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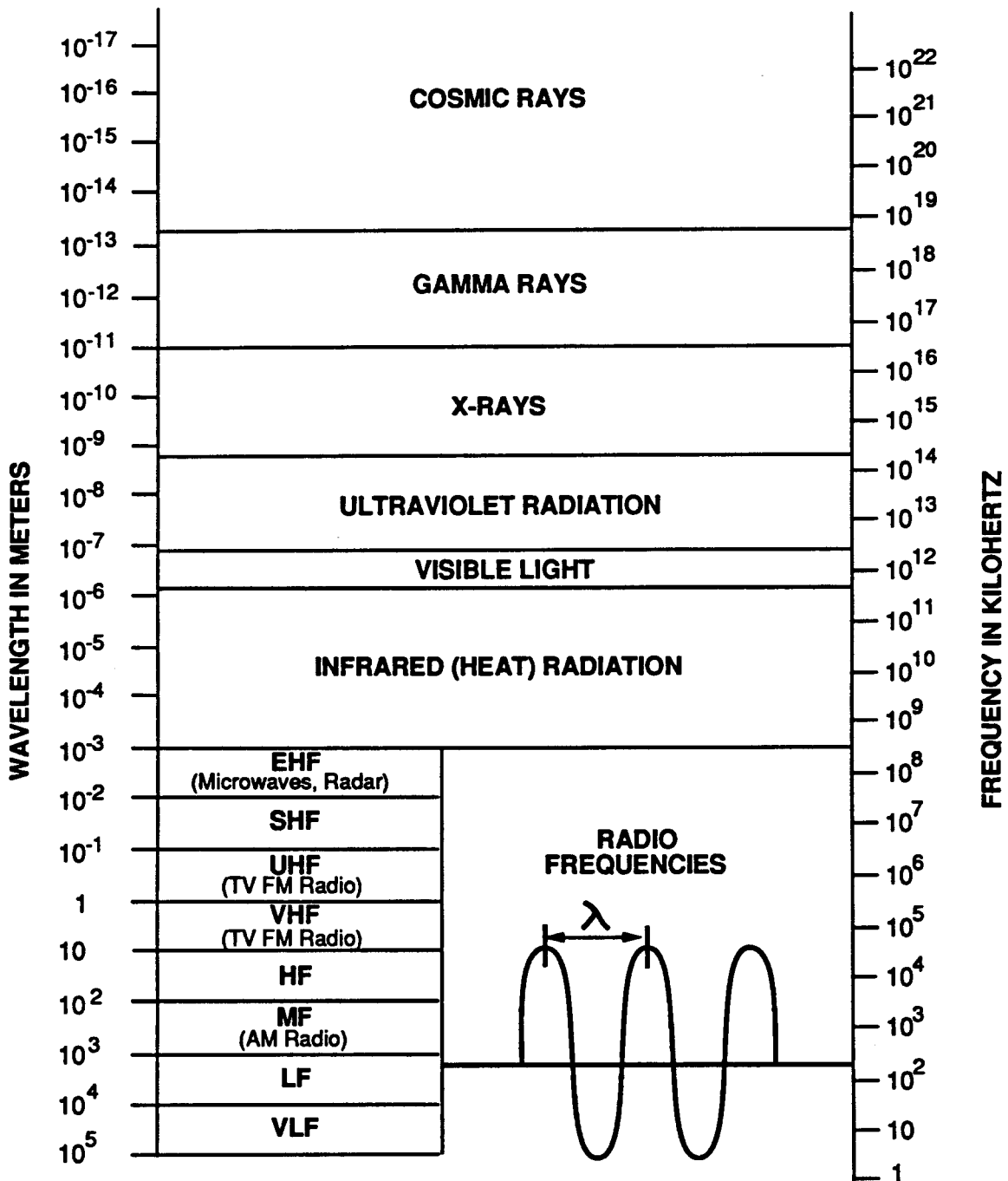
# Color And Color Properties



# What is Color?

- **Psycho-physical phenomena**
- **Electro-magnetic radiation**
- **Due to photo-chemical reactions in the eye**
- **Visual experience independent of shape or duration**  
— **Spectral, Nonspectral and Achromatic Colors**

