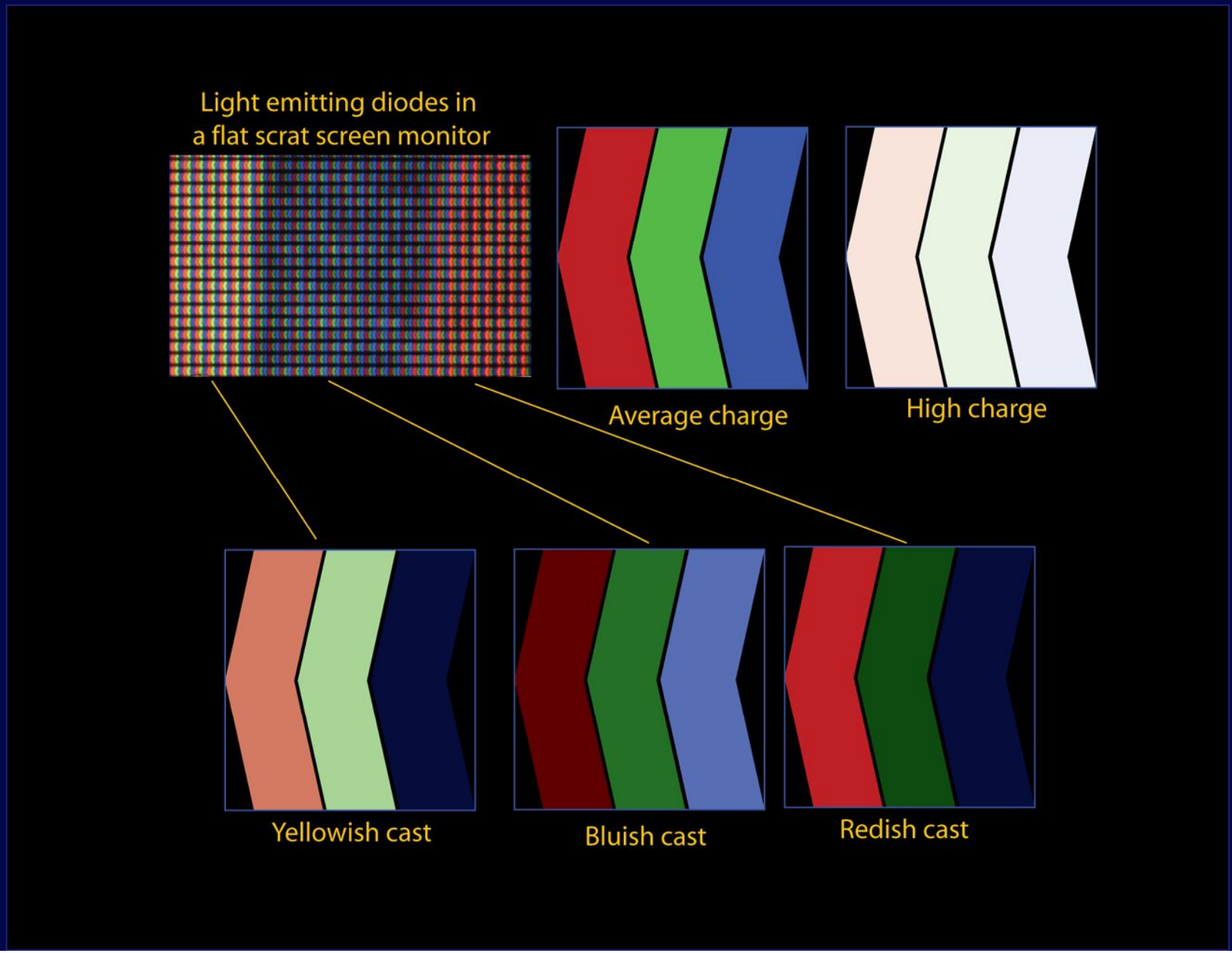
White Light and the Additive and Subtractive Color Systems

- Additive Color System: RGB(red, green, blue)
- Subtractive Color System: CMYK (cyan, magenta, yellow, and black [K is used for black to avoid confusion with blue])

Color: Additive Color 1



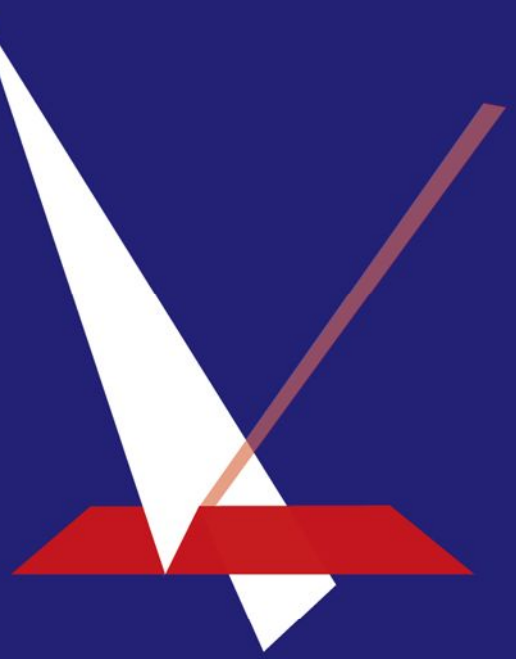
Color: Additive Color 2



Color: Subtractive Color 1

The pigment spectrum of CMYK (cyan, magenta, yellow, and black [K is used for black to avoid confusion with blue] is known as the "Subtractive Color System."

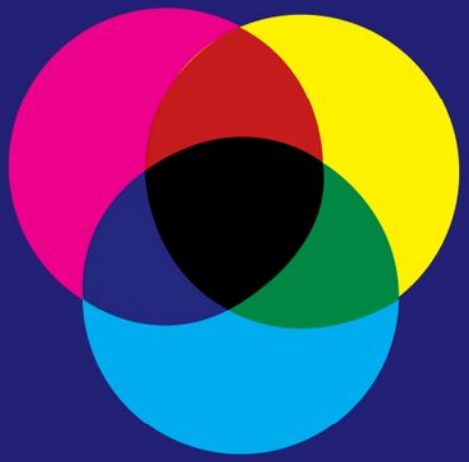
When white light strikes a colored surface, some components of the white light (full spectrum) are absorbed and others are reflected. The components absorbed or reflected depend upon the color of the surface being struck by the white light.

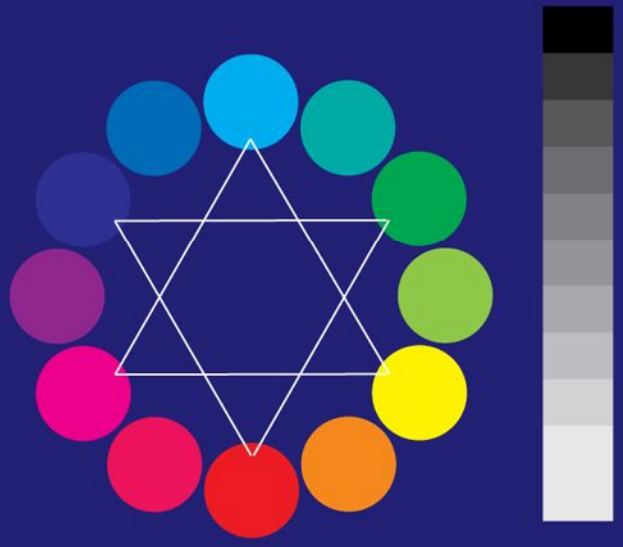


Red pigment absorbs everything but red light

Color: Subtractive Color 2

Subtractive colors are the color mixing palette that we use in opaque pigment painting and to create such things as house paint colors and Pantone colors.

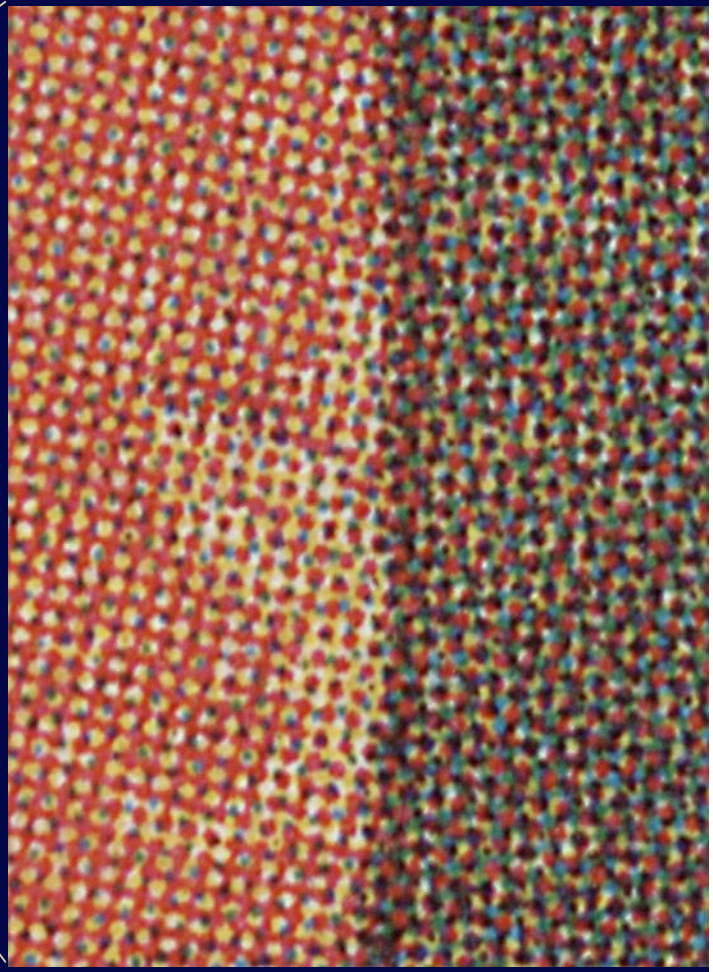




This led to the color wheel we all learned as kids

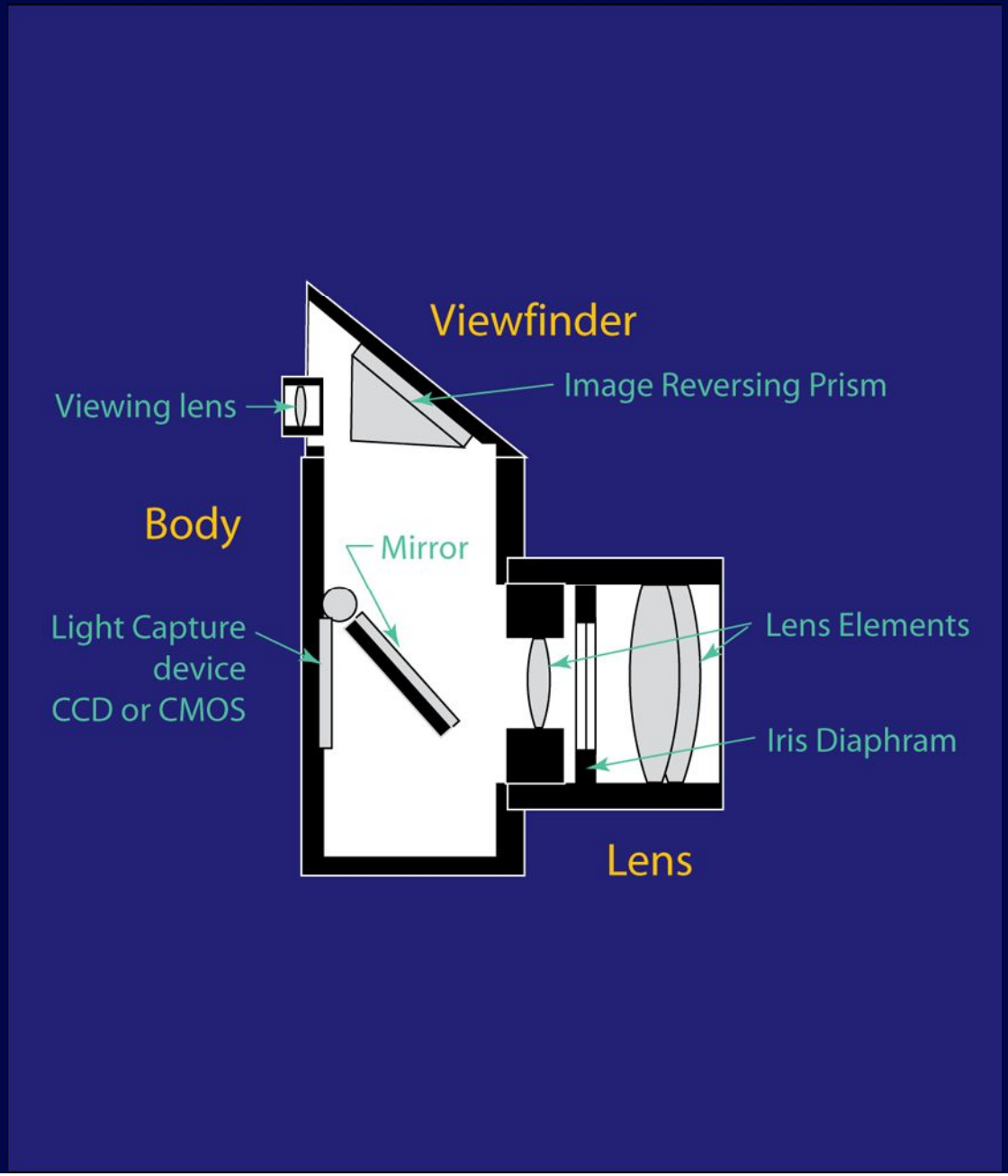
Color: Subtractive Color 3

All Color printing is accomplished through CMYK Subtractive colors



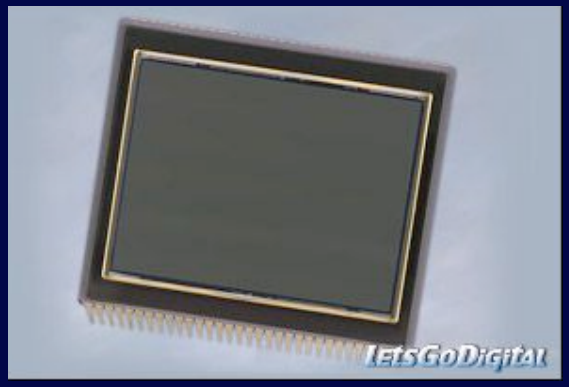
Chigo Daishi (Kobo Daishi as a Child), 14th century. , Art Institute of Chicago

Basic elements of a camera (may be assembled in many ways)

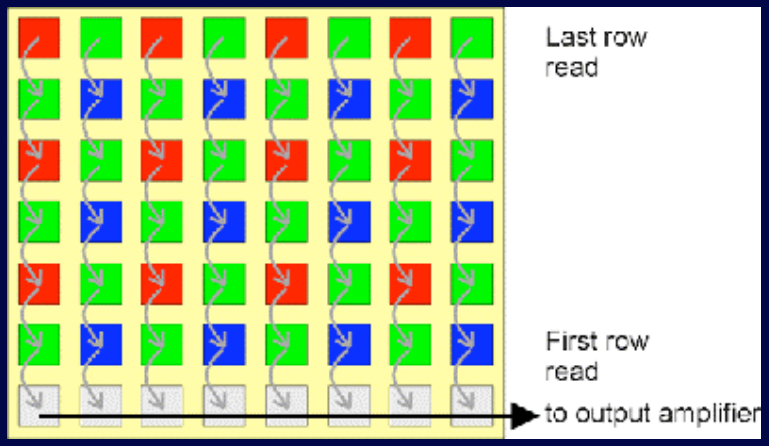


CCD? What is that?

