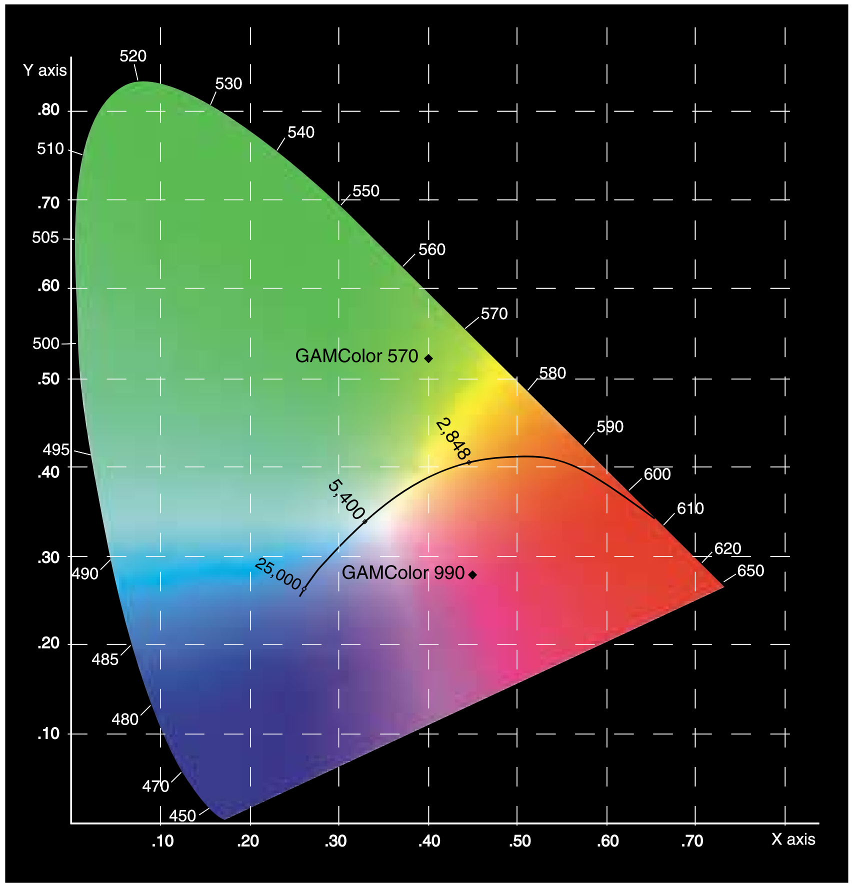


**Plate I. The C.I.E. Chromaticity Diagram.** This diagram is the most practical color map for the lighting designer or technician. Within the limits of the color printing process, it displays all of the color mixes possible using the RGB light primaries.

The perimeter of this diagram displays the spectral colors wrapped around the curved portion and nonspectral mixes of red and blue at the bottom along the straight line.

**Plotting Colors and Mixes on the C.I.E. Diagram.** Note that the diagram includes a curved line near its center. This line, the "black body locus," delineates the visible light output of a standard black body as it is heated from the deepest visible red through white to pale blue. Along this line are plotted key points (color temperatures) vital to plotting information about color filters. The IES standard for "white light" produced by general service incandescent lamps is **2848 K**. This is the point most commonly used to plot complimentary colors. It also approximates the "white" produced by 3200 K theatre lamps under conditions of reduced line voltage typically found at the lighting positions in a theatre. The nominal temperature agreed upon for "outdoor" illumination is **5400 K**. (Note: outdoor light can vary from the dimmest red of sunrise to the deep blue of a northern sky at noon, approximately 25,000 K.) The 5400 K point is used to determine complementary colors when using high-color-temperature lamps such as HID. "Equal energy white" (not plotted), lies very close to 5400 K and is often cited in the place of 5400 K for color plotting purposes.

As a sample of the application of the C.I.E. Diagram to predicting color mixes, two typical gel colors, labeled GAMColor 570 (light yellow-green; x=0.40, y=0.52) and GAMColor 990 (dark lavender; x=0.45, y=0.28) have been plotted using data from Gelfile. A line drawn between the locations of the colors will include all of the possible mixes of these two tints. The midpoint of that line, which in this case is in the cool white area, indicates the result of an equal intensity mix. Note that this mix is dependent on the sources operating at full intensity. If the lamps are dimmed, the colors would have to be replotted indicating their red shift. It is also possible, but with less accuracy, to "eyeball" plotting colors by comparing what can be seen by holding a sample of the color to be plotted up to a source of the proper color temperature and searching out a spot on the C.I.E. Diagram that matches. Note that one must be sure that light transmission is viewed (only one pass of the light through the medium.) Viewing the color medium lying on a white surface makes the light pass through it twice.

