

# Applications Note

*Insight on Color*

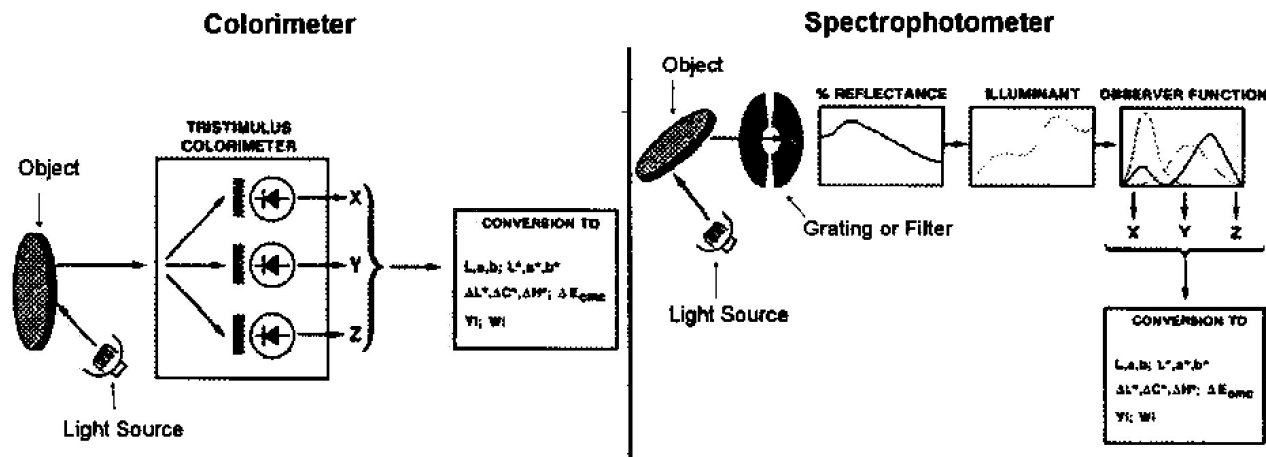
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## Colorimeters Versus Spectrophotometers

Understanding the types of instruments available for measuring color is important when choosing the instrument to purchase or use for your application. The terms “colorimeter” and “spectrophotometer” cause some confusion, so their differences are outlined in the table below. Note, however, that both types of instruments provide data obtained over the same range of visible wavelengths (about 400-700 nm), but they may treat this data differently.

Colorimeter	Spectrophotometer
An instrument for psychophysical analysis—provides measurements that correlate with human eye-brain perception. Colorimetric data directly read and provided as tristimulus values (XYZ, L, a, b, etc.).	An instrument for physical analysis—provides wavelength-by-wavelength spectral analysis of the reflecting and/or transmitting properties of objects without interpretation by a human. Can indirectly calculate psychophysical (colorimetric) information.
Consists of sensor and simple data processor.	Consists of sensor plus data processor or computer with software.
Has a set illuminant and observer combination, usually C/2°.	Has many available illuminant/observer combinations that can be used for calculating tristimulus data and metamerism index.
Isolates a broad band of wavelengths using a tristimulus absorption filter.	Isolates a narrow band of wavelengths using a prism, grating, or interference filter.
Is generally rugged and a less complex instrument than a spectrophotometer.	Is a more complex instrument than a colorimeter.
Works well for routine comparisons of similar colors and for adjustment of small color differences under constant conditions. Optimal for quality inspection.	Works well for color formulation, measurement of metamerism, and variable illuminant/observer conditions. Optimal for both quality inspection and research and development.
Examples: HunterLab D25-series instruments and ColorTrend HTs are colorimeters.	Examples: HunterLab ColorFlexes, ColorQuests, LabScans, MiniScans, SpectraProbes, and UltraScans (all generations) are spectrophotometers.

Below are illustrations of many of these factors.:



### References:

Billmeyer, Fred W., Jr. and Saltzman, Max, *Principles of Color Technology*, New York: John Wiley & Sons, Inc., 1981.

Hunter, Richard S. and Harold, Richard W., *The Measurement of Appearance*, New York: John Wiley & Sons, Inc., 1987.

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