Tishk International University
Department of interior design

COLOR PHYSICS

Second Semester 2020-2021
Second Stage
Color in interior design-Second lecture

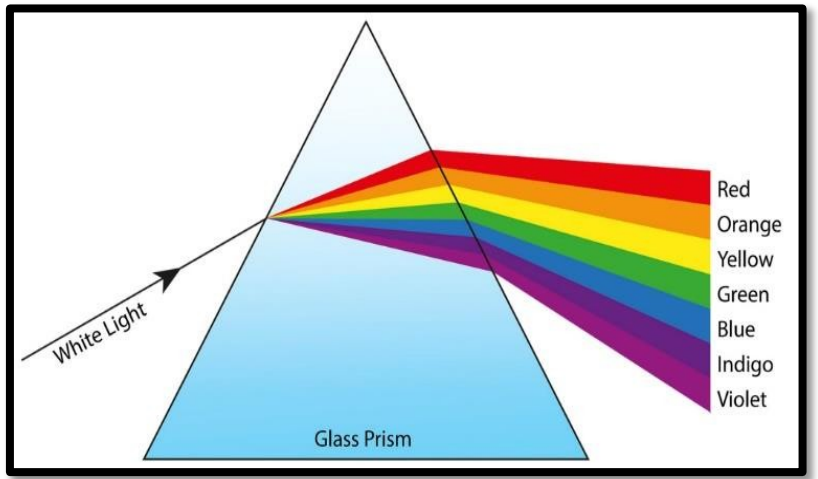
Asst.lec./ Fatn Radhwan Yaseen

OUTLINE

- Color perception(history ofcolor)
- Color perception(spectrum+Light)
- Color perception (vision + light)
- The Optical System
- Modifiers of light
- Color Mixing models for light and paint
- Color Mixing models
- Application of Additive theory

COLOR PERCEPTION (HISTORY OF COLOR)

- In 1665, (Sir Isaac Newton) the first scientist who prove that **(the color is a function of light) and it's a natural part** of the sunlight (white color) .
- He passed a beam of sunlight through a prism .
- He identified the basic colors as the "Visible 7": red, orange, yellow, green, blue, indigo, and violet
- Newton carried his experiment one step further by utilizing a second prism to mix the waves back into sunlight .This Confirms the fact that color is basically made up of light and that when "colored" lights are mixed ,the result is (white light).
- So, he proved that mixing lights of all colors produces white.



COLOR PERCEPTION (SPECTRUM+ LIGHT)

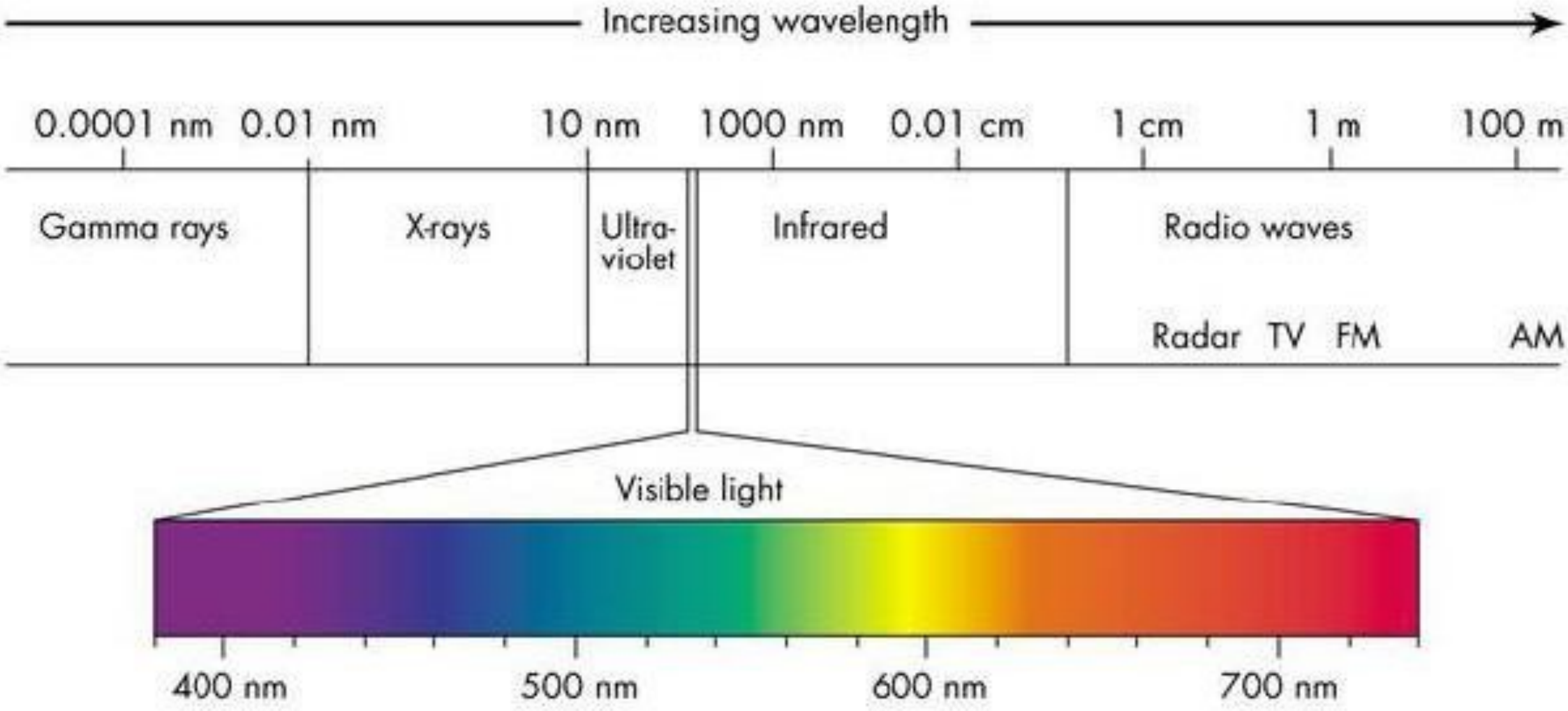
- Color is based on light .