Fully saturated complementaries can be located by drawing a line from one perimeter of the diagram through either 2848 K or 5400 K (or the point representing the color temperature of the source in use) to the opposite perimeter. The ends of the line mark the most contrasting pair of complementaries possible using those two hues. Other pairs located equidistant from the 2848 K or 5400 K mark will also be complimentary, but with less saturation.

Complimentary tint pairs for acting area lighting may be determined by choosing one tint of the proposed pair and drawing a line from its location on the diagram through either 2848 K or 5400 K to a point equidistant on the other side. Actually all pairs of tints located equidistantly on lines passing through the point marking whichever source is in use will be complimentary, but not all will be practically useful for acting area lighting.

Three-color mixes can be plotted on the C.I.E. Diagram by locating the three colors and drawing a triangle with these points at the vertices. Any color included within that triangle can be mixed by adjusting the proportions of the three colors chosen. Colors outside of the triangle cannot be made with this mix.

(Plate I was developed with the assistance of GAMPRODUCTS, Inc.)

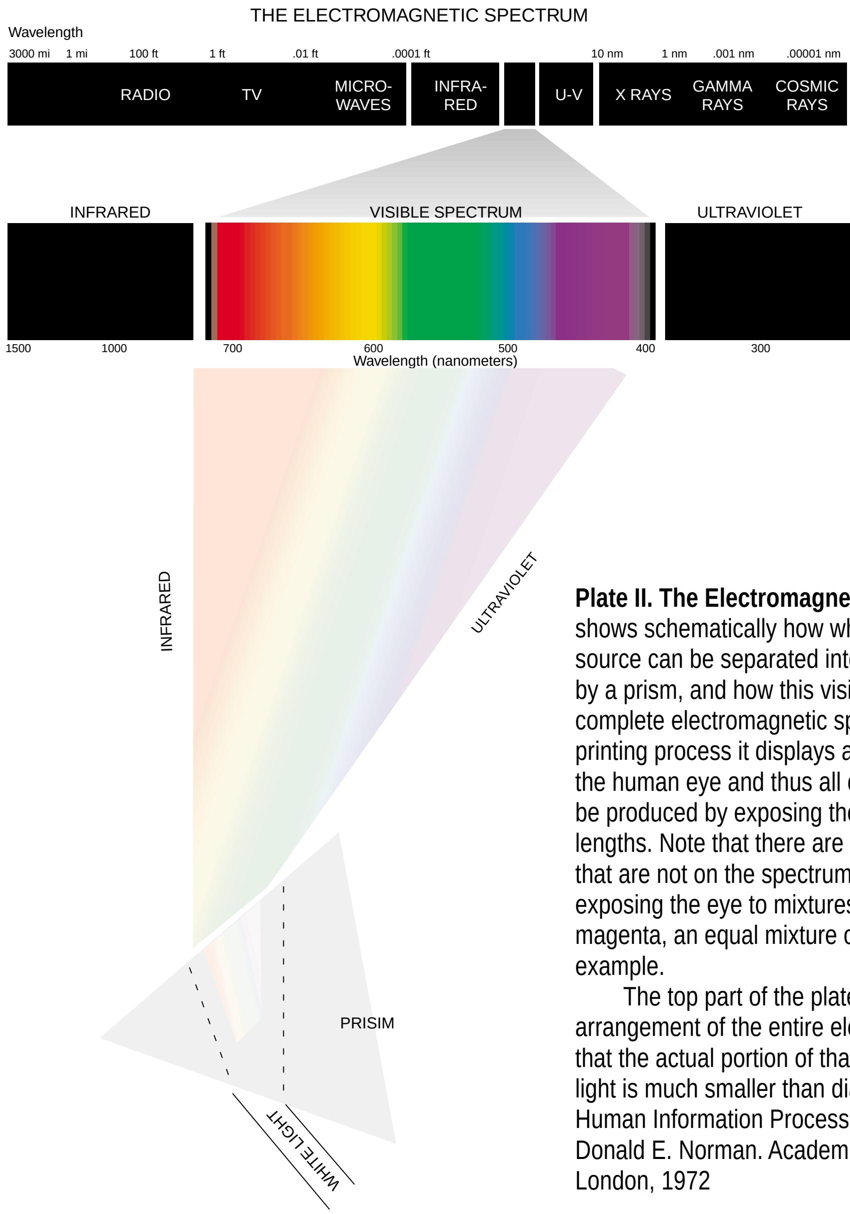


**Plate II. The Electromagnetic Spectrum.** This diagram shows schematically how white light from an incandescent source can be separated into its component wave lengths by a prism, and how this visible spectrum fits into the complete electromagnetic spectrum. Within the limits of the printing process it displays all of the wavelengths visible to the human eye and thus all of the color sensations that can be produced by exposing the eye to individual wave lengths. Note that there are a number of color sensations that are not on the spectrum that can only be produced by exposing the eye to mixtures of wave lengths. The color magenta, an equal mixture of red and blue, is one example.