Charge Coupled [Light Sensing] Device



Kodak's 39 megapixel chip



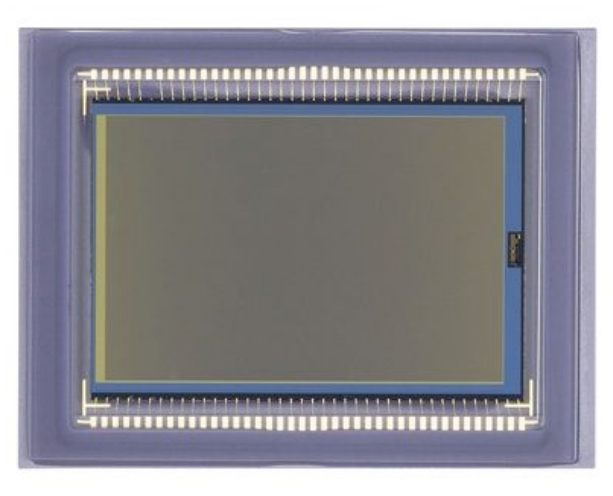
Each pixel is light sensitive to varying colors and levels of light

No light = no charge
Intense light = highest charge

Each row is "coupled" to the row above it. Thus, after a picture is taken, the charged rows are read by means of a cascade of charges through the rows to the bottom and from the bottom into the camera's amplifier.

CMOS? What is that?

Complementary Metal Oxide Semiconductor



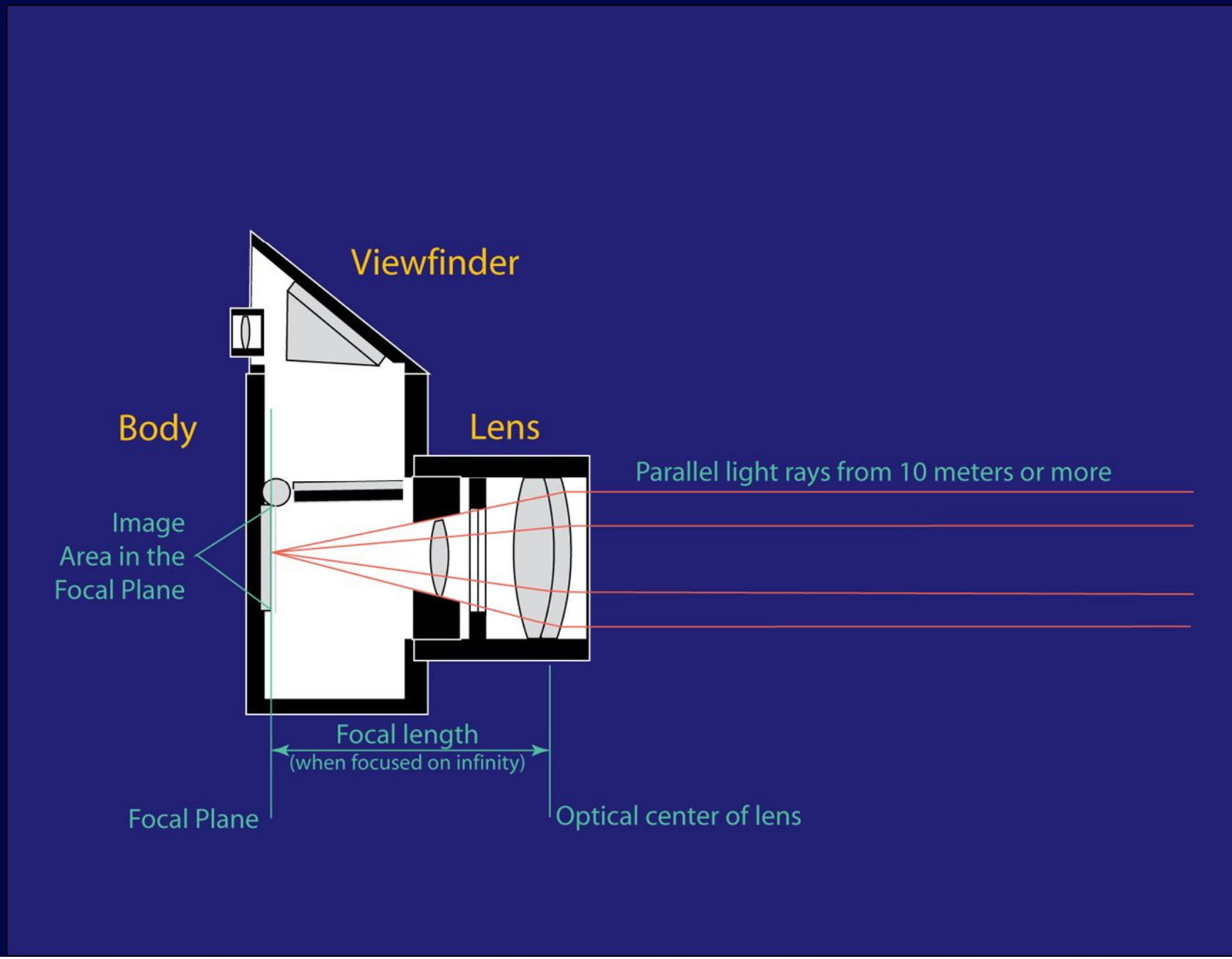
Cannon's EOS-1D CMOS

Made using a much less expensive manufacturing technology than CCD's, CMOS image sensing ships are certainly likely to overtake CCD's in the long run.

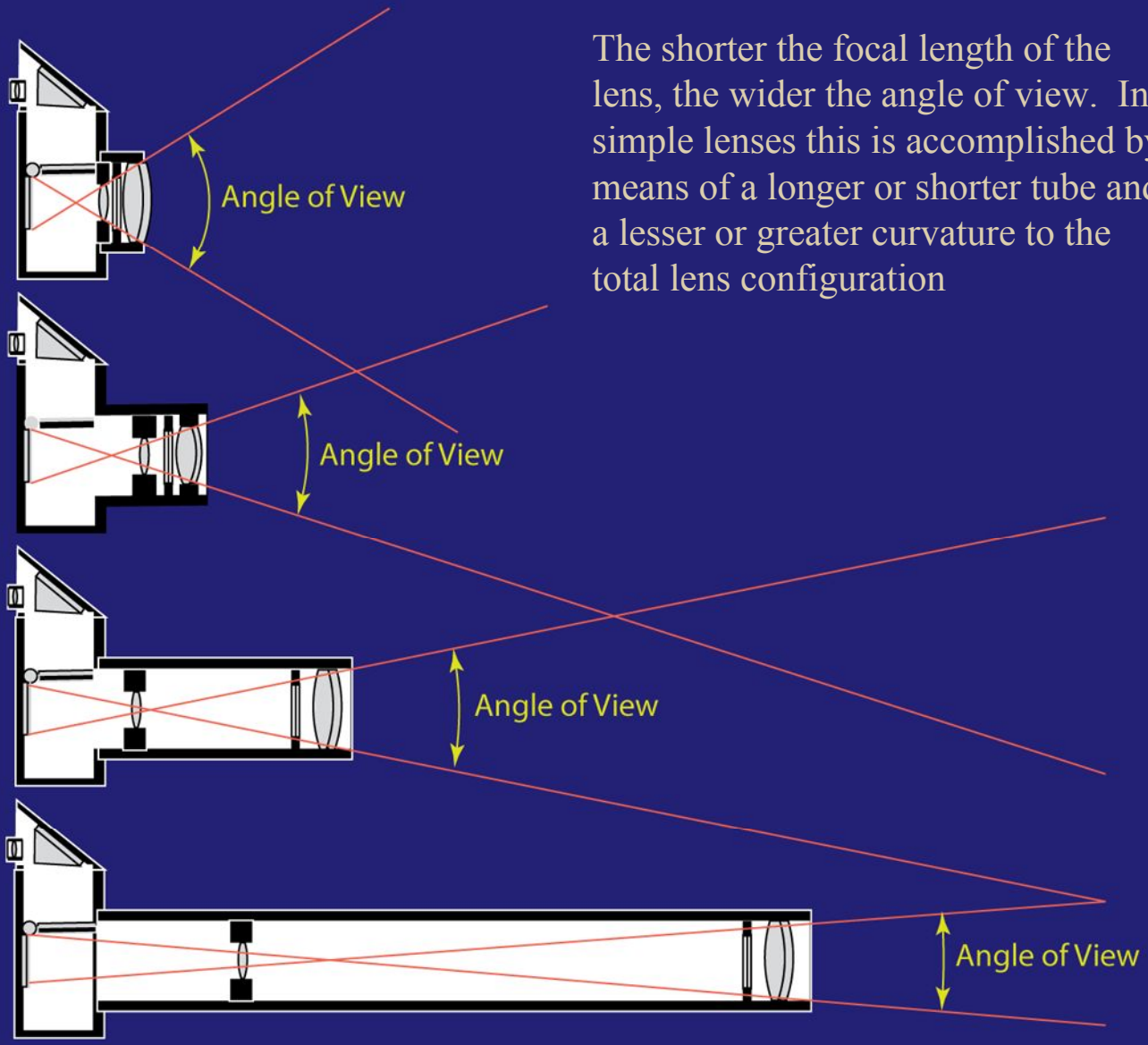
However, except for very high end versions, they suffer from imaging problems and are only used in very expensive or very high end cameras.

For now, beware of them.

The path of light to the CCD

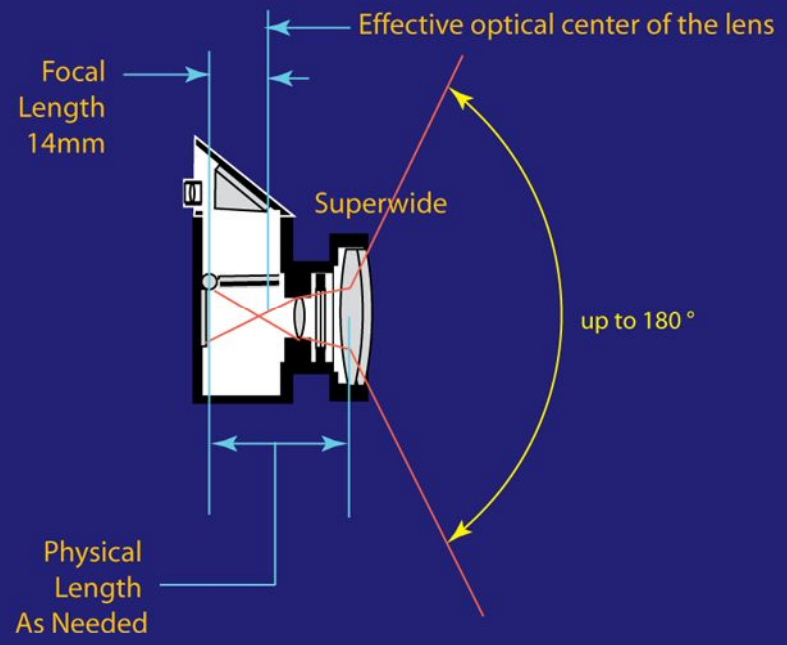


The Focal length of a Lens



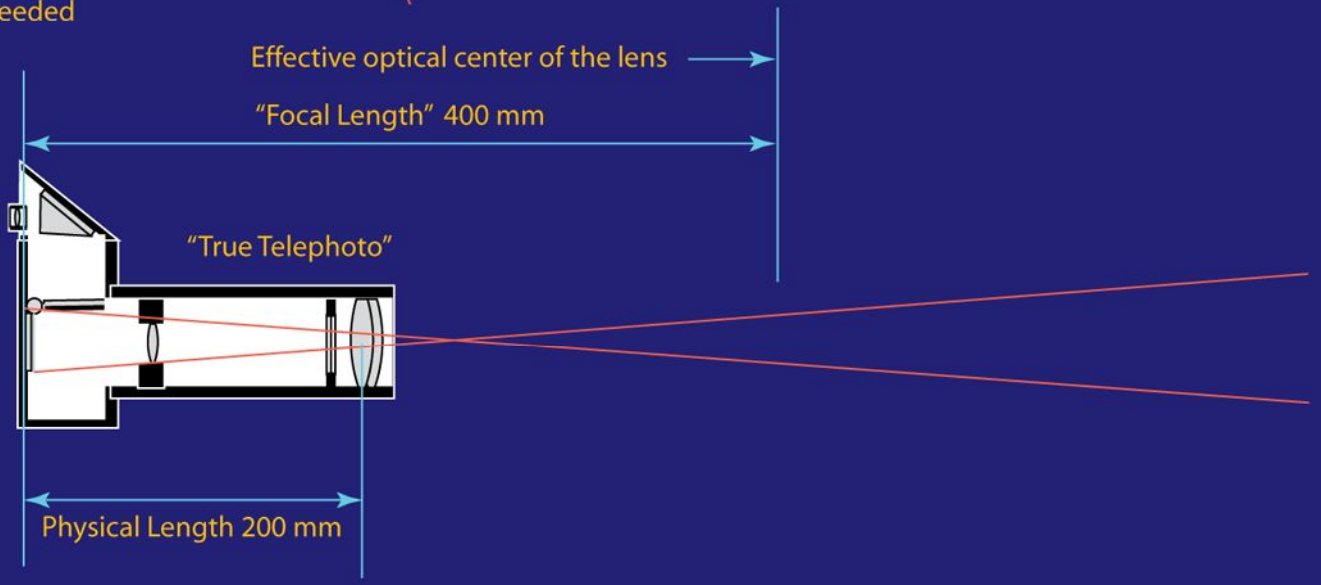
The shorter the focal length of the lens, the wider the angle of view. In simple lenses this is accomplished by means of a longer or shorter tube and a lesser or greater curvature to the total lens configuration

