**Color in Nature**

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- Color is *NOT* just a compound that comes in a wide range of hues and tones
- Types of Color:
  - dyes & stains, pigments, suspended particles, bioluminescence, structural
- Purpose of Color:
  - warning, mimicry, camouflage, transparency

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**Dyes and Stains**

- Mosses stained by iron and iodine
- Elephants stained by mud
- Bodily fluids: urine, blood, defense fluids
- Water soluble colors in some tropical bird feathers
- Squid ejects ink to escape from predator

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**Pigments**

- Metabolic origins
- Chloroplast ~ green
- True blue and purple pigments are rare, most are marine animals

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**Pigments - Autumn Foliage**

- In the summer, the green (chlorophyll) masks the yellow and red pigments (xanthophyll & carotene)
- In the fall, the chlorophyll breaks down and the color changes
**Suspended Particles**
- Water can appear different shades
- Silt
- Sulfur
- Algae
- Blood (in piranha infested waters)

**Bioluminescence**
- Organism produces chemicals which glow
- Host bacteria which produce chemicals
- Used for diversion when attacked or mating (fireflies)

**Structural Color**
- Due to refraction and diffraction of light
- Water droplets, oil, soap

**Structural Color**
- Micro-geometry
- Feathers, butterfly & other insect wings, snakeskin
- Changes color when wet with alcohol or acetone

**Functional Coloring**
- External colors have evolved for individuality, mood, courtship, warning, mimicry, camouflage
- Blushing
- Internal color is probably not functional, just chemistry & metabolism

**Warning Color and Mimicry**
- Brilliant color, fake “eyes”
- Common in insects, reptiles & amphibians
- Visible at rest or displayed when threatened
- Mimic a creature that is more dangerous, poisonous or distasteful
Camouflage

• Imitate or reproduce color and shape characteristics of surroundings
• Visual signals cause pigment to migrate within cells
• Slow (chameleon) or fast (octopus & squid)

Reef prawn

Transparency

• Some marine animals are so transparent they are practically invisible
• Usually have some pigment in the retina and digestive organs

Phyllisoma larvae (lobster)

Paint Pigments

• Pigment + oil, chalk, egg (tempera), gum, water
• Different colors mix with water differently
• Color permanence
• Color availability changes
• Synthetic pigments
  – First: Prussian Blue (1704)
  – can indicate authenticity

Monaco Coronation of the Virgin