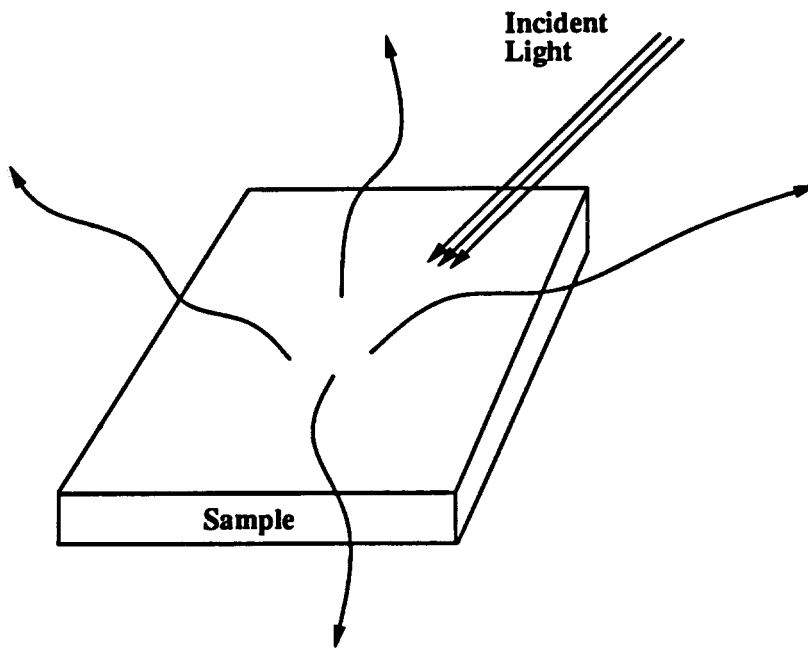
**Figure 13-1 Spectrum Of Electromagnetic Radiations**



## Hues Of Monochromatic Light

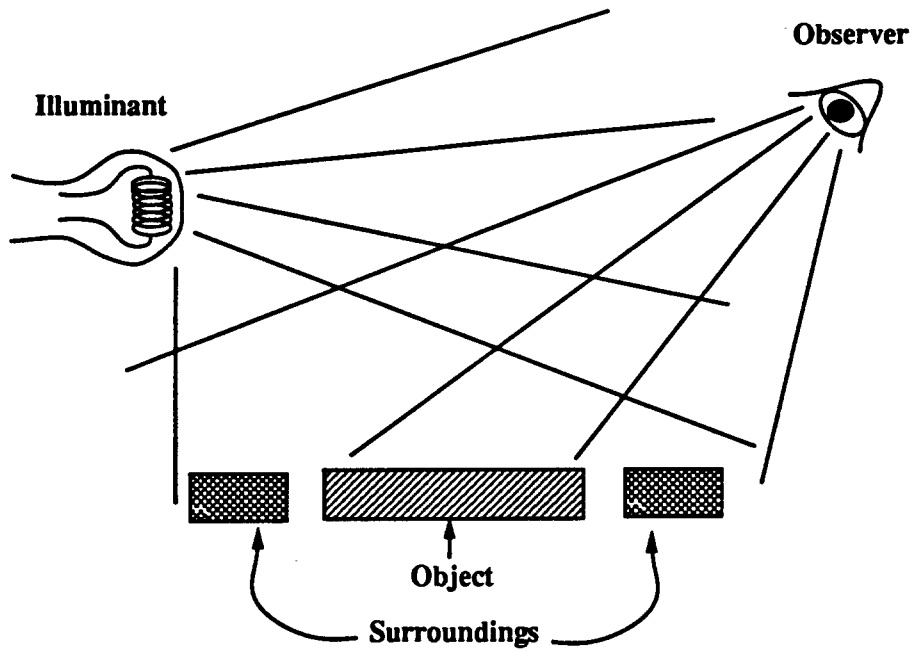
$\lambda$ (mu)	Color
380	UV
380 - 435	Violet
435 - 480	Blue
480 - 490	Turquoise
490 - 500	Bluish-Green
500 - 560	Green
560 - 580	Yellowish-Green
580 - 595	Yellow
595 - 650	Orange
650 - 780	Red
780+	IR (near)

## Figure 13-2 Interaction Of Light With Matter



- Reflected
- Absorbed
- Transmitted

# Figure 13-3 Object Color



**At Least Four Variables?**

# Factors In Perceived Color

- Spectral energy distribution of the light source
- Reflectance characteristics of the sample and surroundings
- Geometric properties of the sample
- Response characteristics of observer's eye
- Intangibles



# Metamerism

## Definition

Objects which appear to match or evoke the same color under at least one light source but have different spectral reflectance curves and can appear not to match under a different light source are metameric objects or exhibit metamerism.