The Focal length of a Lens

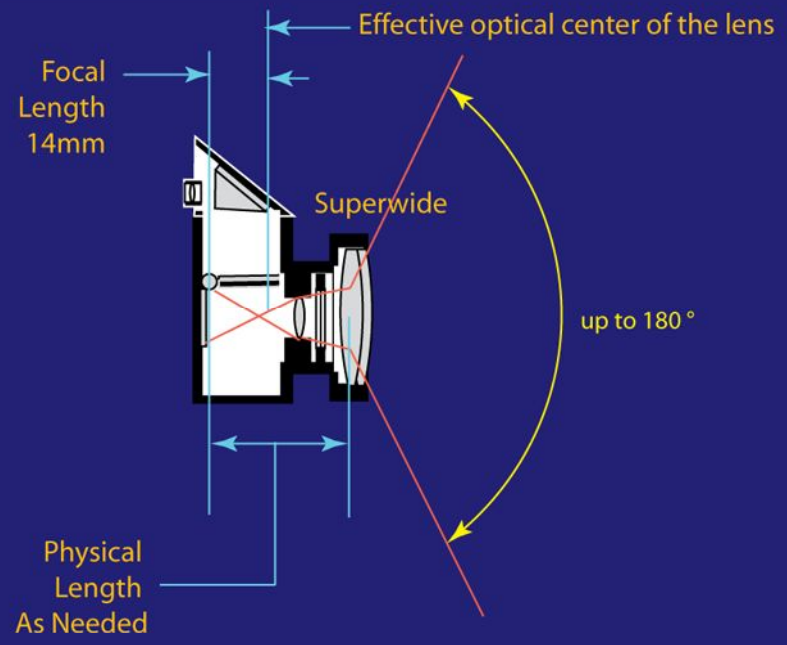


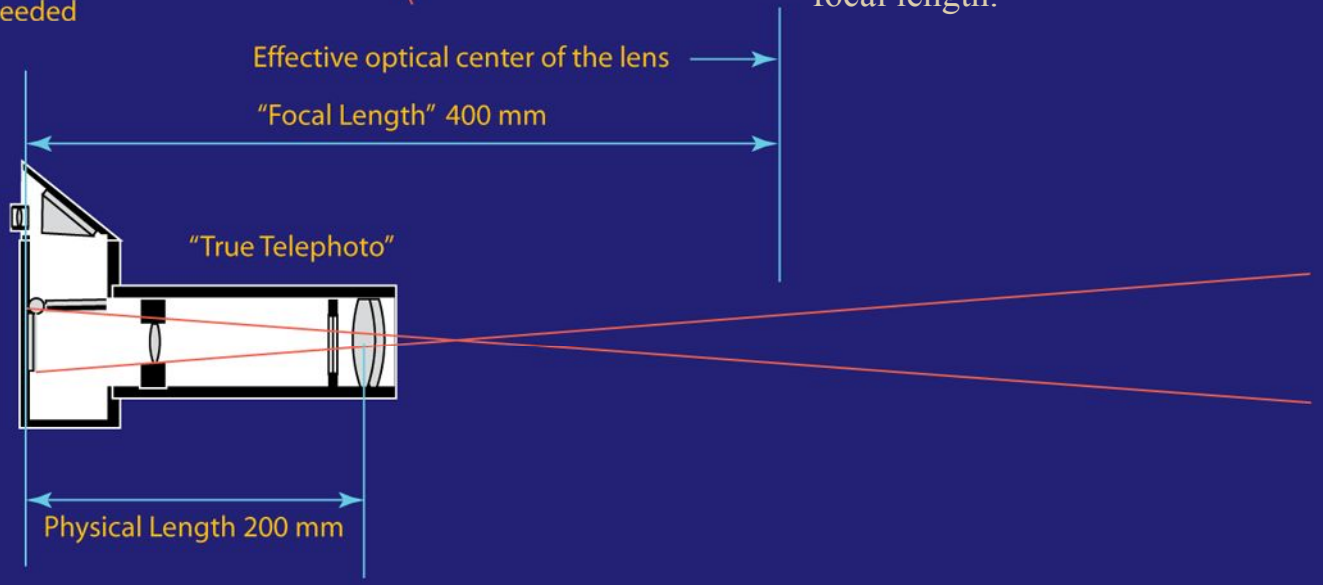
Super-wides:

At about 18 mm for wide angle lenses, the rear elements of the lens interfere with the mirror mechanism. Thus, an optical formula was developed that allows retro-focus, essentially a lens that the optical center is behind any physical element of the actual lens. Flat field lenses of as little as 10 mm have been made and “fisheye” lenses of as little as 6 mm have been made.



The Focal length of a Lens

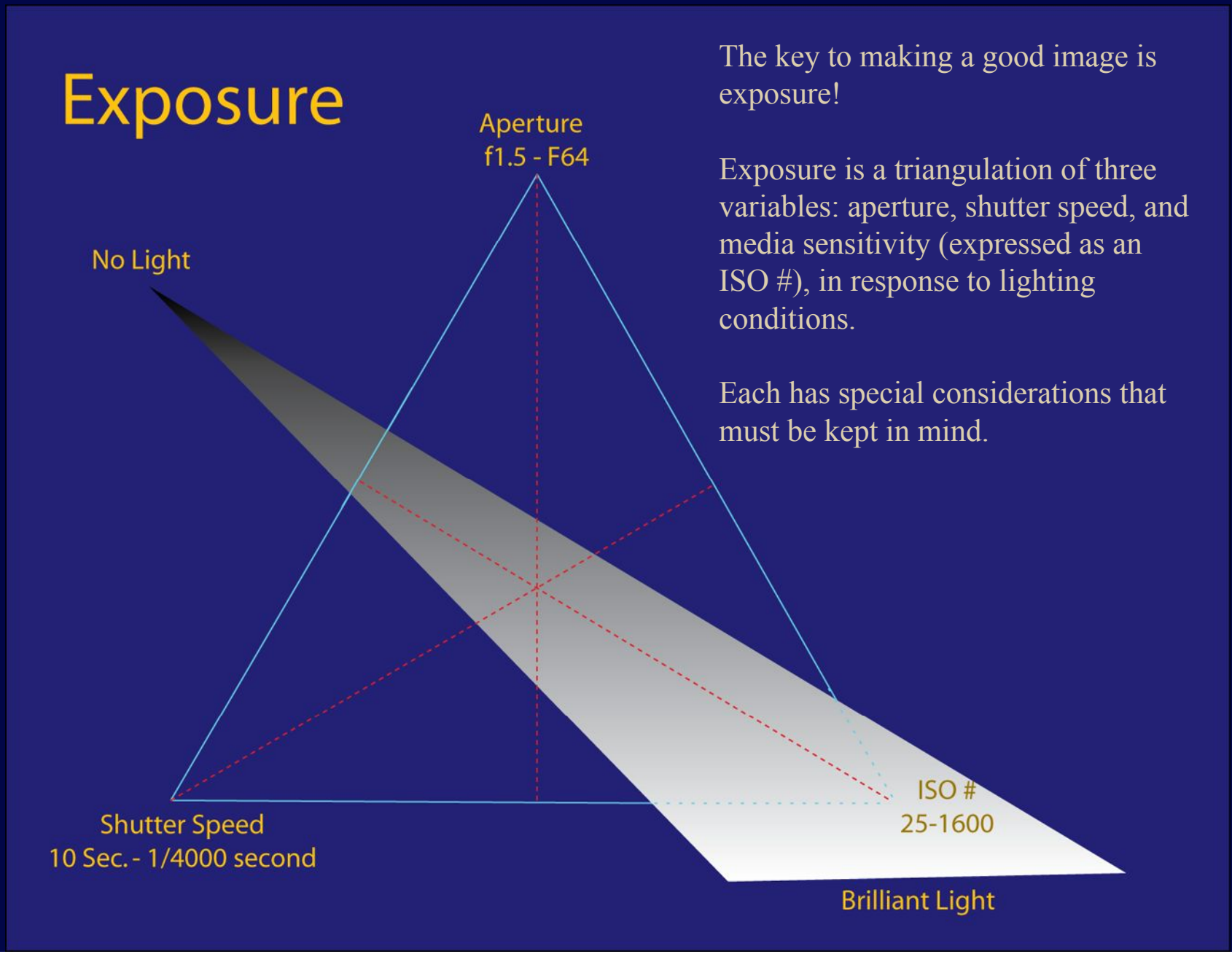




Tele-photo Lenses:

The size and weight of longer and longer telephoto lenses made them impractical as portable instruments. Thus, the "True Telephoto" formulas were developed in which the effective focal length of the lens was about two times (or more) that of the physical lens. In the past lenses up to 2400 mm have been available commercially. At present 600 mm lenses intended for use with either "doublers" or "triplers" allow a maximum of about 1800 mm effective focal length.

Exposure:1



The key to making a good image is exposure!

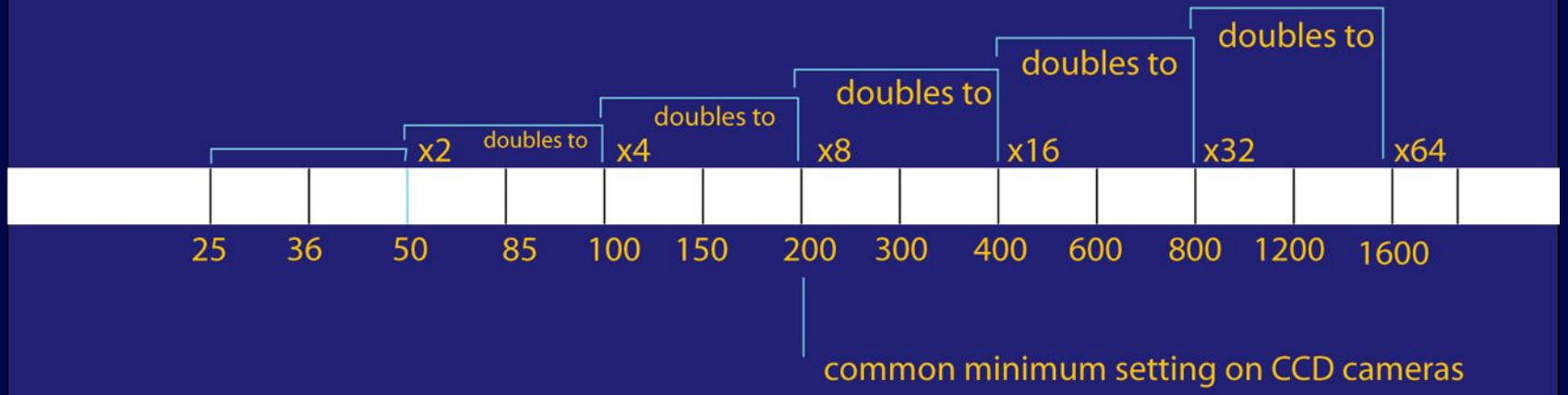
Exposure is a triangulation of three variables: aperture, shutter speed, and media sensitivity (expressed as an ISO #), in response to lighting conditions.

Each has special considerations that must be kept in mind.

Exposure:2

Exposure

ISO # 25 - 1600 = Sensitivity to light



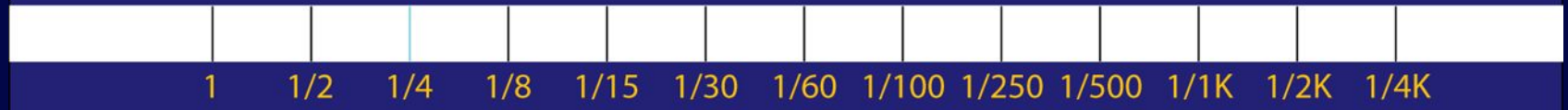
Each increment (e.g., 200-300-400 etc.) is essentially 1/2 stop of improved sensitivity. However, higher numbers of sensitivity can cause noise in the image and one should test their camera to find at what point the noise becomes too much.

Example:
A 200 ISO sensitivity setting at an exposure of 1/250 second at f: 8
can be changed to 400 ISO at an exposure of 1/250 second at f:11
or to 400 ISO at an exposure of 1/500 second at f:8

Exposure:3

Exposure

Shutter speed 1 Sec. to 1/4000th second



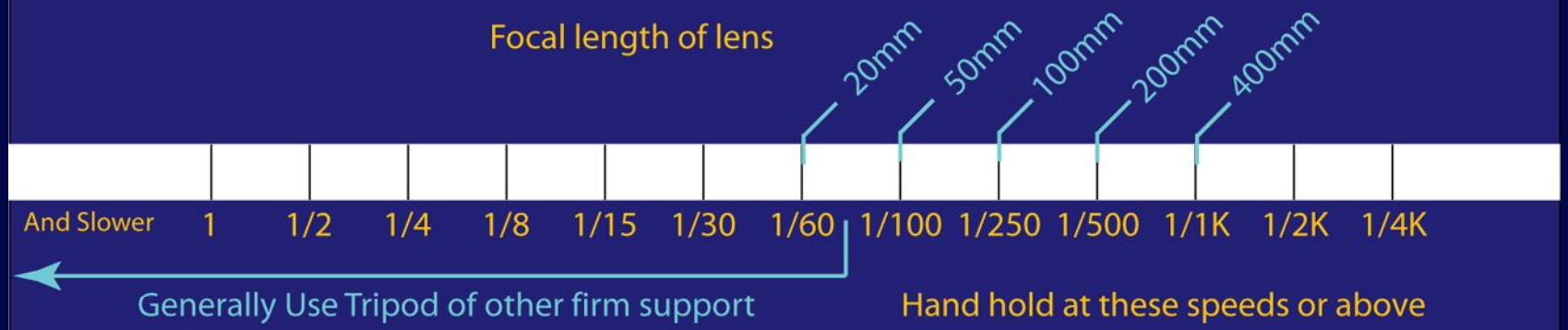
Each increment (e.g., 1/30. 1/60. 1/100 etc) is essentially a 1 stop decrease amount of light transmitted to the CCD. Each step halves the length of time the shutter is open and thereby halves the amount of exposure received by the image sensor

Example:
A 200 ISO sensitivity setting at an exposure of 1/250 second at f: 8
can be 200 ISO at an exposure of 1/100 second at f:11
or to 200 ISO at an exposure of 1/500 second at f:5.6

Exposure:4

Exposure

Shutter speed part 2 (IMPORTANT) Shutter speed and Image sharpness



Shutter speed has a second very important function— to control camera movement when exposing an image. The human being is not a steady platform! Quite the contrary, between heart-beat, pulse, breathing, and general twitching we are not steady at all. While short focal length lenses (6 mm-40 mm) used at 1/60 second and above are not a problem, anything else tends to magnify the problem. The suggested minimum shutter speeds should be used if one is hand holding the camera.

