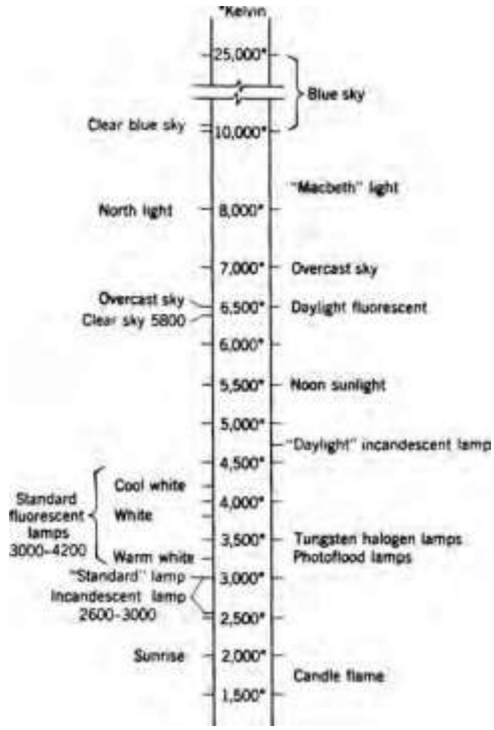
Fundamentals of color

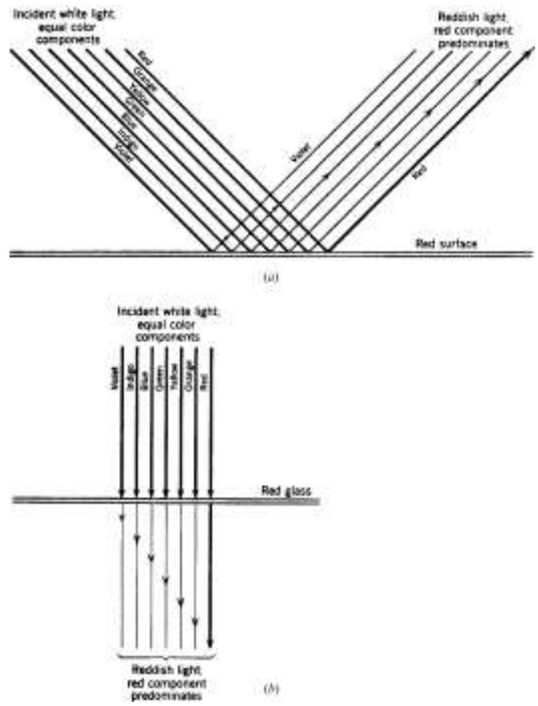
Color temperature

- color temperature, such as 3400 K for halogen lamps, 4200 K for certain fluorescent tubes, and so on
- Temperature is measured in Kelvin, which is a scale that has its zero point at −460ºF
- when a light-absorbing body (called a *blackbody) is heated,* it first glows deep red, then cherry red, then orange, until it finally becomes blue-white hot. The color of the light radiated is thus related to its temperature.
- color temperature can be assigned only to a light source that produces light by heating, such as the incandescent lamp. Other sources, such as fluorescent lamps, produce light by processes that are detailed in Chapter 12. Such sources are assigned a *correlated color temperature*



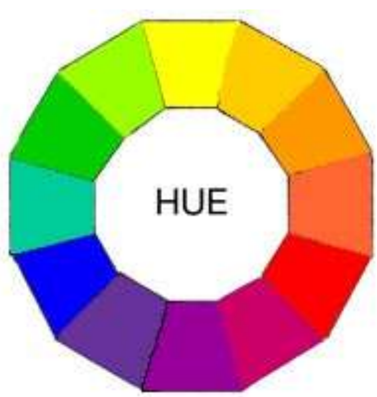
Light and color

- A white light reflected from a red wall acquires a red tint because the component colors of the white light other than red were absorbed in greater proportion than the red. When reflected, the red light takes prominence, thus giving the reflected light a red tint
- **Object color**: the color of an object is its ability to modify the color of light incident on it by selective absorption. The color reflected or transmitted is apprehended by the eye as the color of the object.
- An object is technically said to be "colorless" (not transparent) when it does not exhibit selective absorption, reflecting and absorbing the various components of the incident light nonselectively. Thus, white, black, and all shades of gray are colorless, neutral, achromatic, or, more precisely, lacking in hue.