- Light : is the electromagnetic rays , which contain Gamma rays , X rays , Ultraviolet , visible light , infrared, and radio waves .

- Color : is a (physical phenomenon) , a specific visual sensation produced by visible radiation of light, or "Color stimulus." , Color stimulus occurs when light from a natural or artificial source is interrupted by an object or a dust particle.

- **The Visible Light** that Newton discover : is the electromagnetic rays we can see , its ranging from red (rays most bent) through orange, yellow, green and blue to violet (rays least bent).

COLOR PERCEPTION (VISION + LIGHT)

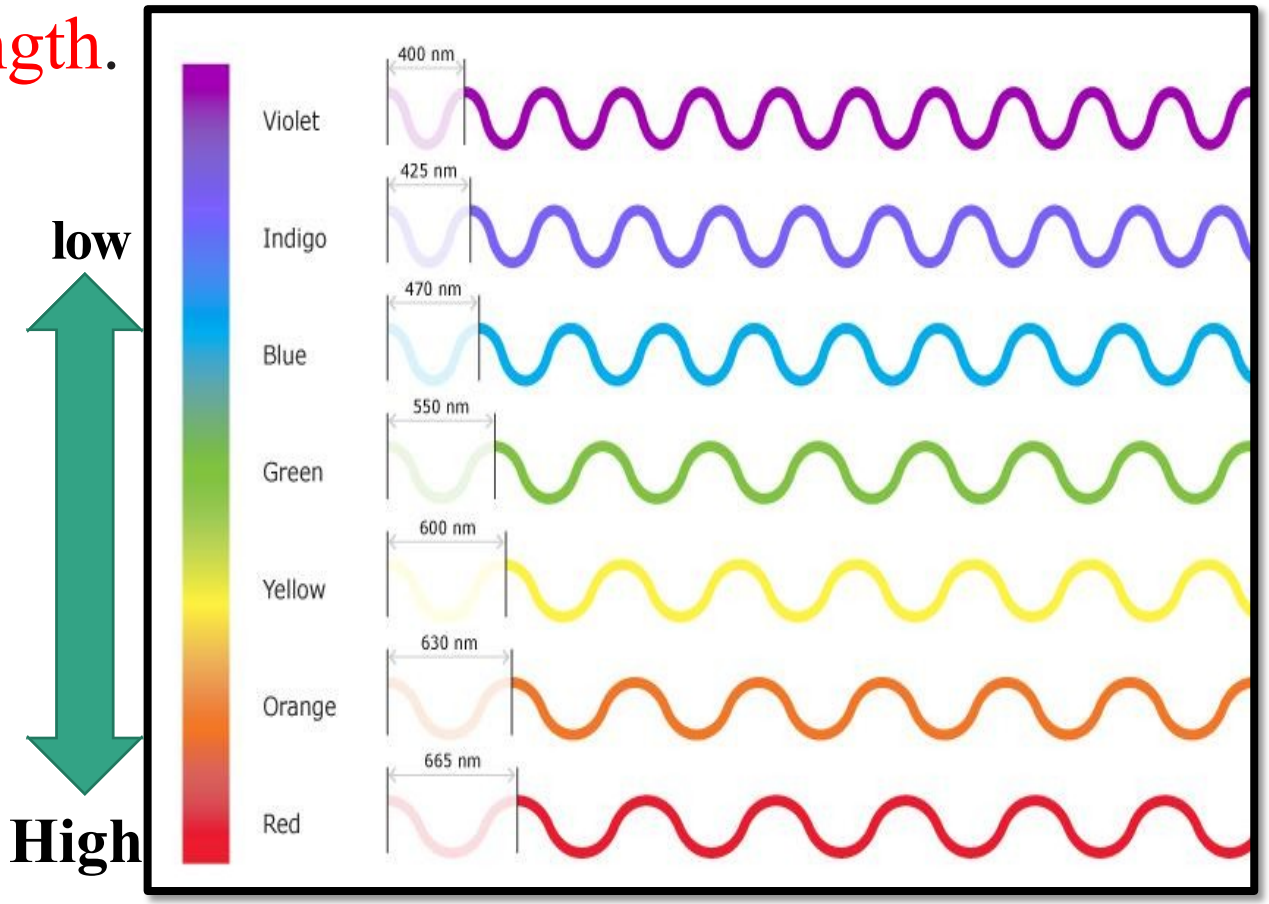


CONT.

- The physical difference between (radio waves, infrared, **visible light**, Ultraviolet, and X-rays) is the wavelength.

- Wavelength and hue are the color‘s perception.

- Each hue(from the visual spectrum) has a certain range of wavelength, with red , having the longest wavelength , and violet having the shortest of the range wavelength .



