biochromatics

advancing color and beauty through optics, chemistry and psychology

Bio-Chromatics 101: Understanding the Science of Color

P&G Beauty & Grooming scientists have developed Bio-Chromatics, a color science model that combines the principles of chemistry, optics and psychology to create biology-based color products. Applying the latest research in optical interactions, ingredient composition and color perception to product development enables researchers to optimize how color interacts with hair and skin through microscopic formula variations.

Optics: *The Behavior and Properties of Light*

The composition of light and the way it bends and reflects off of objects helps define the color spectrum, predicting how colors and shades will interact with each other. Human eyes can see up to 7,000,000 colors.[1] All of these different shades are processed when light wavelengths hit objects. Certain wavelengths are absorbed by objects and others are reflected, determining which colors the human eye perceives. Visible light is actually a small part of the full electromagnetic spectrum, which extends from cosmic rays at the highest energies down through electric-power-transmission frequencies at the lowest energies.[2]

P&G Beauty & Grooming scientists are working to understand and measure the optical principles that drive visual perception of skin and hair color. For example:

- P&G Beauty & Grooming are delivering shades that interact with a person's individual skin tone to reduce the appearance of "ashy" skin and look more natural.

- Scientists also use predictive appearance modeling to measure how certain foundation shades and lip colors will react with different skin tones

Chemistry: *Ingredient and Pigment Formulations*

Combining ingredients and pigments to create vibrant colors and various shades requires a precise understanding of the chemical interactions of different components. Color is measured using lightness (dark to light), hue (shade) and chroma (intensity). The slightest change to a formulation can create microscopic color changes and alter the properties of certain pigments.

- P&G Beauty & Grooming scientists developed a colorant technology that delivers pigments to hair strands as color molecules called micropearls. Each shade of hair color contains a unique mix of different colored molecules and conditioning ingredients to create the desired shade. This formula provides high gloss color to hair more effectively in less time.

- By using pigments known as encapsulated organic colorants instead of standard cosmetic formulations in foundations, P&G Beauty & Grooming scientists create more vibrant shades that mimic naturally flawless skin.

Psychology: *The Perception of Color*

While optics determines the colors people see, interpreting color is a complex physical process that involves the simultaneous interaction of the eyes and the brain through a network of neurons, receptors and other specialized cells.[3] Different colors can mean different things to people – for example, red can imply heat and fire to one person, and love to another.[4]

Based on the notion that the science of color involves more than primary vs. pastels, the P&G Beauty & Grooming Bio-Chromatics model acknowledges that color helps people establish the way they perceive the world around them. For example, different shades of makeup have the potential to alter a person's perceived beauty and can be associated with certain characteristics, such as trustworthiness, competence and likeability.

- Scientists at P&G Beauty & Grooming have partnered with leading academic researchers and institutions, such as Dr. Nancy Etcoff and Harvard University, to further understand how different cosmetic looks and color combinations change the way women are perceived by others.
- Scientists will also evaluate the way hair color shades and finishes affect how a person is judged.

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[1] http://www.colormatters.com/optics.html
[2] http://www.webexhibits.org/causesofcolor/1.html
[3] http://micro.magnet.fsu.edu/optics/lightandcolor/index.html
[4] http://www.sitepoint.com/blogs/2010/01/07/the-passionate-color-red/