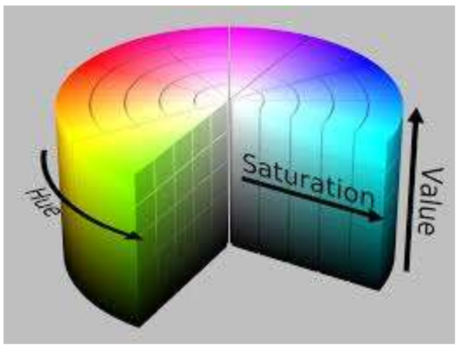


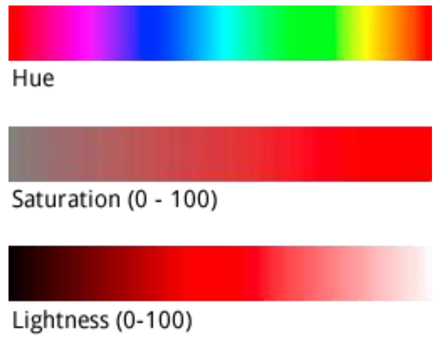
Hue, Value, Chroma

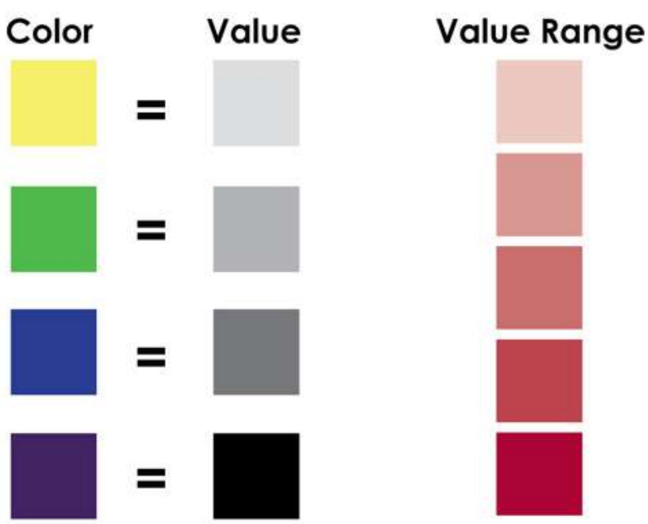
- ***Hue*** *is defined as that attribute by which we* recognize and therefore describe colors as red, yellow, green, blue, and so on.



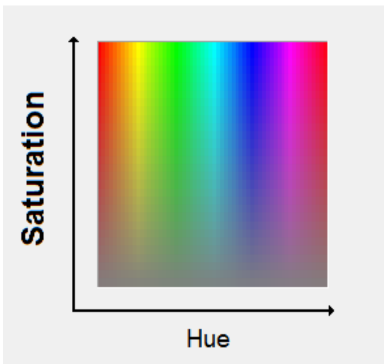
- The difference between the resultant colors of the same hue so arranged is called *brilliance or **value***. *White is the most brilliant of the neutral colors* and black the least; pink is a more brilliant red hue than ruby; and golden yellow is a more brilliant (lighter) yellow hue than raw umber