The easy way to remember this is to use the following formula:
shutter speed = (1 ÷ Focal length x 2), (i.e., 50 mm = 1/100 sec. ; 200 mm = 1/400 Sec. etc. (Always round up to the next faster shutter speed.)

Exposure:4

Camera motion

No camera motion

Exposure:4

Shutter speed also controls motion of the subject matter

Stop motion = high shutter speed

While documentation photography is usually concerned with the sharpest image possible, scenic photography, especially of water, is often enhanced by allowing motion to show.

Subject movement = slow shutter speed

Images from: http://en.wikipedia.org/wiki/Shutter_speed

Exposure:5

Exposure

Aperture f:1.0 to F:64

The F:Number is derived form the focal length of the lens divided by the diameter of the aperture. The natural f: number is the actual focal length divided by the open diameter of the lens. However, as the iris diaphragm is closed, the f: number is increased by the reduced size of the iris diaphragm.

The important thing to remember is the higher the number—the less light

Aperture is a constant concern because it affects two elements of photography.

1) Exposure
2) Depth of field

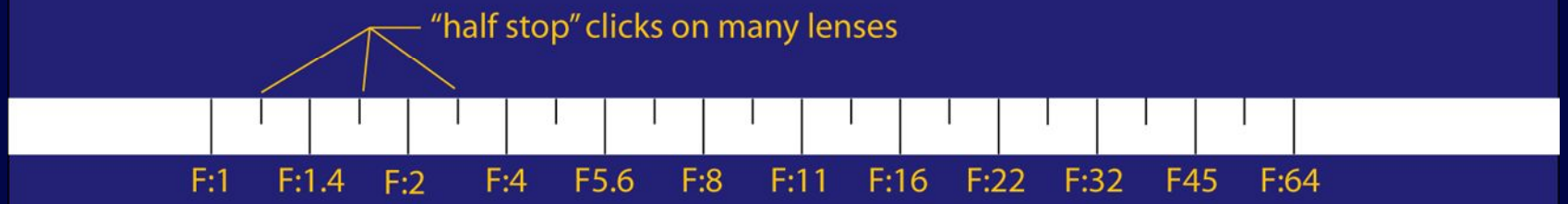
Both must be considered in every photograph.

*While f: 1 lenses are "exotics" and mind-boggling epxensive, they do exist. However, they are not very useful for the art historian (unless you want to photograph is the Moulin Rouge)

Exposure:5

Exposure

Aperature f:1.0 to F:64

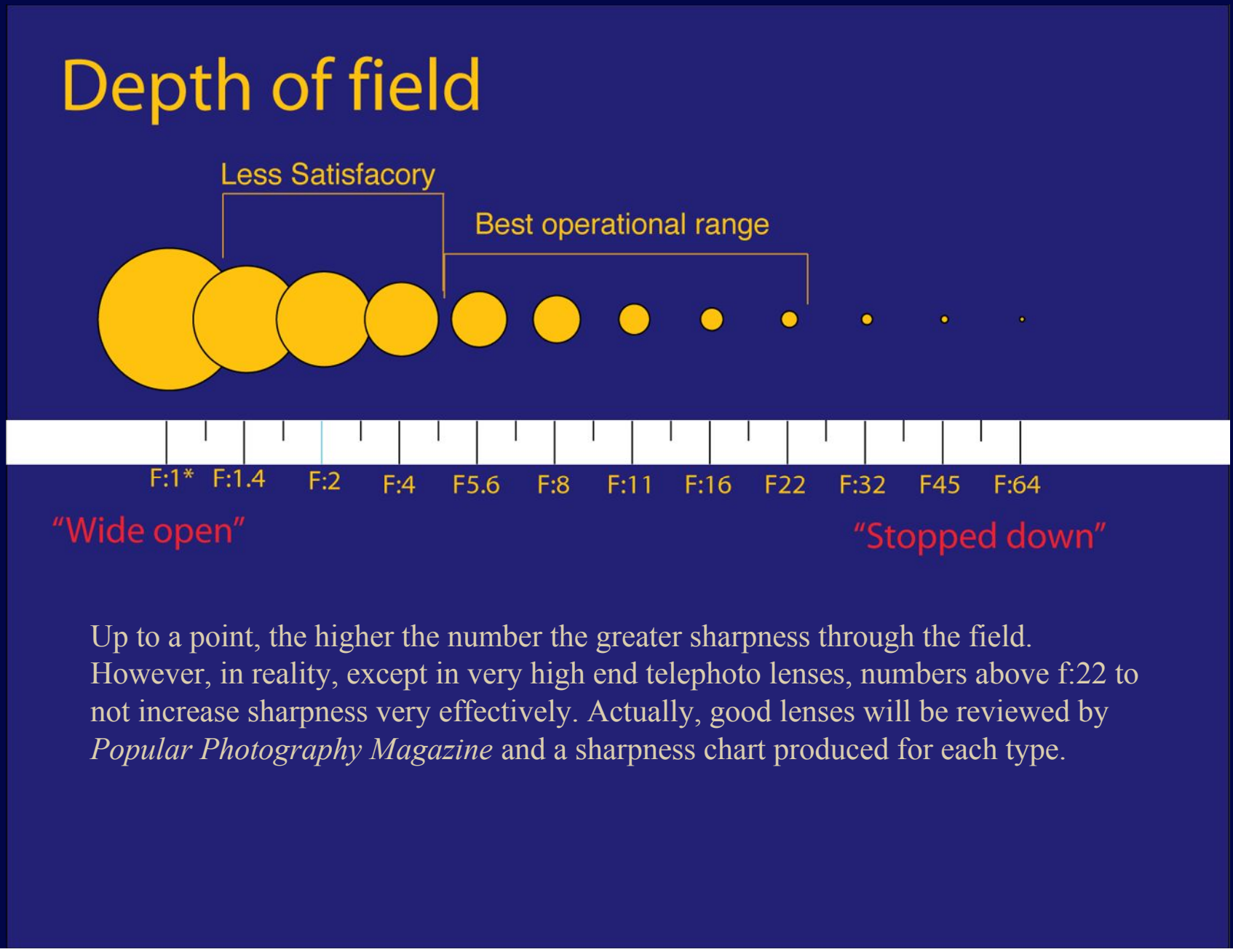


Each increment (e.g.,) is essentially 1 stop of decreased light transmission

Example:
A 200 ISO sensitivity setting at an exposure of 1/250 second at f: 8
can be 400 ISO at an exposure of 1/250 second at f:5.6
or to 200 ISO at an exposure of 1/500 second at f:5.6

If one is bracketing for perfect exposure, simply changing the exposure by 1/2 stop is the easy way to do so. However, many digital cameras can do so automatically simply by setting the bracketing feature to on.

Depth of Field



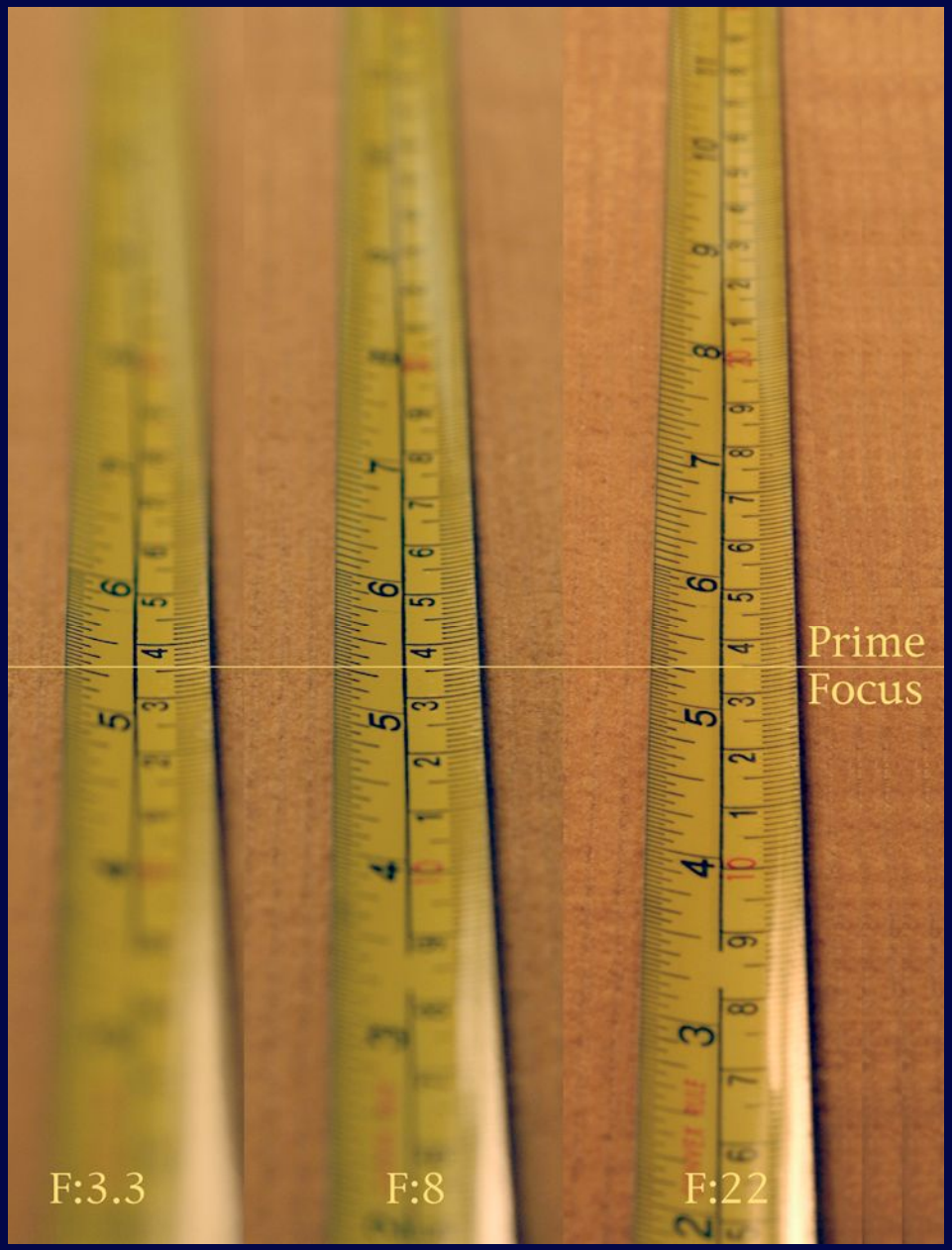
Up to a point, the higher the number the greater sharpness through the field. However, in reality, except in very high end telephoto lenses, numbers above f:22 to not increase sharpness very effectively. Actually, good lenses will be reviewed by *Popular Photography Magazine* and a sharpness chart produced for each type.

Depth of Field

Using a 60 mm lens I shot a tape measure at f:3.3 essentially wide open, a mid point,m f:8 and fully stopped down at f:22.

The increased depth of field is obvious and must be taken into account for three dimensional objects especially.

A close look at the f:22 strip shows That the usable focus extends about 1/3 in front of the prime focus line and snout 2/3 in back of the prime focus line. This Means that if one is photographing a 3 dimensional object, manually focusing to 1/3 of the depth of the object will allow the largest lens opening but still have the object completely in focus.



Depth of Field

Critical depth of field

Typical automatic shot

Aperture controlled shot

Depth of Field

With automatic cameras which focus on the closest point of an object, the rear portions of the object being photographed can be so out of focus as to make a defective photograph. Shot at f:3.3 with a 60 mm lens, in terms of research and study, this is a completely unsatisfactory image.

Depth of Field

Although the hands have not improved any, the second image is sharp through its entire three dimensional space, even the back of the mounting block is sharp

60 mm lens @ f:3.3

60 mm lens @ f:22

Depth of Field

The comparison
Is best made from
100% images

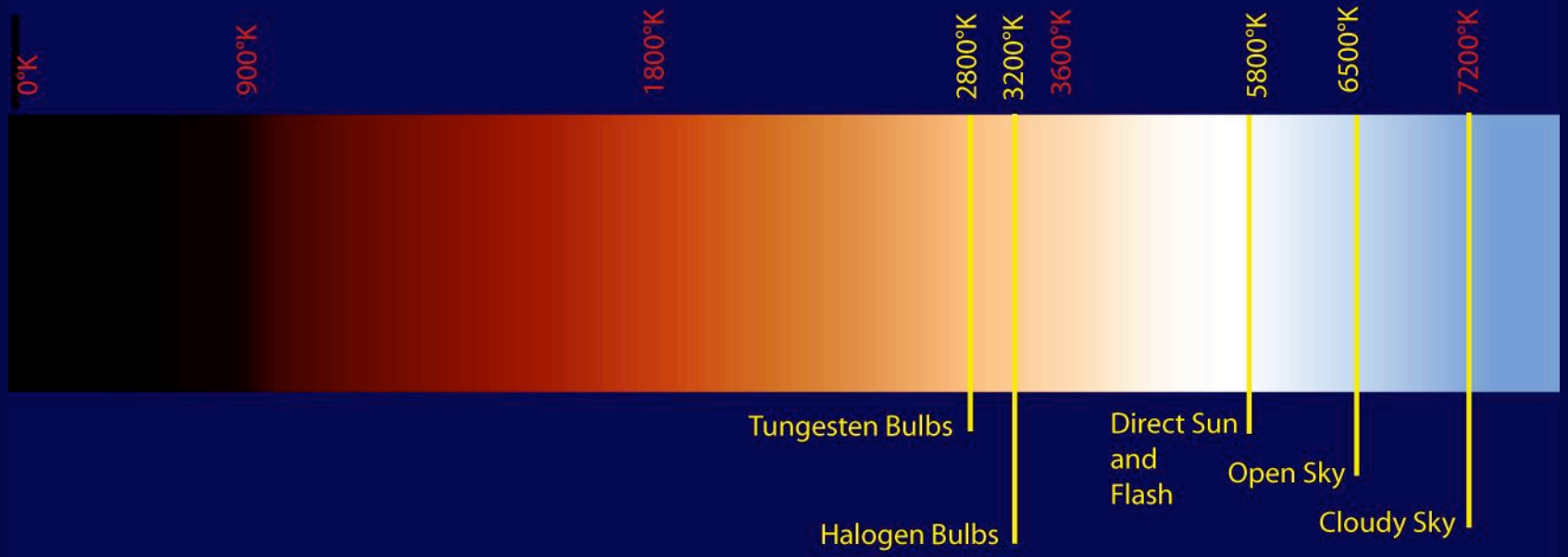
60 mm lens @ f:3.3

60 mm lens @ f:22

White Balance

Black Body Theory

The temperature of a theoretical black body as it is heated gives us a nomenclature known as "color temperature"