## Variations

- Illuminant metamerism
- Observer metamerism
- Geometric metamerism
- Instrument metamerism

# Color Measurement

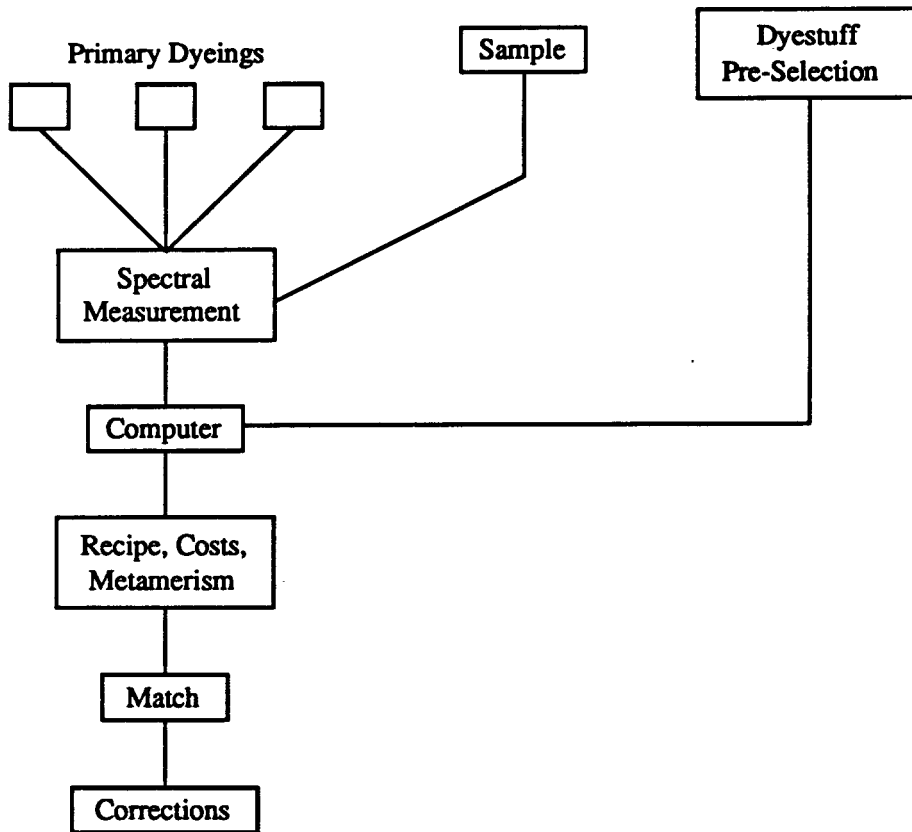
**Colorimeter** - Measures amount of visual red, green, blue components reflected from colored sample.

Tri-stimulus values, X, Y, Z  
Reveals metamerism

**Spectrophotometer** - Gives non-metameric color matches - spectral reflectance

**Color Eye** - Combination of a colorimeter and a spectrophotometer

# Computer Color Matching



## **Advantages of Computer Color Matching**

- **Reduce the number of production adds**
- **Match colors at lower costs**
- **Provide consistent distribution of shades**
- **Control dye inventory levels**
- **Monitor dye quality**

# Limitations Of Computer Color Matching

- Accuracy of dyeing processes
- Textile materials
- Optical theories and measurements
- Original dye selection
- Economic factors

# Use Of Color Instruments

## **Applications**

- Match shades
- Dyeing process
- Shade sorting
- Quality control

## **Limitations**

- Multi-color designs
- Textured fabrics
- Defining acceptable shade ranges

# **Sources Of Color Variations**

*(In Dyeing)*

## **Raw Materials**

- Substrate (Fiber, Yarn, or Fabric)
- Preparation of Substrate
- Dyes
- Dyeing Assistants (Chemical Aux.)
- Water

## **Processing**

- Time
- Temperature
- Machine "speed"
- Steam Quality
- Liquor Ratio
- Etc. (Including subsequent processing, i.e. Finishing)