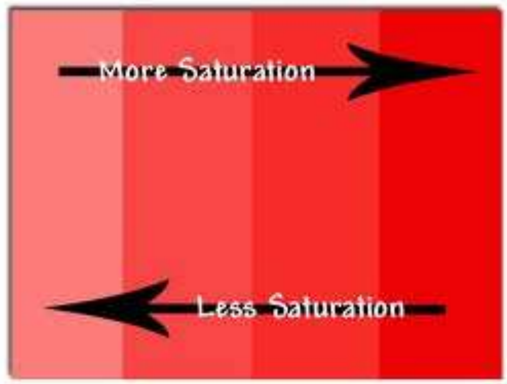


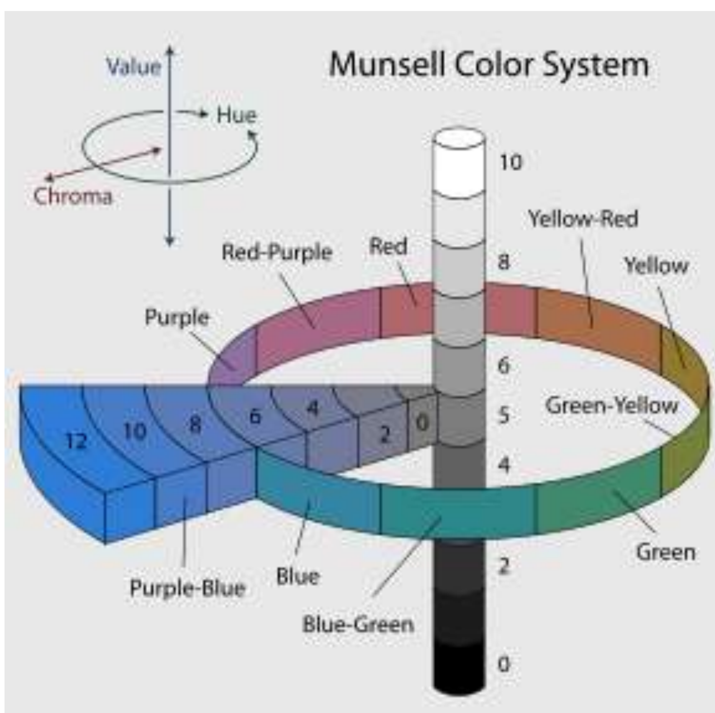


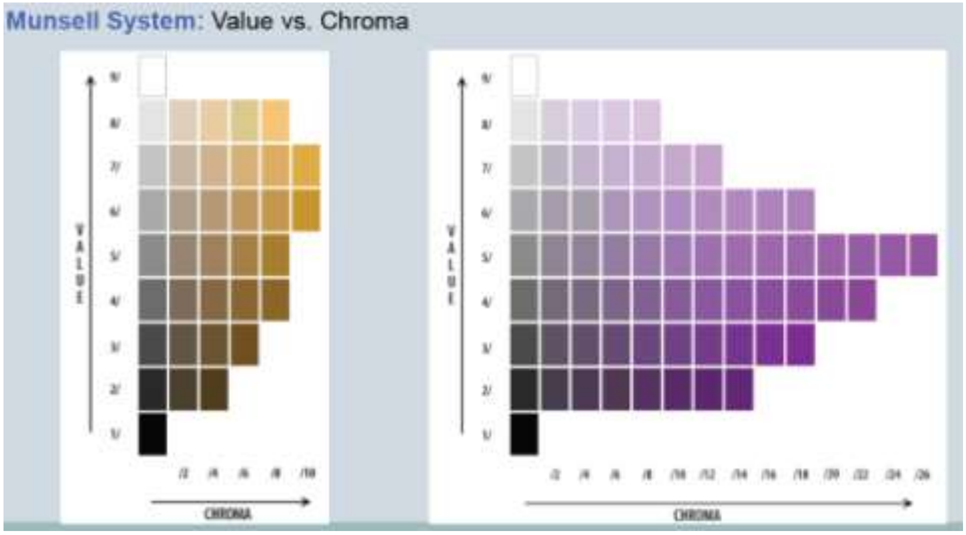


- Colors of the same hue and brilliance may still differ from each other in ***saturation***, *which is an* indication of the vividness of hue or the difference of the color from gray. Thus, pure gray (black plus white) has no hue; as we add color, we change the saturation without changing the brilliance.