Kelvin" is similar to centegrade but starts a absolute 0.
To convert to centegrade subtract 273°

White Balance 1

All frames exposed with halogen light

WB setting at top left of frame

On essence, the camera adds yellow to compensate for the increasingly blue light

White Balance 2

All frames exposed with under open sky

WB setting at top left of frame

On essence, the camera adds blue to compensate for the increasingly yellow light

White Balance 3

Halogen

Florescent

Flash

Direct Sun

Open sky

Deep Blue sky

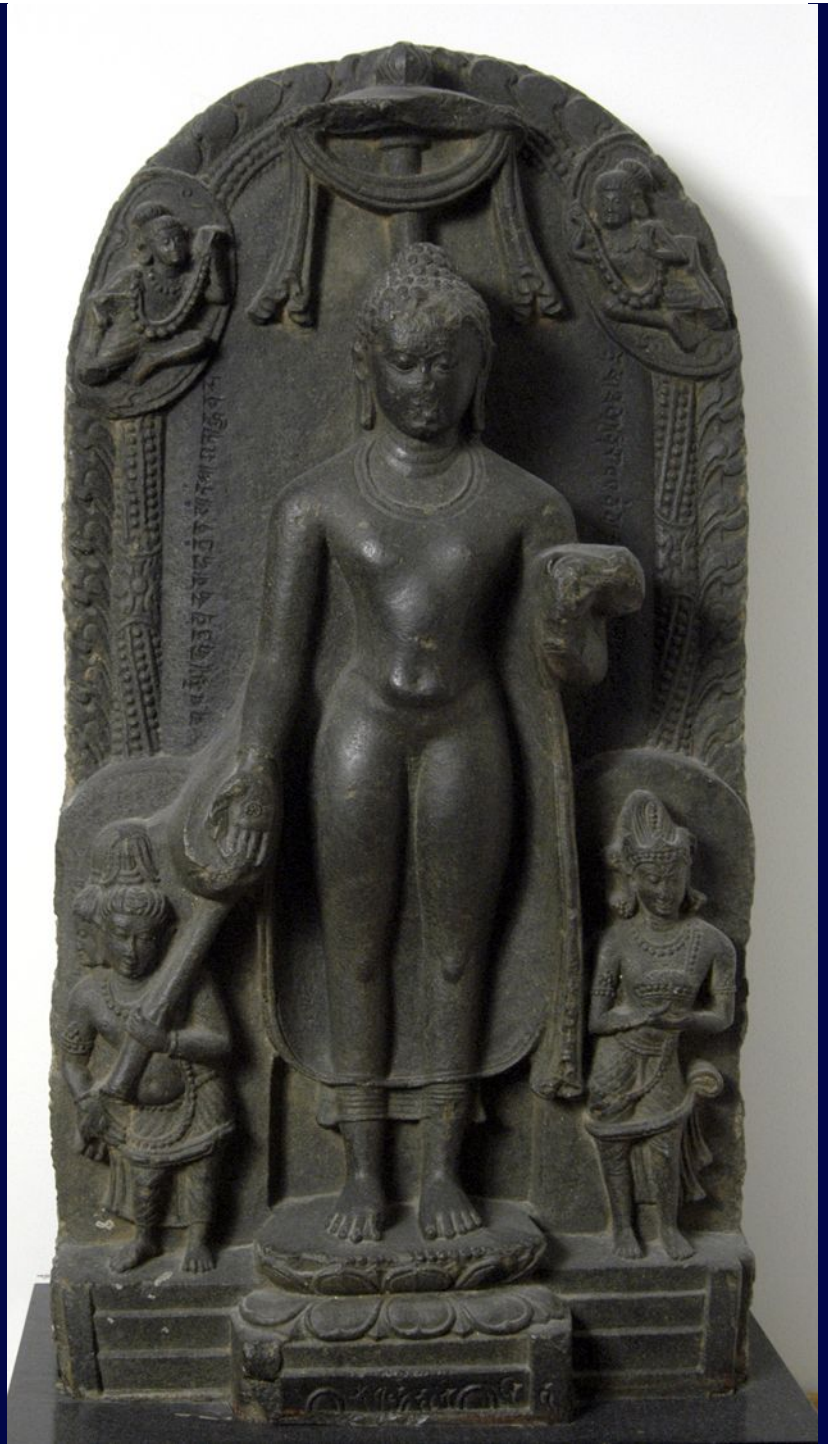
These “white balance” can cause dramatic ill effects in photographs. It should be something that one is always aware of and constantly adjusting as the situation changes.

Lighting the Object: Part 1a

A ideal image to study lighting is a monochromatic sculptural image. Because it is all one color, any comprehension of its form is due to light and light alone.

In field photography, there is usually only one light or permutation thereof. What we do with that light is of paramount importance and the key to good photography.

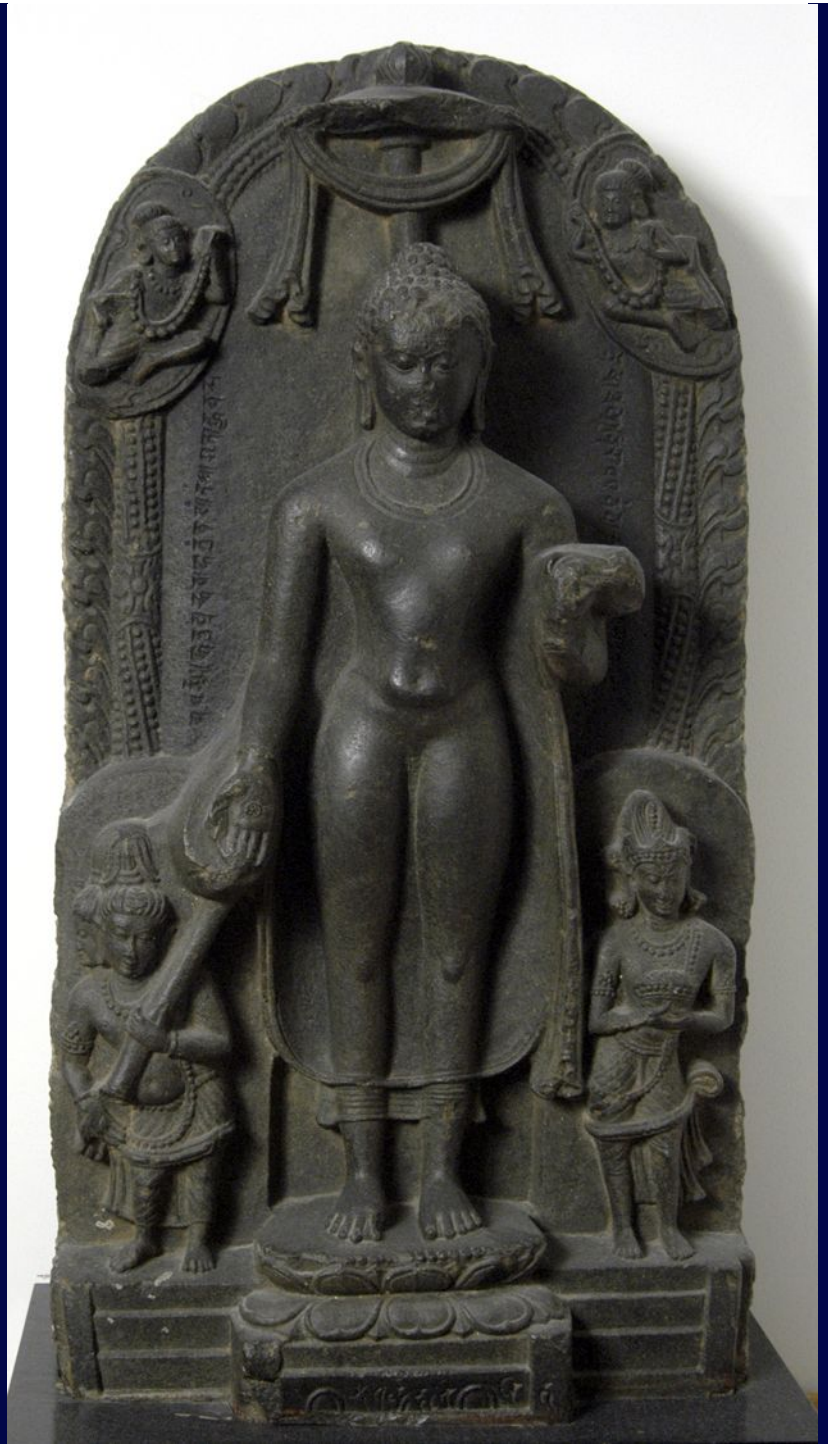
The images in the following discussion have all be made under “field conditions” with only one light, a hand held camera, and no assistants.



Lighting the Object: Part 1a

This photograph was made with a single flash aimed into a small umbrella reflector which created a very broad source of light, approximately 2.5 feet across which created a soft light across the entire image. The flash/umbrella combination was held to the photographer's upper left and at about 6' distant from the sculpture. Virtually no retouching in PhotoShop took place.

While not perfect in a studio sense, this is a very reasonable lighting of a monochromatic subject.

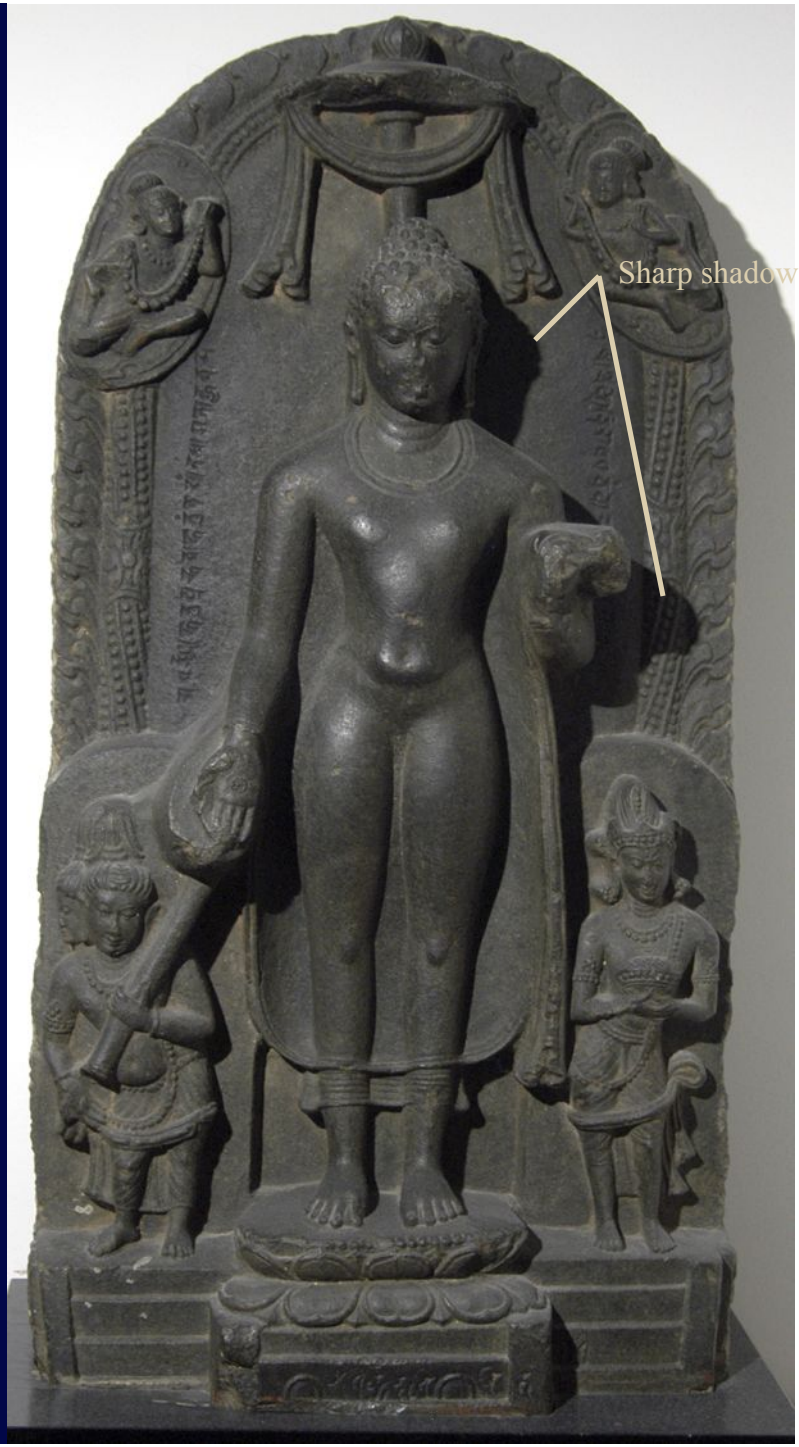


Direct flash, on-camera produces a flatly lighted poorly articulated image that is very difficult to read.