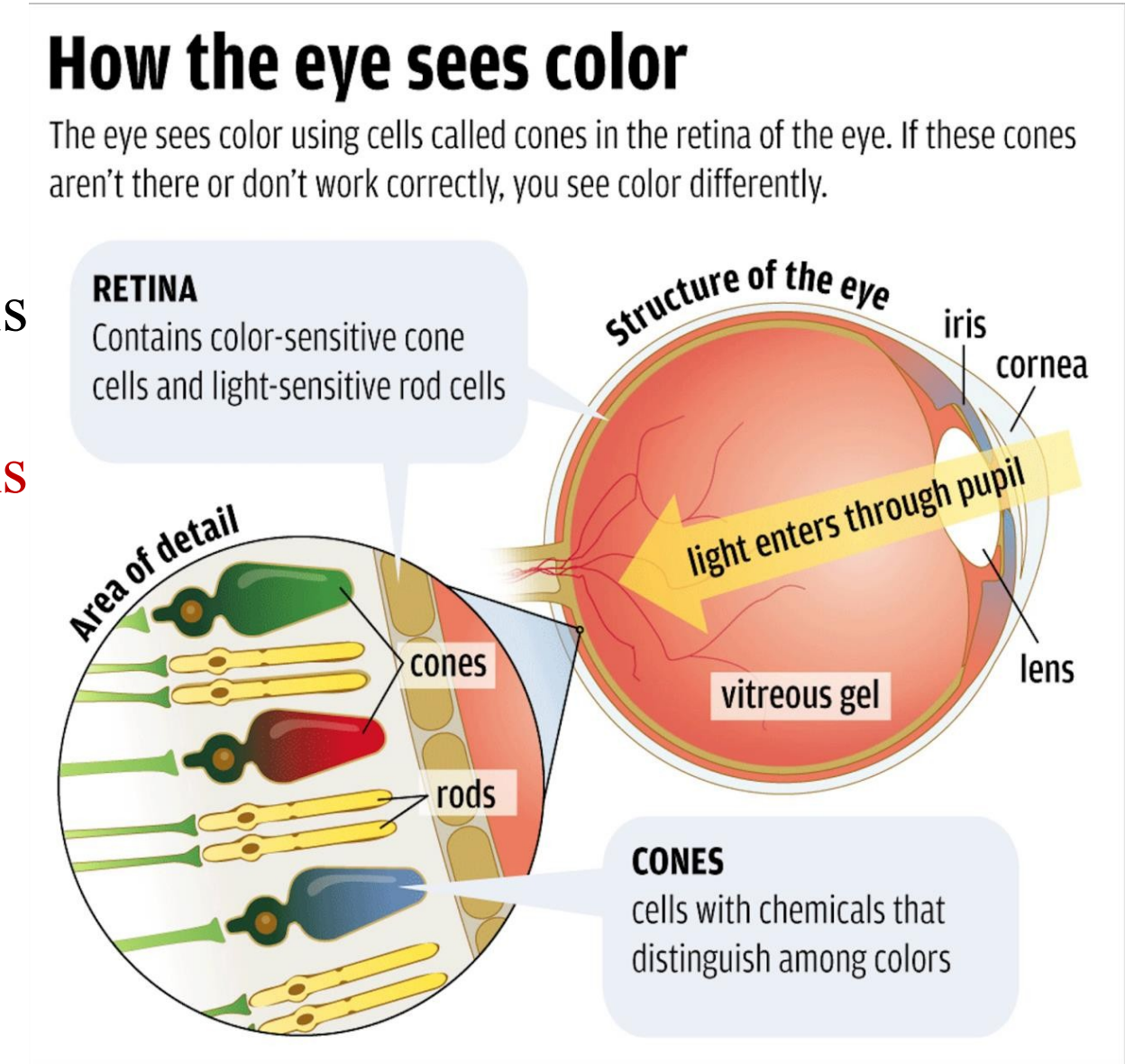
THE OPTICAL SYSTEM

- The eye and light are in direct relation with one other. Since color only exists in the brain, it is the eyes job to receive the reflected light waves and transmit the wavelengths to the cerebral cortex.

- The eye is an optical system that directs visible luminous radiation to the retina (light-sensitive) layer which contains the individual receptors (the rod and cone cells) .