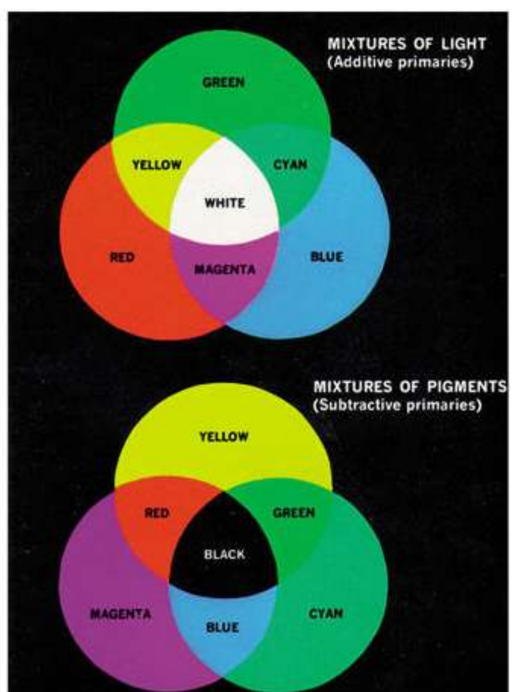


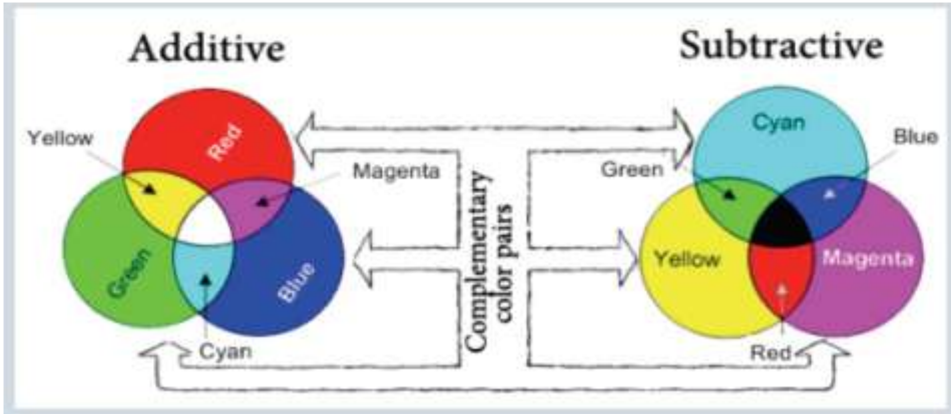




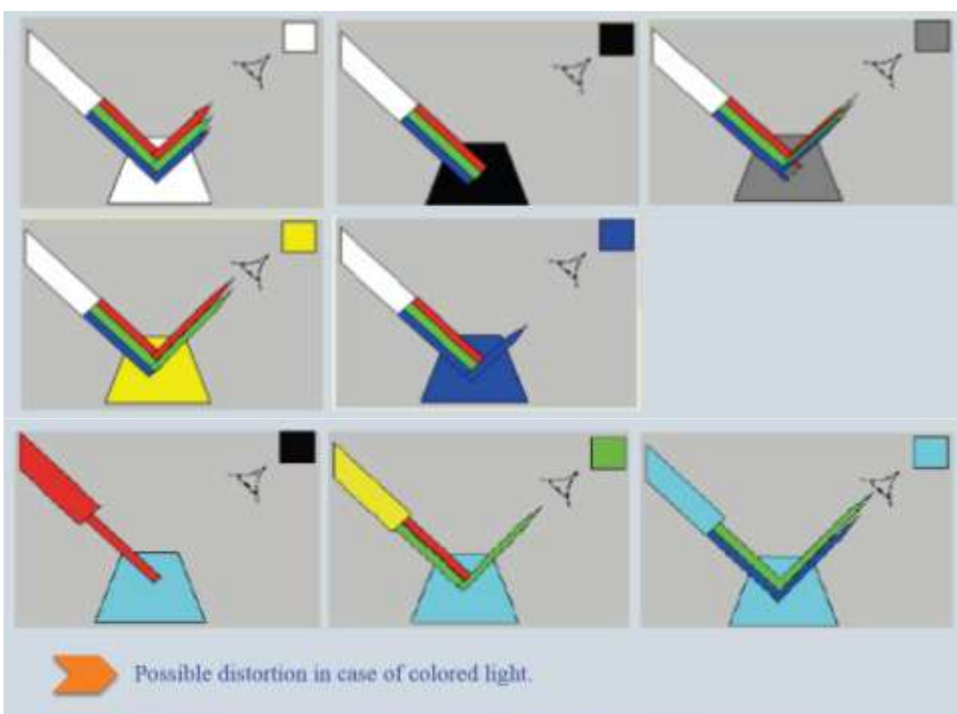


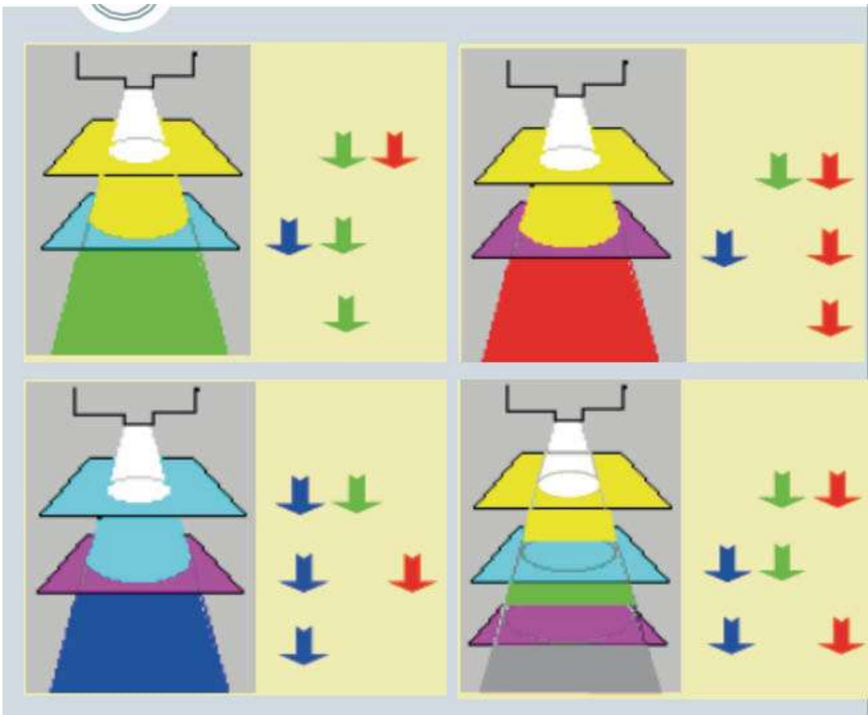
Additive and subtractive





If a red object is illuminated with blue-green light, the object's color appears gray because the red pigment absorbs the blue-green and reflects nothing; hence the gray.





1) What is the resulted color of projecting a blue light on the following pigments?