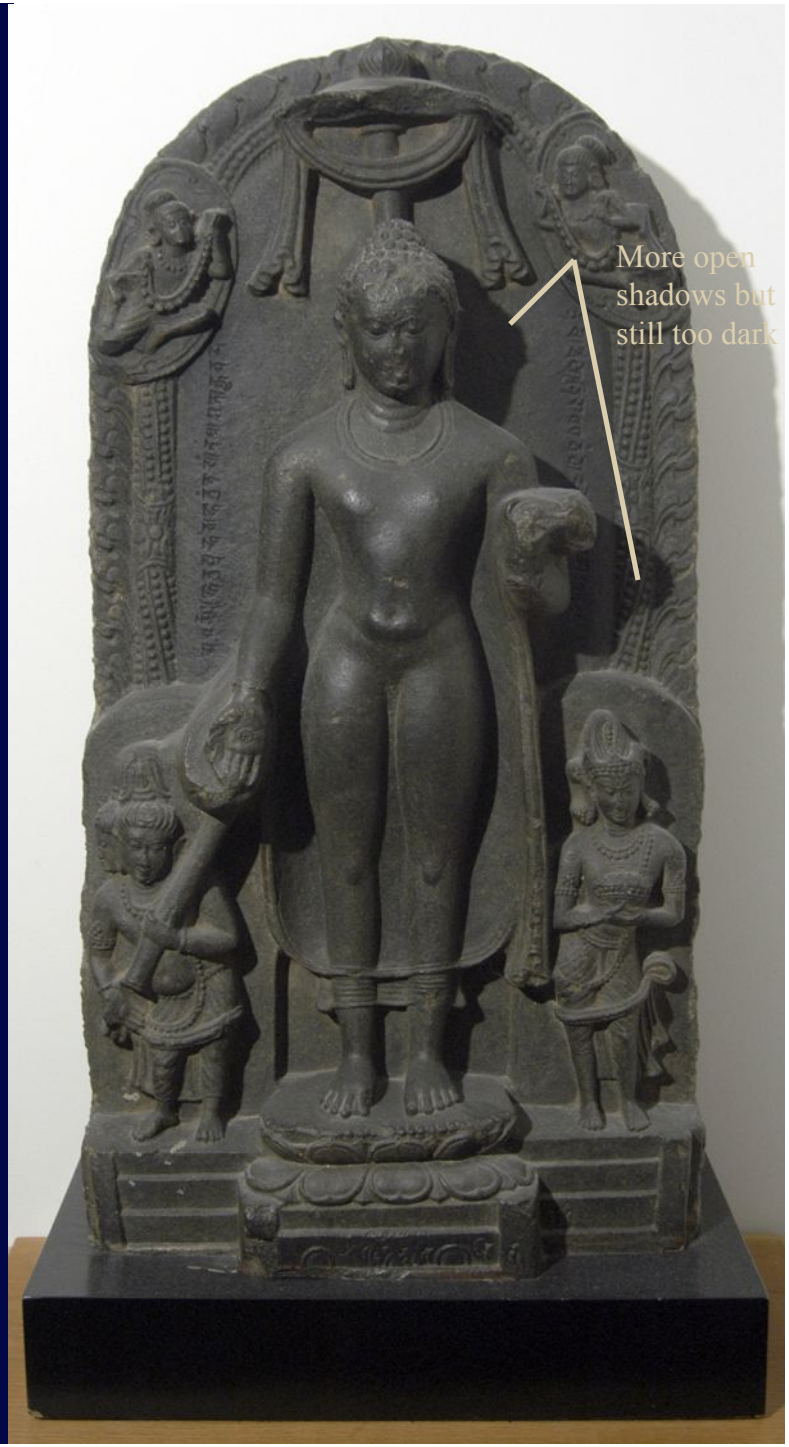
Direct flash, on-camera produces a flatly lighted poorly articulated image that is very difficult to read.

Compare, the articulation of the pearl garland and aura of light.

Direct flash, off-camera produces a strongly lighted and articulated image that has deep, sharp shadows that are difficult to read. Generally speaking, it is satisfactory but can be improved upon.



Direct flash, off-camera with a diffuser produces little difference from the direct flash. The image is strongly lighted and articulated with deep, sharp shadows that are difficult to read, Generally speaking, it is satisfactory but can be improved upon.



Bounce flash off of a white ceiling. Generally not available and much softer lighting than is useful for interpreting sculpture. Some contrast can be built in PhotoShop

Flash on camera:
too flatly lit

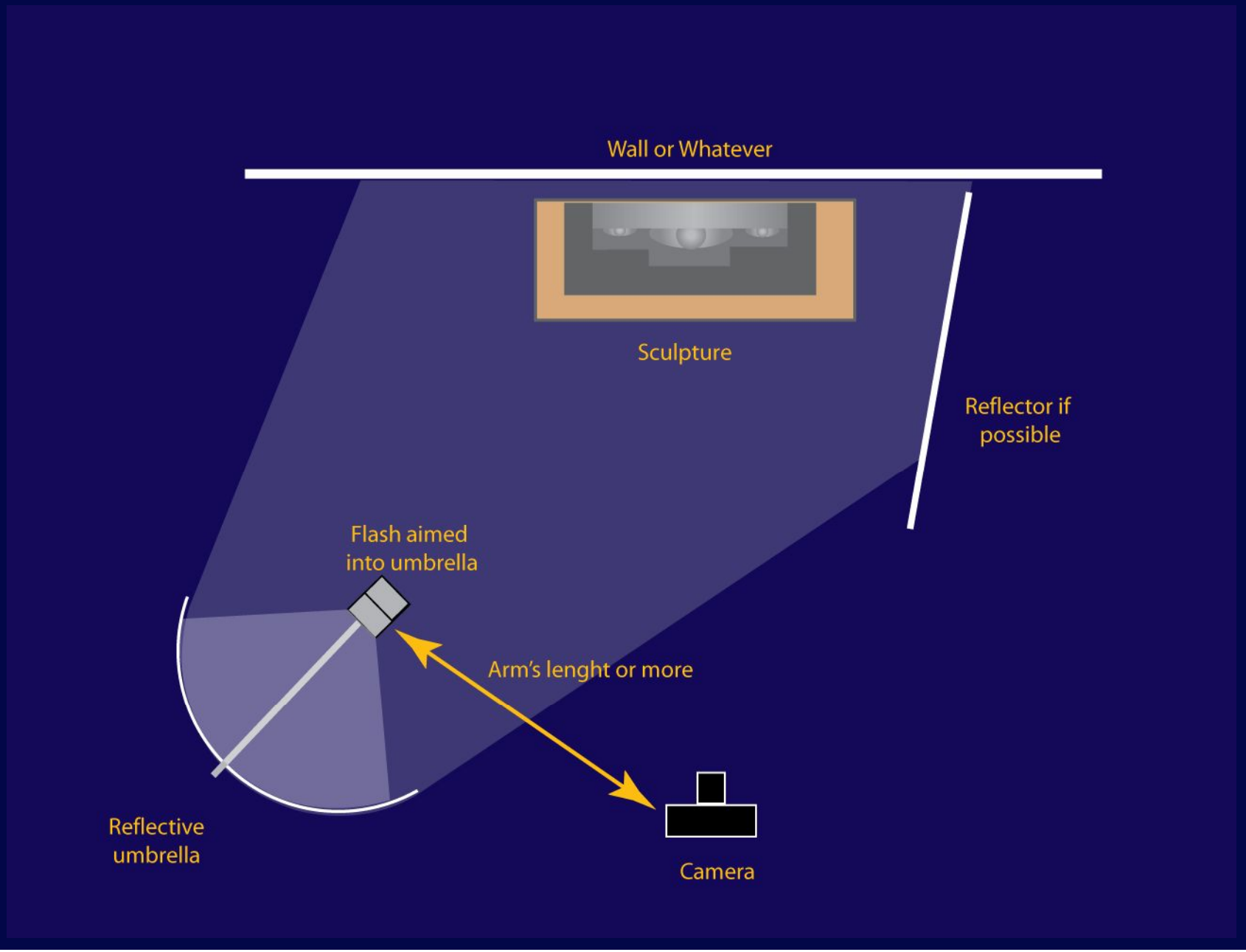
Flash off camera:
too harsh shadows

Flash with umbrella:
best of group

Bounce flash:
too washed out

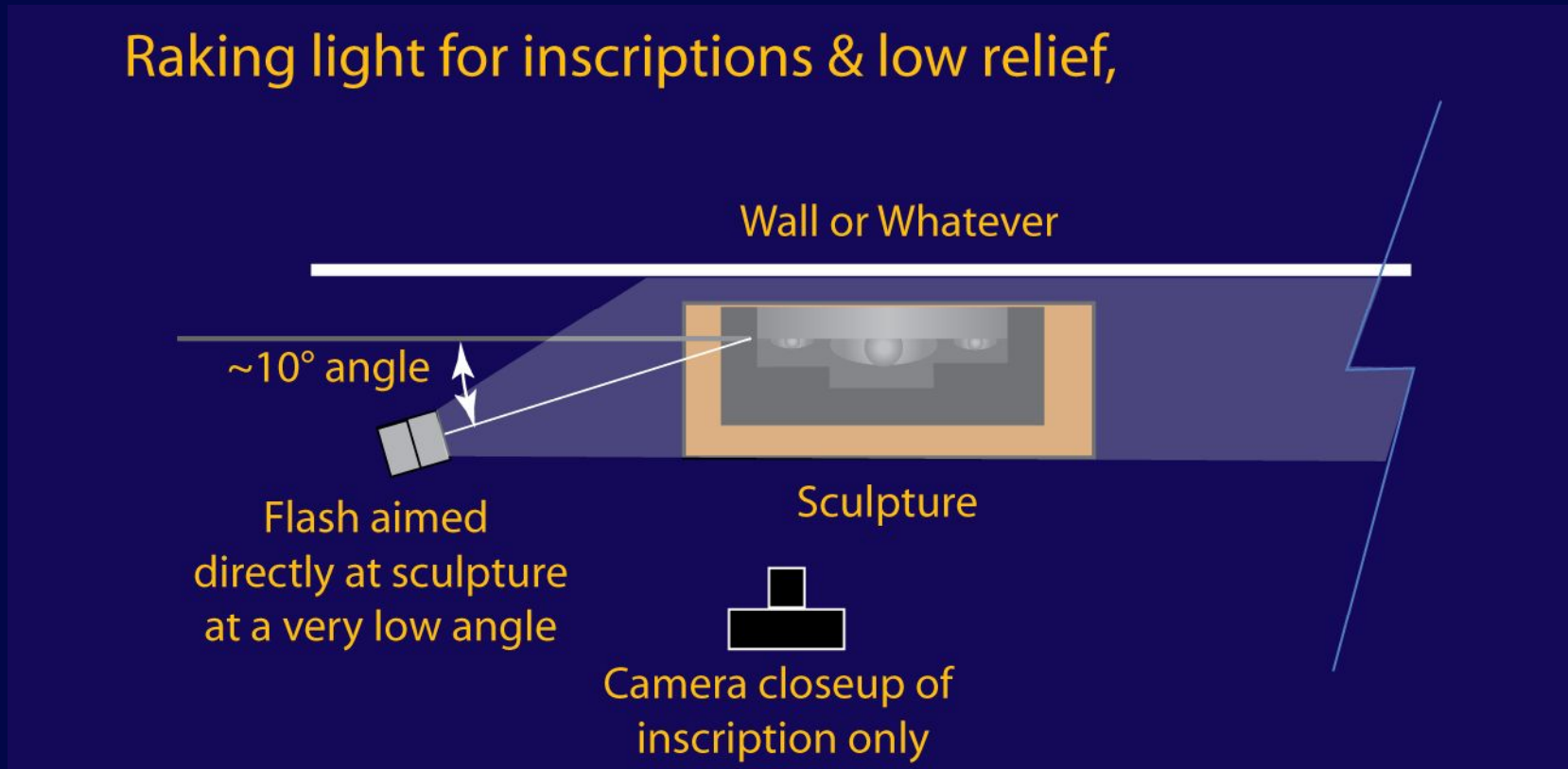
While the variations in photographsare often fairly subtle, the distinctive improvement in rendering of detail is self-evident.

Basic lighting diagram relating to the previous discussion

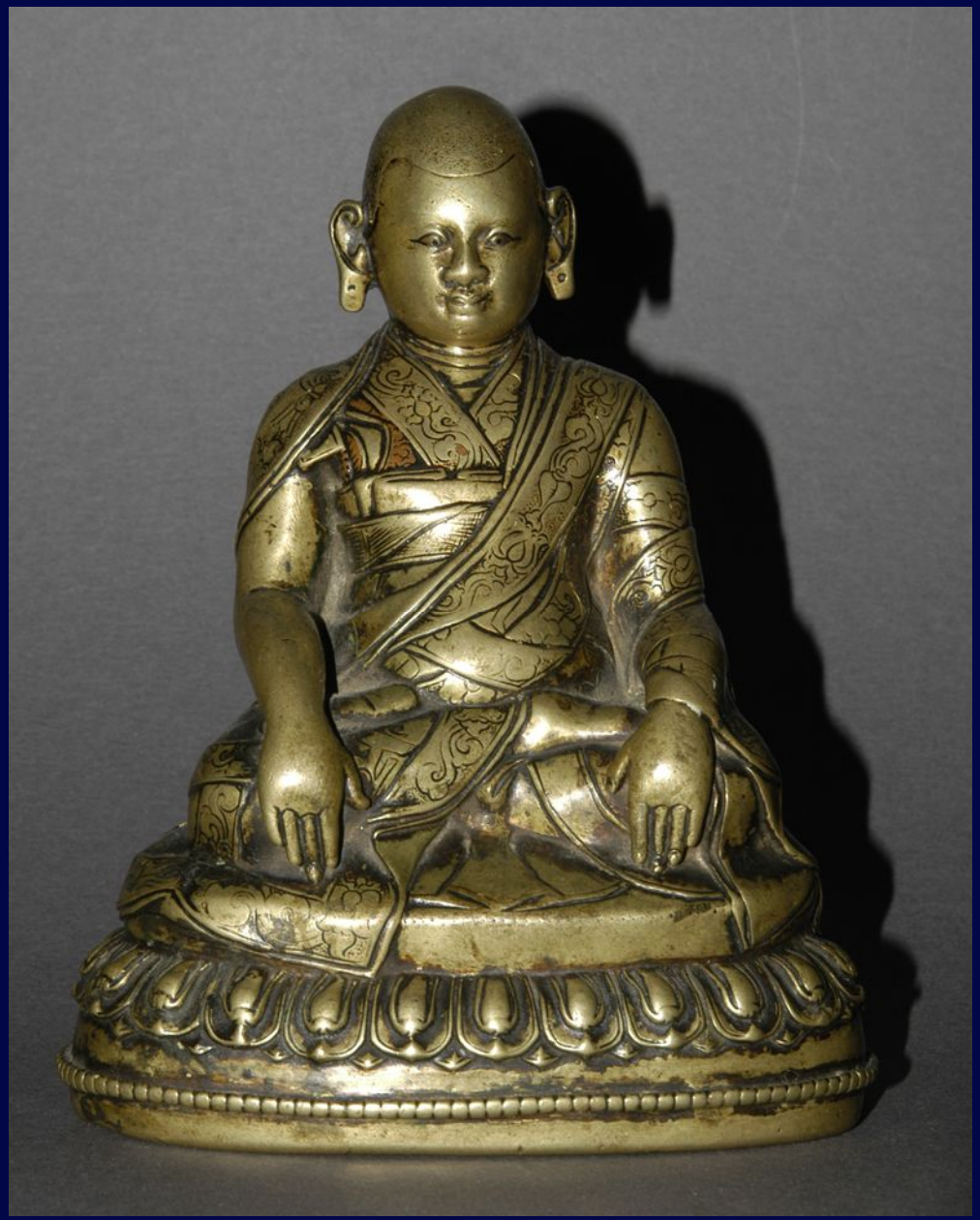


Incised inscriptions or other low relief forms, including the texture of the painted Surface require a special light technique called “raking light.”