The top part of the plate shows schematically the arrangement of the entire electromagnetic spectrum. Note that the actual portion of that spectrum occupied by visible light is much smaller than diagrammed. Adapted from Human Information Processing. Peter H. Lindsey and Donald E. Norman. Academic Press. New York and London, 1972

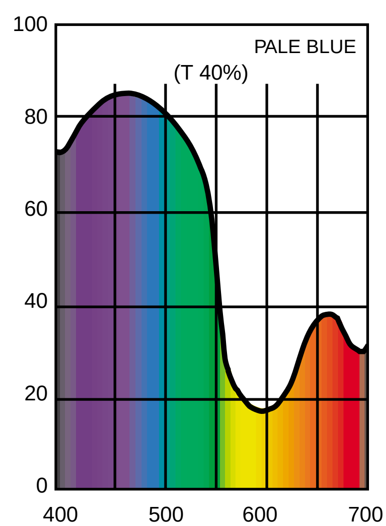


**Plate III. Color Medium Spectrogram.** This plate graphically illustrates the information in color medium spectrograms commonly distributed by dealers. A representation of the visual spectrum has been superimposed over the spectrogram. The areas under the curve indicate the relative amount of each wavelength transmitted by this particular medium. For example, the spectrogram indicates that this Pale Blue color medium transmits considerably more light in the blue wavelengths (over 80% transmission at 450 nanometers) than in the orange and red wave-lengths (less than 20% transmission at 600 nanom-eters).

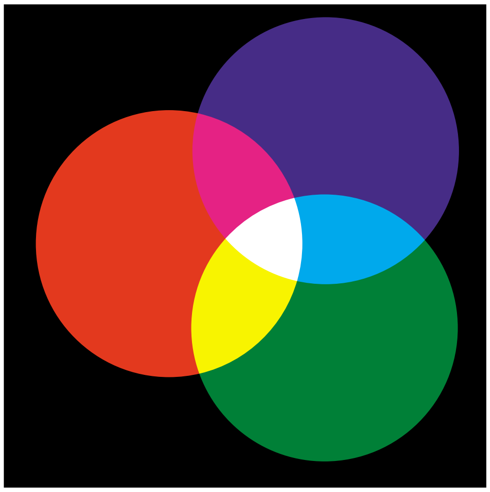

**Plate IV. Additive Color Mixing.** This figure illustrates what would be seen if three spotlights of equal brightness and color temperature producing "white" light were equipped with pure primary red, blue and green media and focused to overlap on a white surface. Where all three colors are present, the result will appear to the normal eye as white; where only two of the three colors (primaries) overlap, the result will be the secondary colors, yellow, magenta and cyan (blue-green).