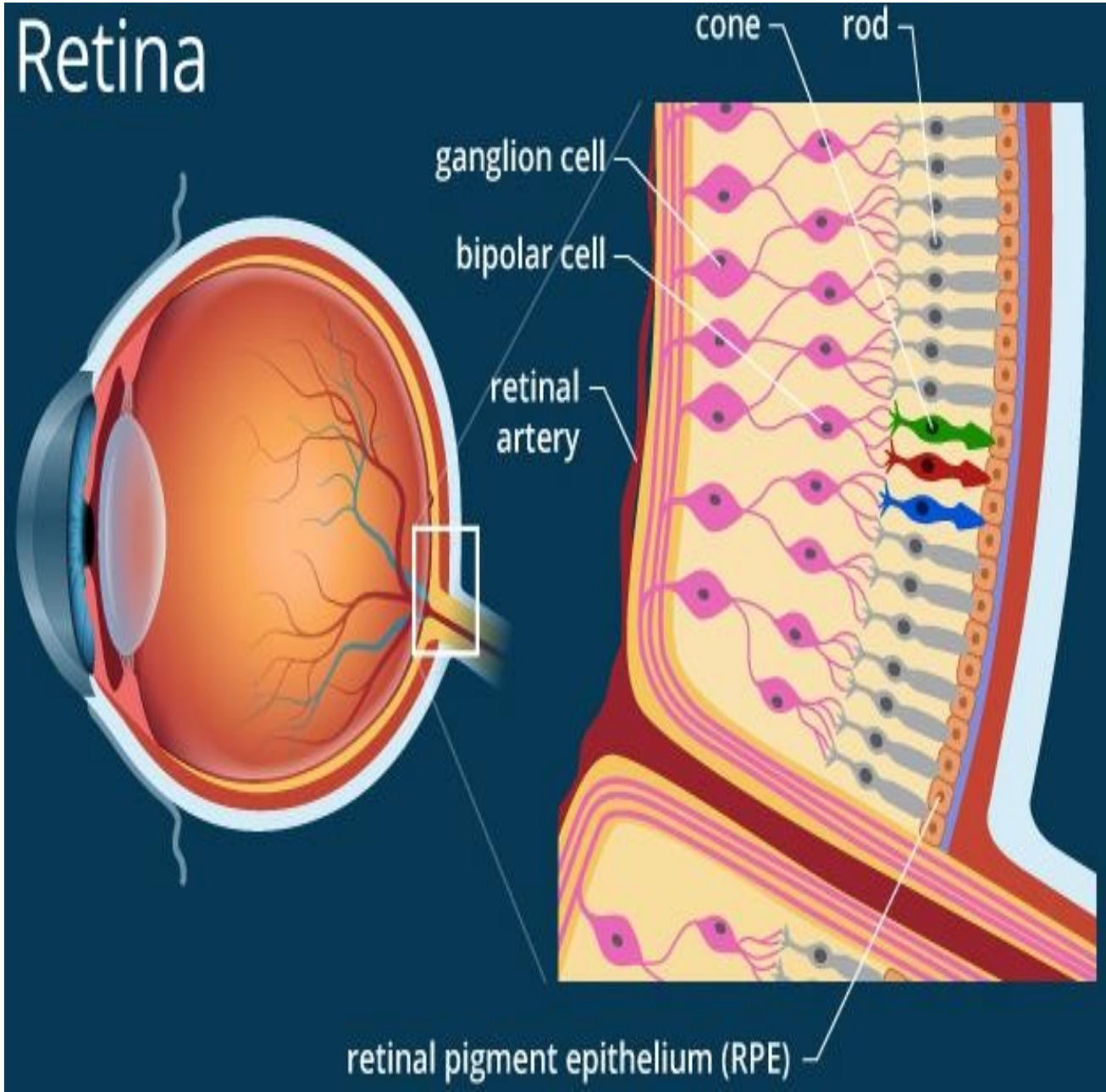
CONT.

The Retina : is a thin layer of tissue that lines the back of the eye on the inside. It is located near the optic nerve. The purpose of the retina is to receive light that the lens has focused, convert the light into neural signals, and send these signals on to the brain for visual recognition.



CONT.

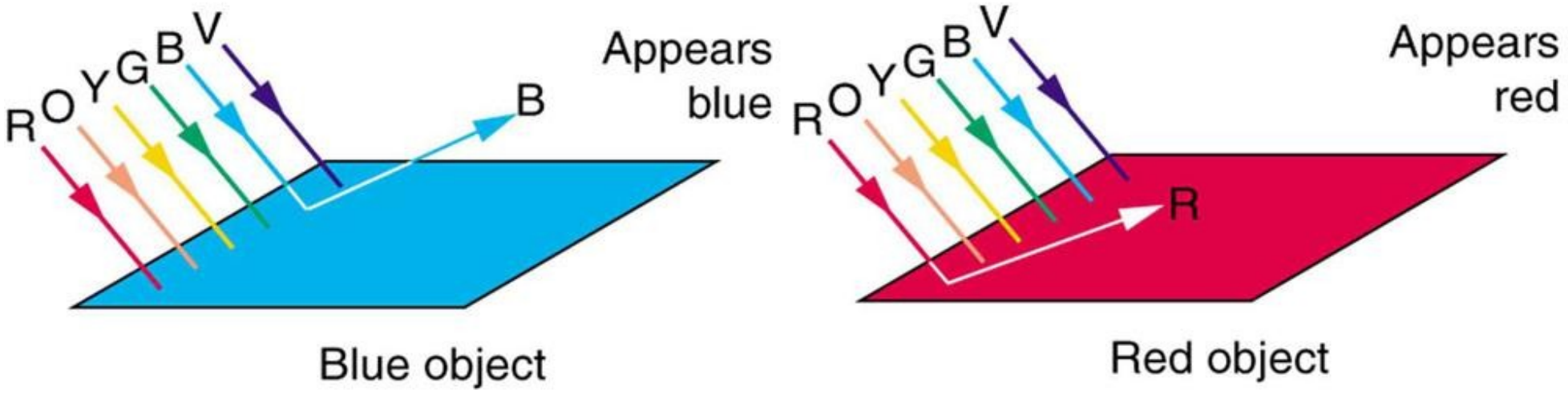
- These individual receptors (the rod and cone cells), which decode the physical stimulus and translate it into a physiological one (feelings) .
  - The rods differentiate between light and dark, only registering light's intensity, while the cones differentiate between colors .
- **The cone cells are in 3 colors (Red , blue and Green).**