Basic lighting diagram depicting raking light

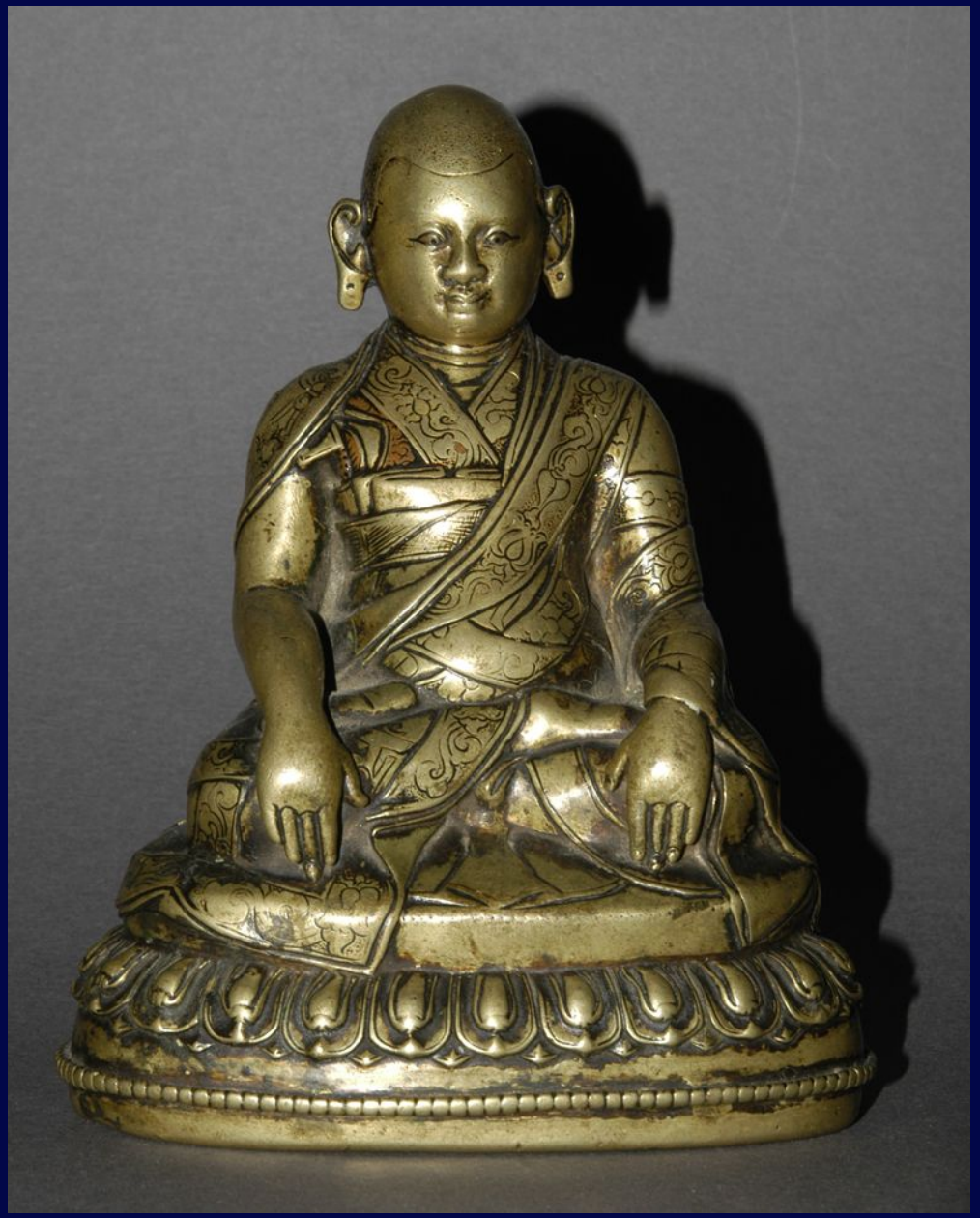


Remember, in photographing inscriptions it is the legibility of the inscription that counts, NOT the beauty of the image or the photograph



Lighting the Object: Part 1b

Shiny metal objects create their own set of problems. This teacher's portrait was taken with direct on-camera flash. It resulted in "burned out" specular highlights, deep shadows, and "black ghost" in the background.



Lighting the Object: Part 1b

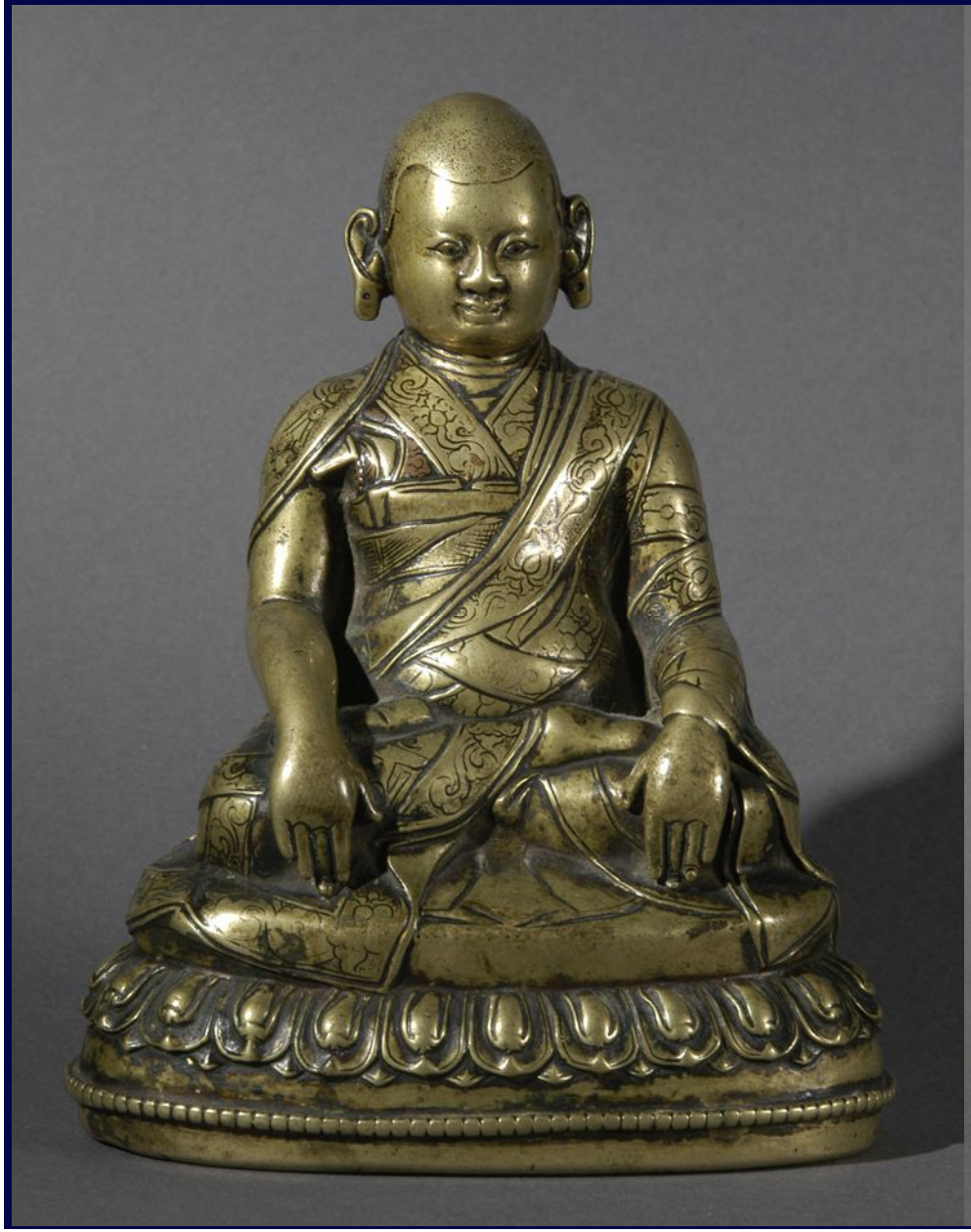
An off-camera direct flash with a much broader opening for the light source gives much better lighting but the image is still contrasty and loses detail in the shadows.

Lighting the Object: Part 1b

An off-camera flash into a white umbrella provides a much softer light and much clearer detailing than the direct flash.

Lighting the Object: Part 1b

Off-camera, direct flash



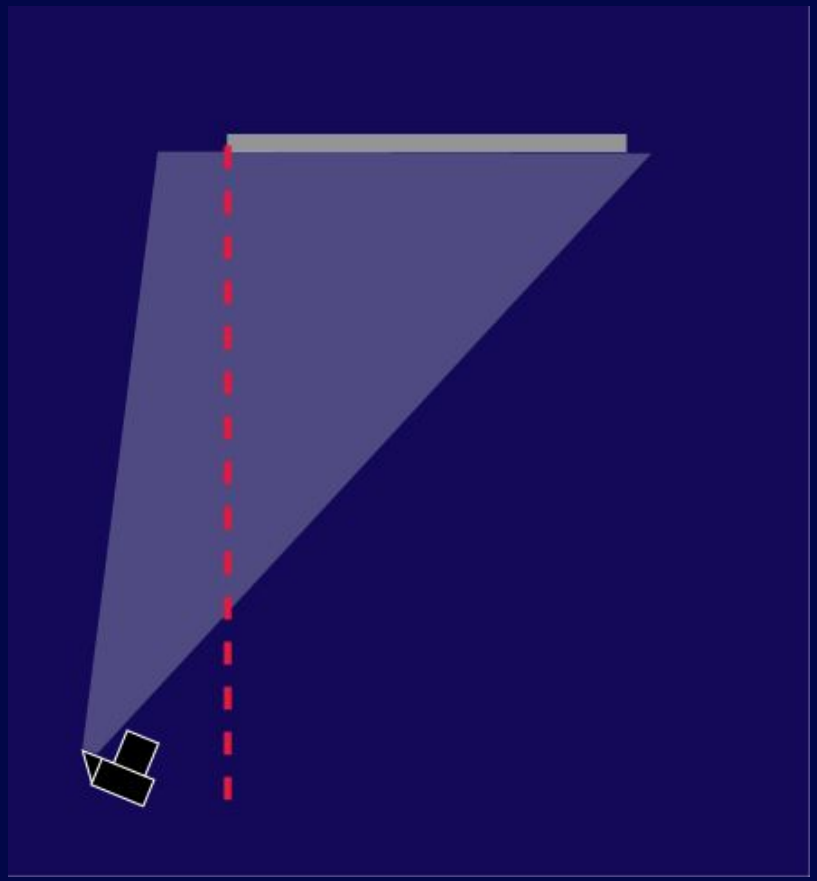
Off-camera umbrella reflected flash

Basic lighting for paintings

One of the surest ways to have a bad day in photography is to stand directly in front of a painting or an object behind glass and take a photograph of a reflection of the flash!

Basic lighting for paintings

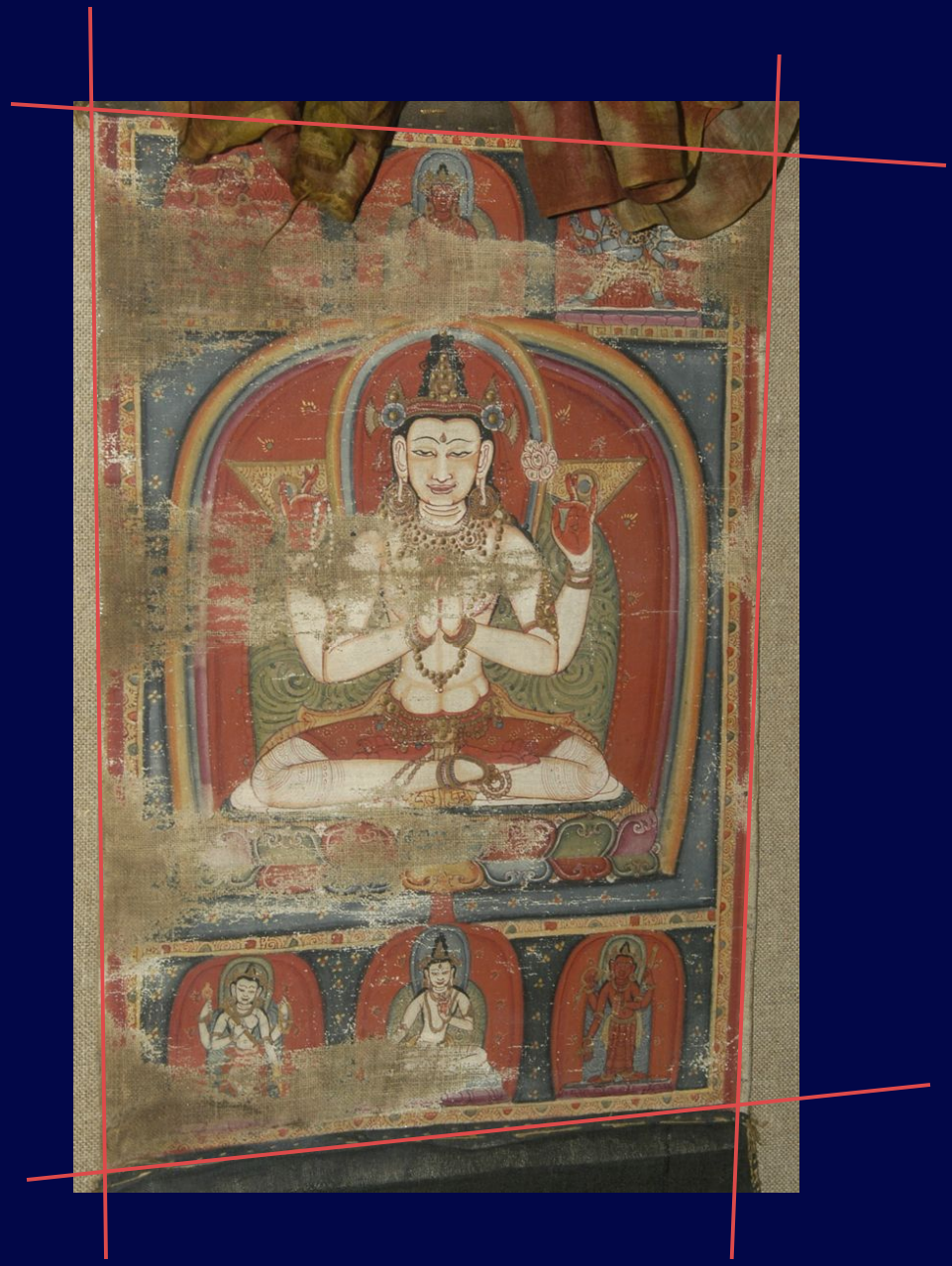
By standing to the left (or right) of the area being photographed there will be no reflection.