a)Represent the final colors qualitatively.
b)Re-draw the surfaces with final colors quantitatively.

Blue light

W	R	Org	Y	G	M

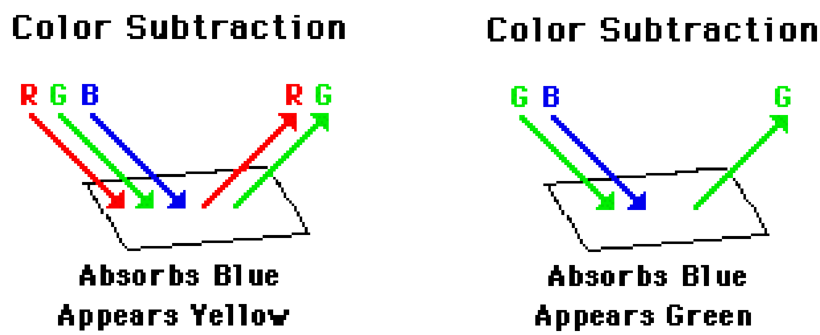
2) If a projector of red light is focused on a grey surface, what is the resulted color that we got? (give the percentage of the resulted color)

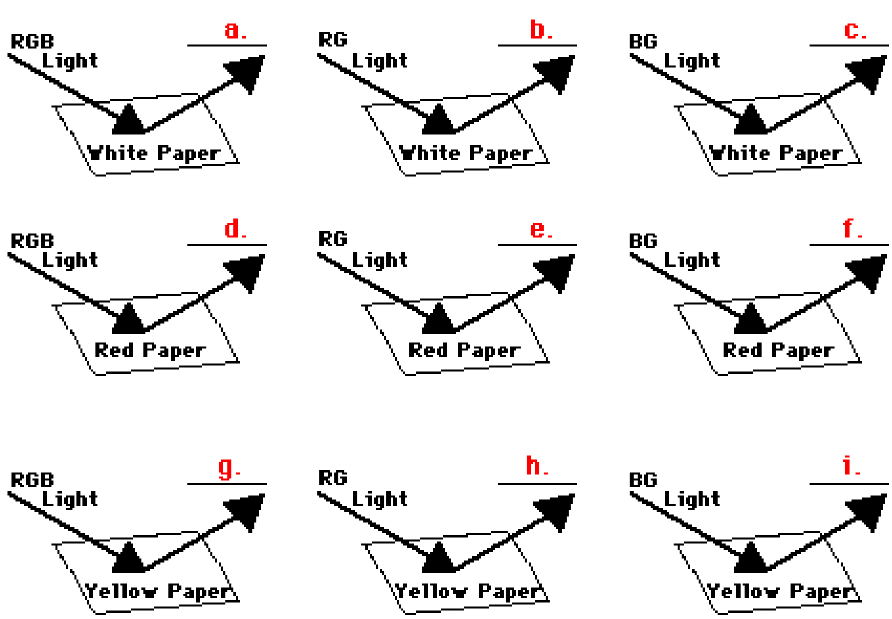
3) Represent the final colors of the below bar when using a cyan light projector. (give the percentage of resulted color).