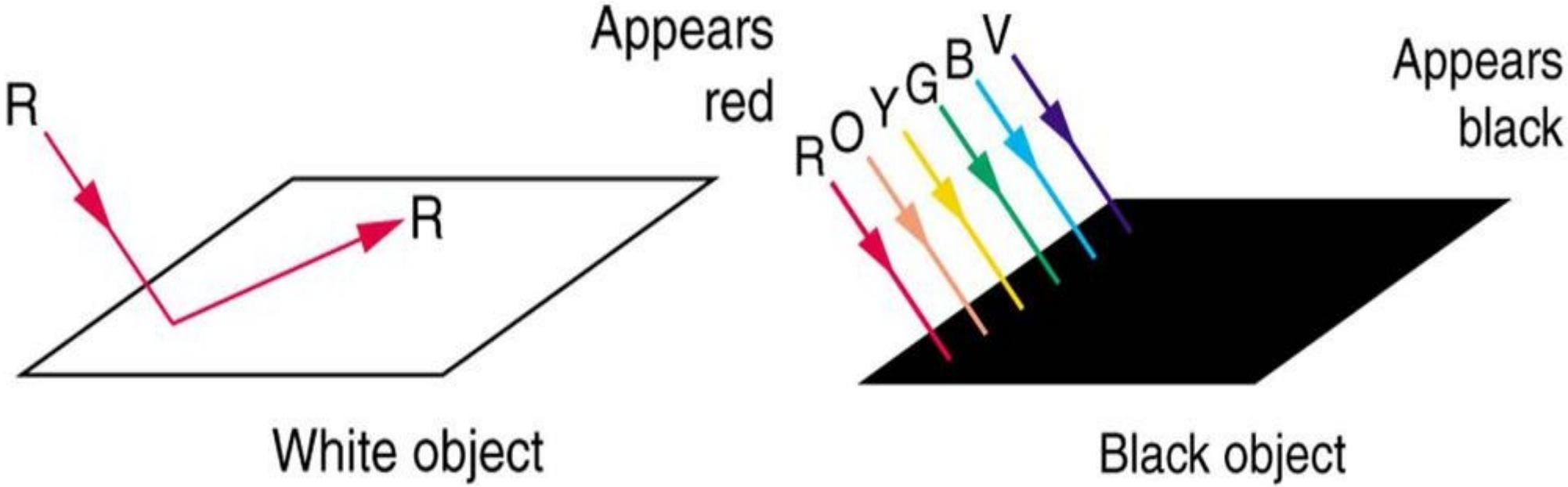
MODIFIERS OF LIGHT

- Objects appear different colors because they absorb some colors (wavelengths) and reflected or transmit other colors.
- The color of an object or surface is determined by its reflected or transmitted light.

- An object that the eye perceive it as red or blue ,if we spot on it a white light , it will absorbs all the colors except its same color (red or blue), which it reflects.



CONT.



- White is often described as the reflector of all colors,
- while black is described as the absorber of all colors.

COLOR MIXING MODELS FOR LIGHT AND PAINT

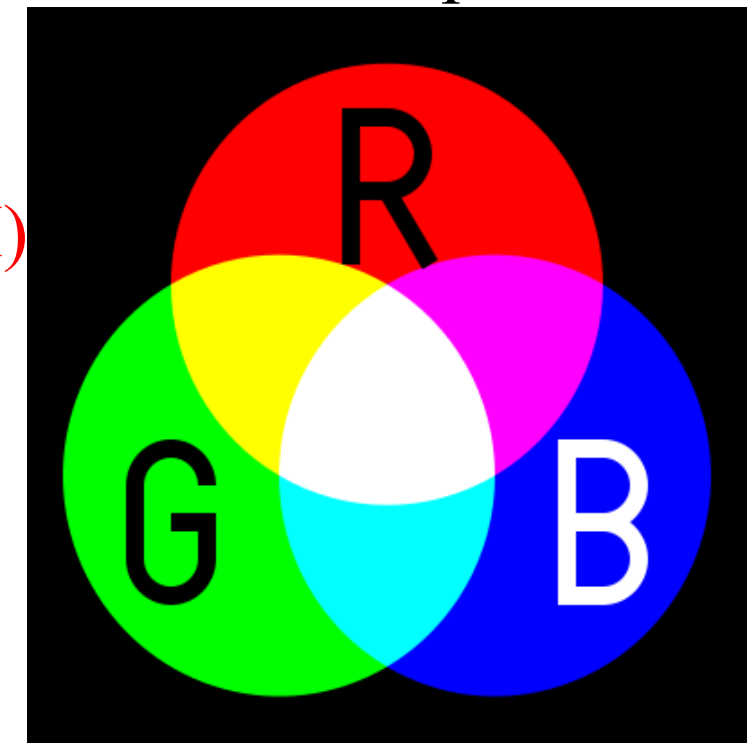
- There are 2 theory of color mixing models , They are:

1. Additive theory(RGB).
2. Subtractive theory (CYMK).

COLOR MIXINGMODELS

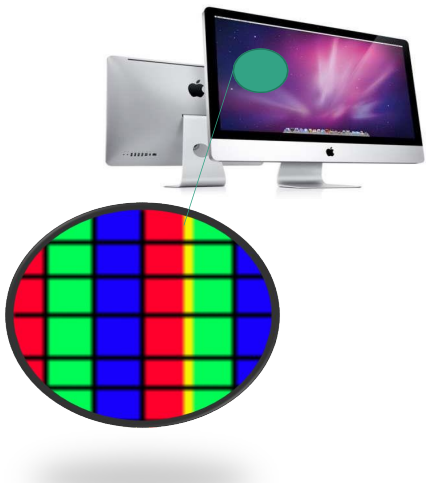
1. Additive colors (screen) RGB:

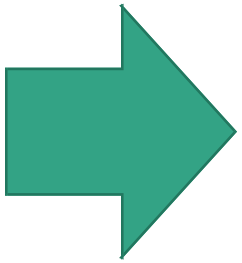
- The additive, or light theory deals with radiated and filtered light.
- Colored light , produced by filtering white light so that only one color can pass through the filter (a colored glass or gelatin), makes normal color vision inoperative
- In this process color is created by adding light **(red, green & blue)** to **dark** background. (Primary light colors And the result is secondary colors Cyan (C) , Magenta (M) , yellow (Y) .
- When all three of the colors are combined and displayed to their **fullest extent**, the result is a ***pure white*** color. When combined to their **lowest degree**, the resulting color is ***black***.
- Photo editing programs always allow the use of RGB colors as these offer the widest range of colors.



CONT.

- The main purpose of the additive colors or light Theory is for their presentation of colored images in electronic systems ,such as televisions ,computers ,cellphones , web colors and video projectors.
- Additive color devices, such as television, work by having the capability to generate an image composed of red, green, and blue light.
- **The more colored lights we mix together in this system , the brighter the resulting color becomes .**





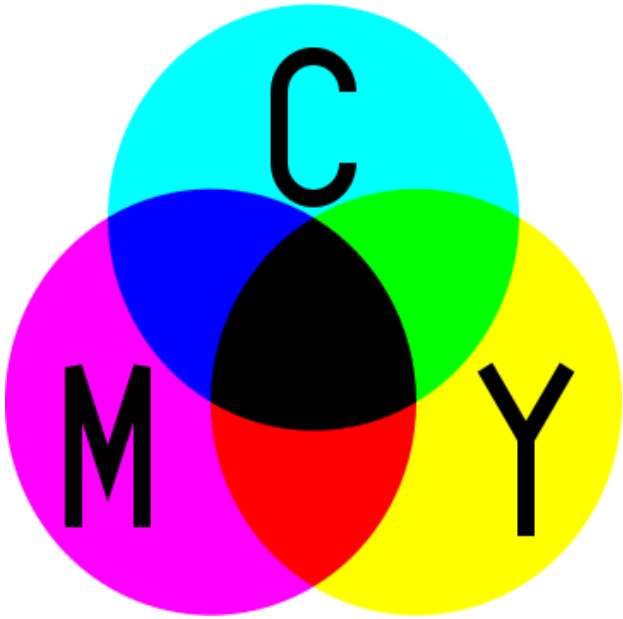
CONT.

2. Subtractive colors CMYK:

- The subtractive, or pigment theory deals with how white light is absorbed and reflected off of colored surfaces.

- Typically illuminated by **white light .**

- Used in inks for printing with a **black (K)** added , because (CMY) pigments and inks rarely give deep, rich black tones by themselves (they tend to make a muddy brown) **this case only in printers machines** .



CONT.

- **Subtractive Primary colors** are: Cyan (C), Magenta (M), yellow (Y) (the secondary colors is Red , Green and Blue).
- Colored Pigments absorb light and reflect only the frequency of the pigment color.
- Each subtractive colored pigments removes one of the additive primary colors from the reflected or transmitted

Subtractive or Pigment Theory is used in printing and painting.

CONT.

- In interior design (as in painting and printing , and other situation using pigments and dyes as the colorants) , one is usually working with subtractive color .

- For example, a red object is actually one that absorbs all colors but red and reflects back only red light .

- The more paints we mix together the darker the resulting color becomes .

Application of Additive theory

1. (Stages:)

- The mixing of colored light is used in theaters stages (interior) , cafés and restaurants environments ,also it used in open spaces stages (exterior), However, it create similar stage effects.

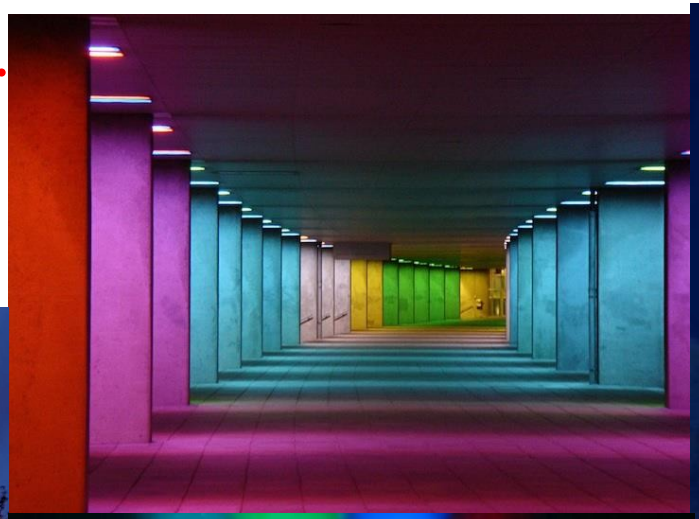
Cont.