Unless doing very big areas, on-camera flash is best for this problem because it stays right with the camera and is correctly aimed.

Basic lighting for paintings

However, there is angular distortion.



Basic lighting for paintings

Using the grid and distort tools in Photo Shop, it takes less that one minute to correct angular distortion.

Basic lighting for paintings

Do not forget, raking light and close up details may also be important!

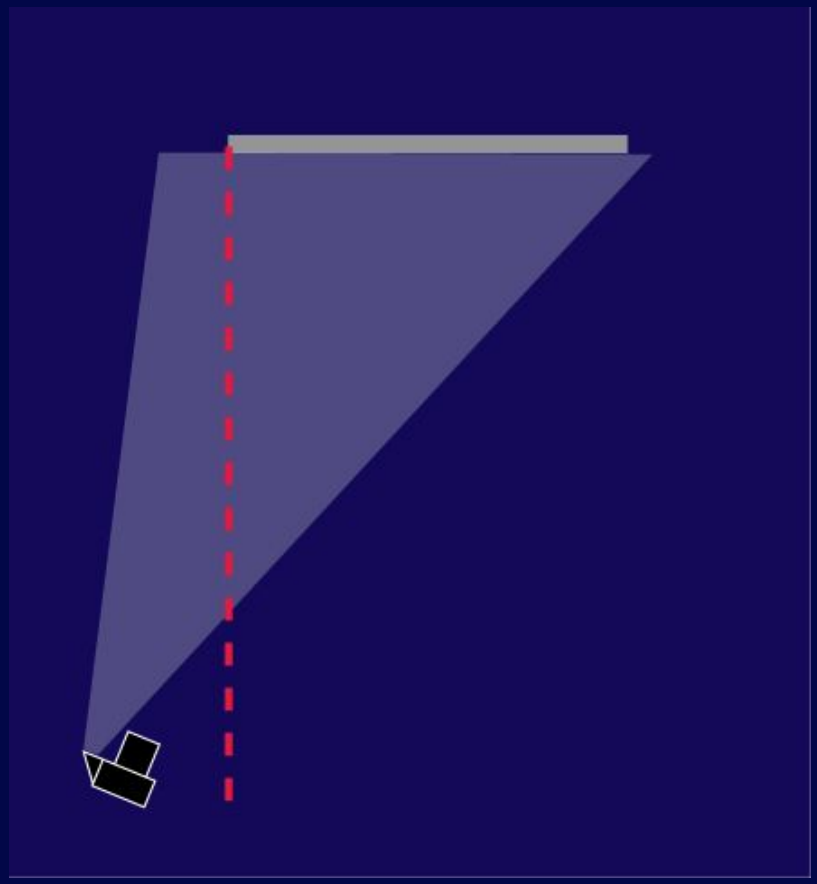
Very old scanned film photograph

Basic lighting for Paintings

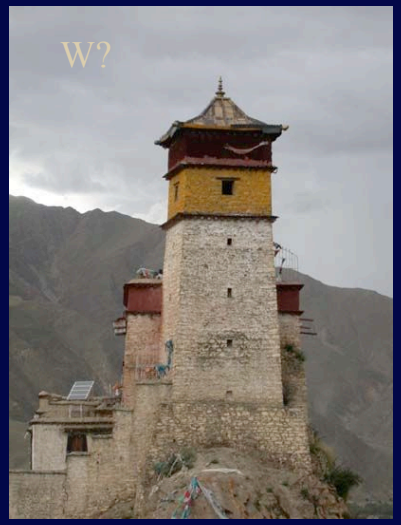
Many paintings that are not behind glass can also have glare problems. This is because of the highly burnished surface that many paintings started out with.

Basic lighting for paintings

Exactly the same off axis solution works for them as well

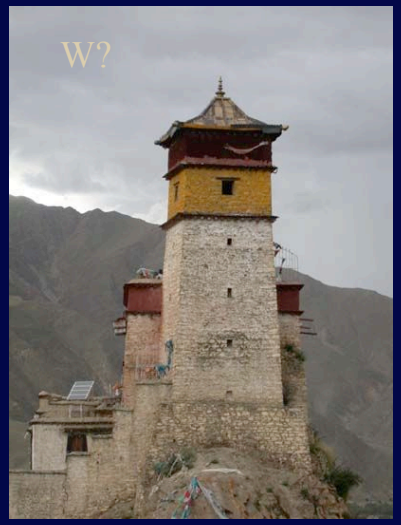


Building Documentation: Using the very difficult shape and positioned on a promontory building Yum(or Yam)bu as an example, we can see that even with a full circle of photographs it is still very difficult to guess the actual layout. Directions subject to change



Building Documentation:

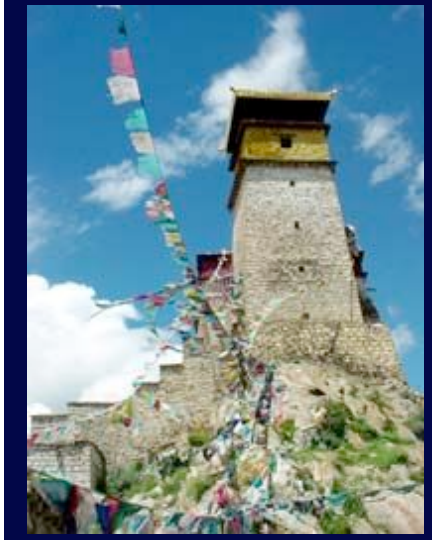
There is no easy or quick solution, If possible, have the van or bus “circle” the building in the plain while others try to get details and overviews by hiking to various points. Then, using one of the telephoto lenses zoom in in varying degrees



Yum(yam)bu, Varying views from just the west side ?

Good setting shot

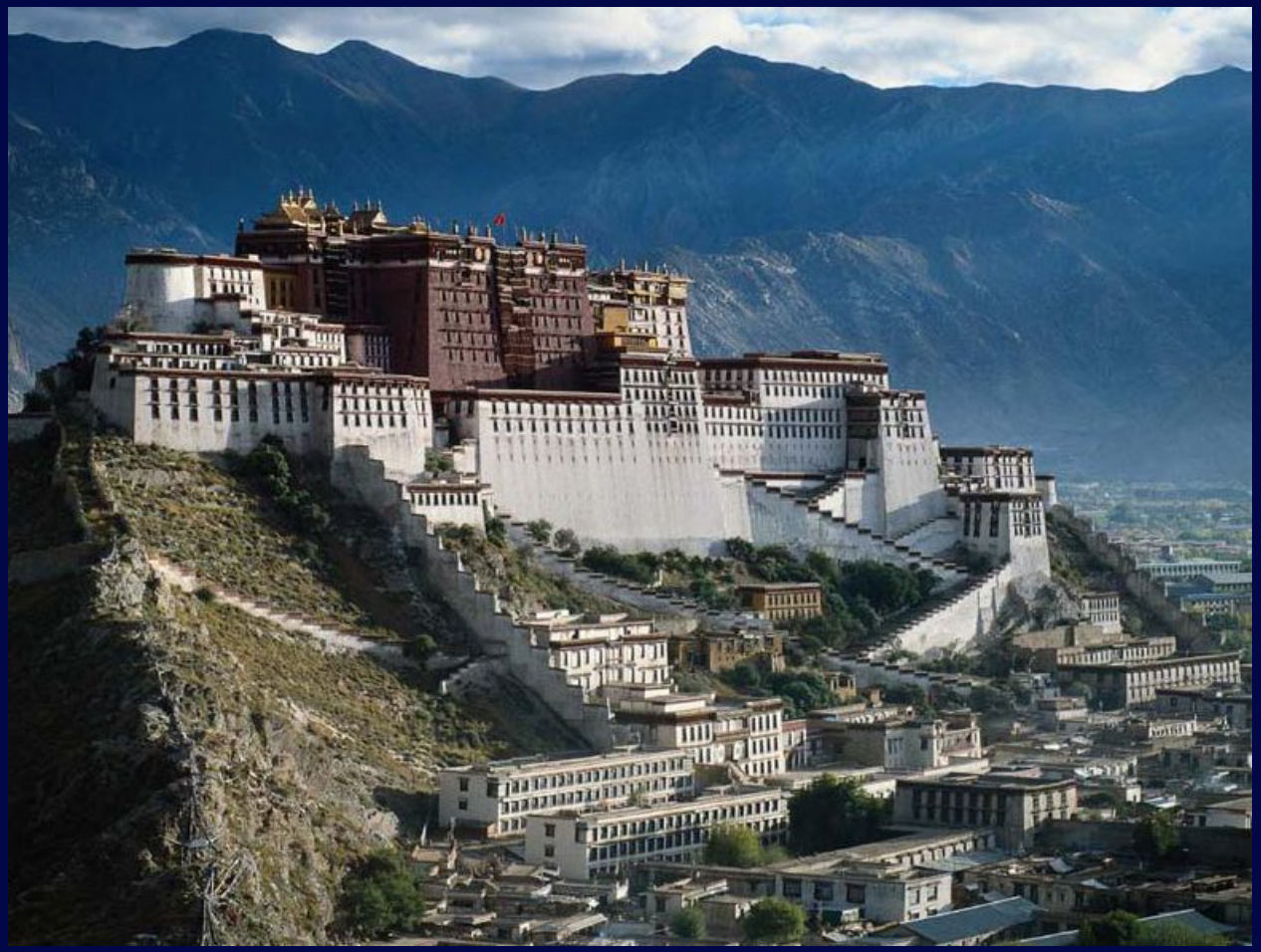
Good structure from west shot



Can’t tell much.

Good!

Good vista shot, now use telephoto to one at left.

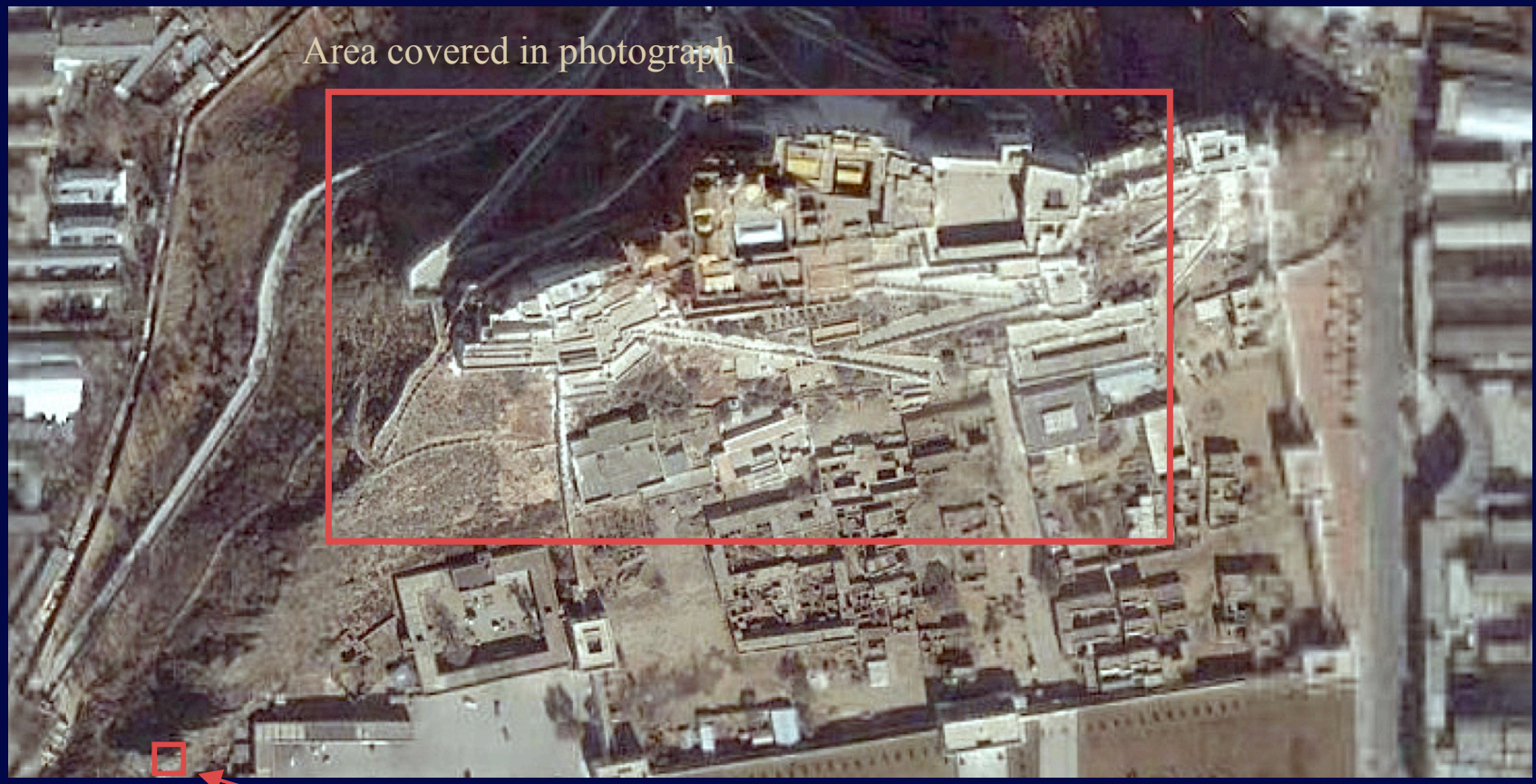


South face of the Marpo ri and the Potala, ca 10-11 AM from a high position to the southwest, probably the southwestern spur of Marpo Ri.

The end

Have a great trip!

Much love to all, John



Picture Google Earth

South face of the Marpo ri and the Potala, ca 10-11 AM from a high position to the southwest, probably the southwestern spur of Marpo Ri.

End