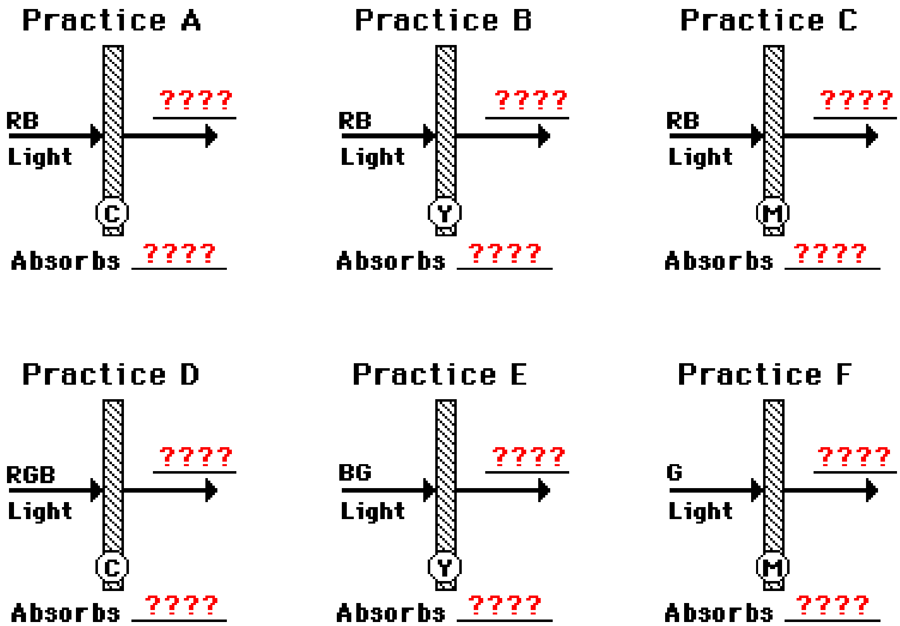
Cyan light

W	R	Org	Y	G	M	B

4) Similar to previous exercise, but we use here a magenta light projector, how the original colors will


Color Subtraction
R G B
R G
Absorbs Blue
Appears Yellow
Color Subtraction
G B
G
Absorbs Blue
Appears Green


RGB
Light
a.
White Paper
RG
Light
b.
White Paper
BG
Light
c.
White Paper
RGB
Light
d.
Red Paper
RG
Light
e.
Red Paper
BG
Light
f.
Red Paper
RGB
Light
g.
Yellow Paper
RG
Light
h.
Yellow Paper
BG
Light
i.
Yellow Paper



Reaction to color

- Light of a particular hue (other than white) is rarely used for general illumination except to create a special atmosphere. When a space is lighted with colored light, the eye adapts by a phenomenon known as color constancy
- make meat look redder on a butcher’s counter by using blue-rich, red-poor, cool white lighting in the remainder of the store
- The use of green paint on the walls also enhances the redness of the meat.
- after looking at a green surface one shifts the gaze to a white surface, one sees the complementary red color

- a green object looks somewhat blue-green on a yellow background because the eye is supplying the complementary color to yellow—that is, blue. Similarly, the same green object looks slightly yellow–green when on a blue background, the eye supplying the yellow.
- Apparent brightness of a color is a function of its hue, in that light colors appear lighter than dark colors even when measured luminance is the same.
- the coolness of blues and greens and the warmth of reds and yellows. Thus, cool colors might well be used in a fur salon and warm colors in a display of summer wear
- Red and yellow are “advancing” colors because objects lit with them tend to advance toward the observer, giving the appearance of becoming larger. The opposite effect is noted with blue and green, accounting for their being known as “receding” colors

- A practical, energy-saving application of these color phenomena would be to use warm colors to compensate somewhat for lowered thermostats in the winter and cool colors for the opposite effect in summer.
- eating areas, which should be lighted with reds and yellows because cool colors are generally unappetizing
- In an atmosphere designed to be calm and restful, greens should generally predominate either in illuminant color, object color, or both
- Cool colors also seem to shorten time passage and are well applied in areas of dull, repetitive work