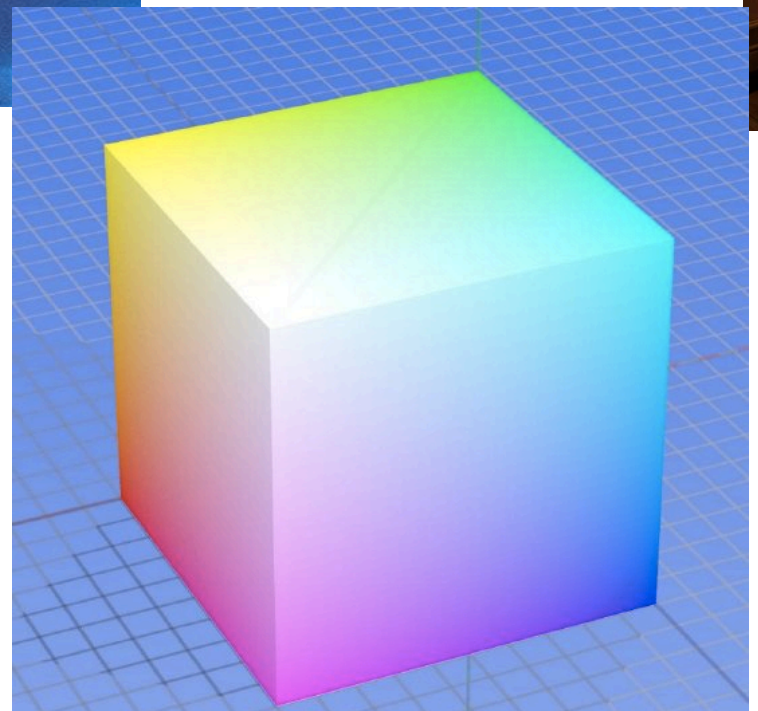
- Care should be taken in the use of colored lights ,especially where **colors selections** are important ,because these lights can distort real color and cause eye irritation.

Cont.

2. Elevations

- RGB system is can be Used in Colored LED system in Façades.





Cont.

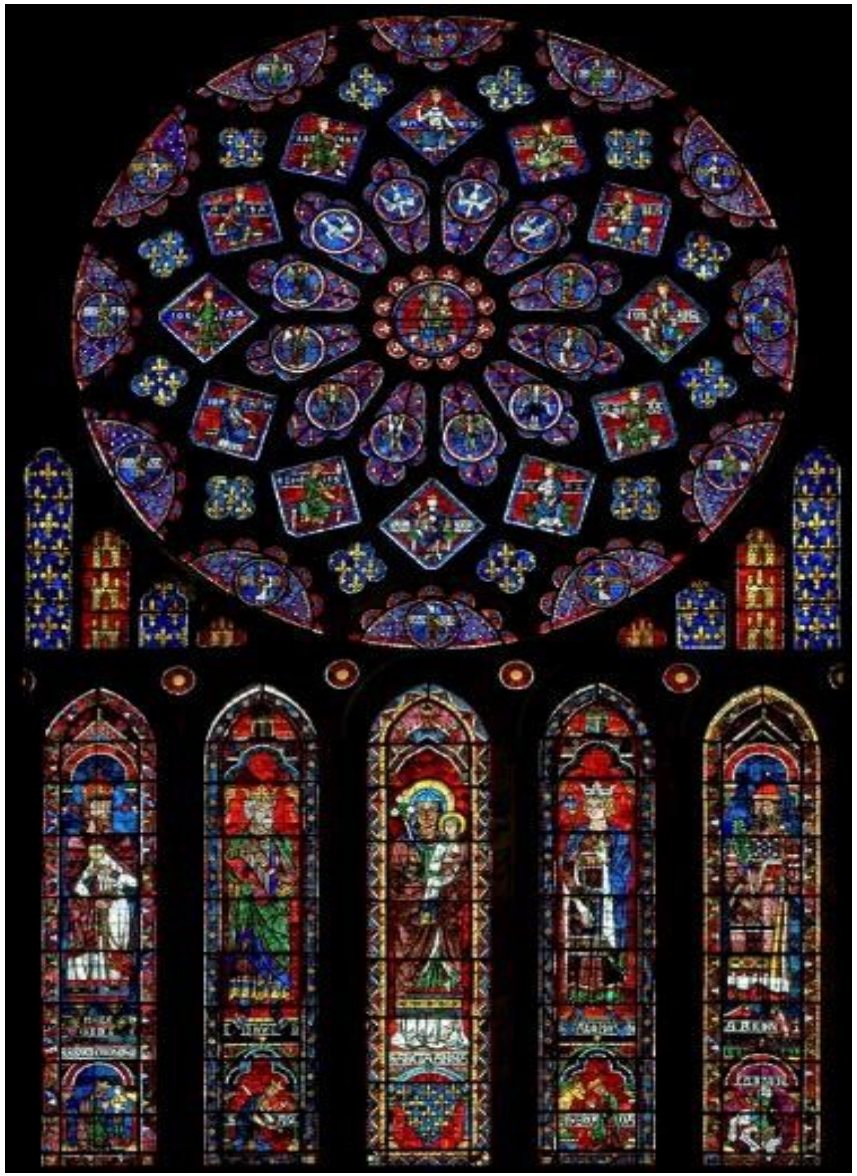
3. (Stained Glass)

- Glass generally refers to hard, brittle, transparent material.
- Basic ingredients for making glass are sand and wood ash (potash) ,The mixture are melted together at very high temperatures melted into liquid which, when cooled, form a material that is ideal for a wide range of uses from packaging and construction to fiber optics. To color the glass, powdered metals are added to the mixture.

Cont.

Advantages of Glass:

1. Visibility and Light Transmission
2. Energy Conservation
3. Security
4. Durability
5. Beauty & functionality
6. Scratch Resistant
7. Heat Safety
8. Easy Maintenance
9. Cost Effectiveness



Cont.

- The art of stained glass reached its height between 1150 and 1500 , created for great cathedrals
- Windows were the major pictorial art form.
- Purpose of stained glass windows in a church was both to enhance the beauty of their setting and to inform the viewer through narrative or symbolism.
- Subject matter was generally religious. in churches, though "portraits" and are often included, and many narrative scenes give valuable insights into the culture of the time.

Cont.

- The last third of the 19th century saw the development of a fundamentally approach to architecture and interior design.
- All over Europe there was a need for liberating change of direction, a desire to break away from set formulas based on pastiche of historical styles and a search for original ideas, all of which resulted at the beginning of the 1890s in the birth of **Art Nouveau**.

Cont.

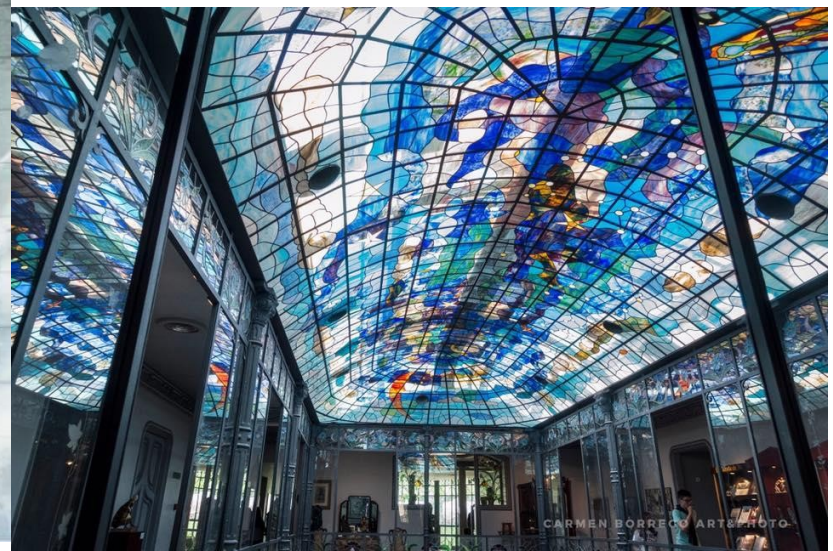
- Art Nouveau (French for "New Style") was popularized by the famous Maison de l'Art Nouveau (House of New Art), a Paris art gallery operated by Siegfried Bing.

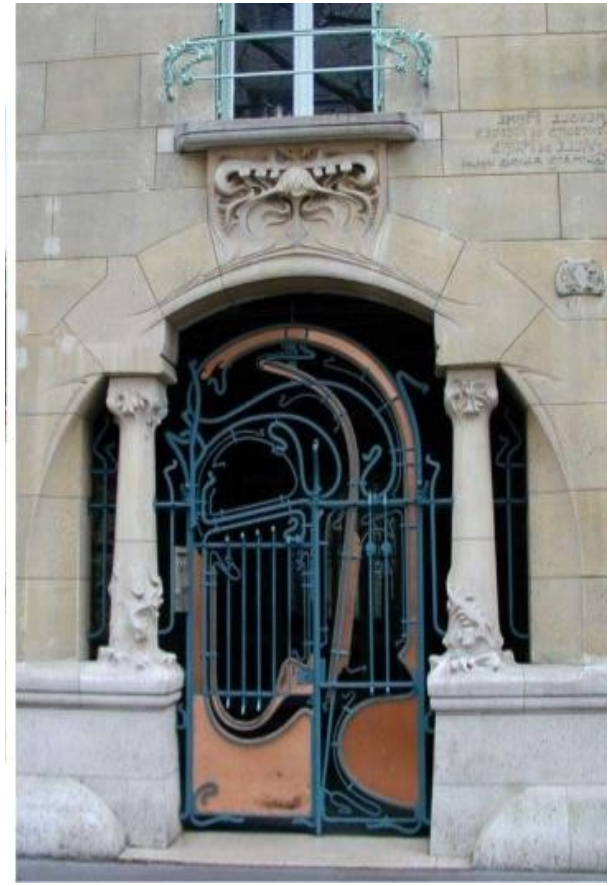
Stairway of Tassel House, Brussels

- Art Nouveau represents the beginning of modernism in design (Modern Architecture). It occurred at a time when designers, architects, and artists began to understand that the handcrafted work of centuries past could be lost. While reclaiming this craft tradition, art nouveau designers simultaneously rejected traditional styles in favor of new, organic forms that emphasized humanity's connection to nature.

Cont.

- flat, decorative patterns;
- intertwined organic forms such as stems or flowers;
- an emphasis on handcrafting as opposed to machine manufacturing;
- the use of new materials; and the rejection of earlier styles
- Sainted Glass





Cont.

LAMPS


THANK YOU


QUESTIONS?
COMMENTS?
CONCERNS?