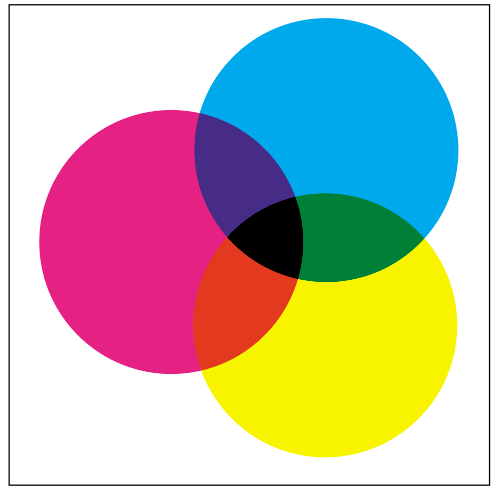

**Plate V. Subtractive Color Mixing.** This diagram shows three circles of pure secondary color medium overlapped as shown and viewed with white light source behind them. Note how the secondary colors of one color system match the primary colors of the other system.

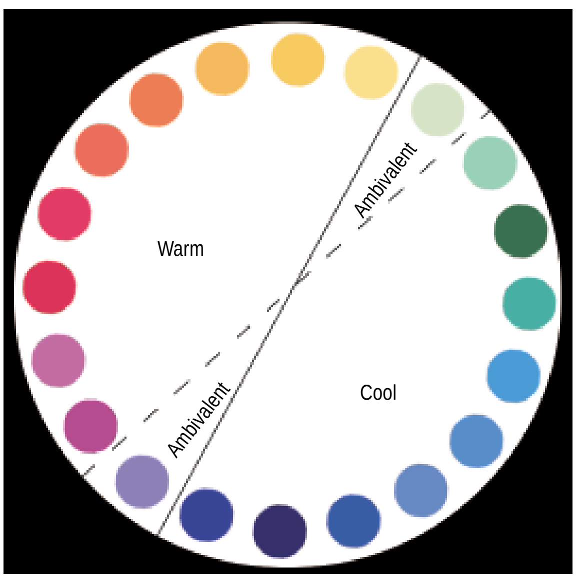


**Plate VI. The Color Wheel.** This plate reproduces a color wheel made with stage-quality color media of moderate saturation. Acting area colors derived from these samples would be even less saturated. Note the categories of "warm" and "cool" and how tints of yellow-green and red-purple are ambivalent, being either warm or cool depending on the color to which they are contrasted.

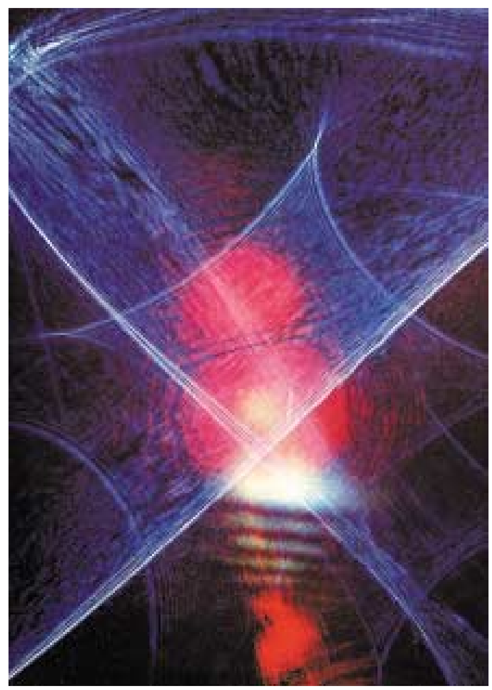

**Plate VII. Laser Interference Pattern.** This pattern was produced by one of the earliest laser projectors devised for stage use. Josef Svoboda worked with the Siemens Co. of Germany to produce laser images that could flood the stage including dancers. The laser beam is dispersed and sent through an irregular piece of glass which produces an infinity of random patterns. While the patterns vary with distance from the projector, they are in focus from the projector to infinity. Interference patterns remain to be a feature of laser displays today although laser scanning has added many other possibilities. Courtesy Siemens, Germany.

**Plate VIII. Wedding scene, *A Midsummer Night's Dream***, Shakespeare. Performed at the Colorado Shakespeare Festival. Director, Robert Cohen; set design, Douglas Scott Goheen; costumes, Chuck Goheen; lighting, Richard Devin. Note the focus on the figure downstage with secondary foci on the other figures. This lighting coordinates with the blocking to unify the scene. Photo Richard Devin.

**Plate IX. *Le Bourgeois Gentilhomme*** (Molière). Staged at ACT. Adaptation by Charles Hallihan; directed by William Bell; scenery, Richard Seger; costumes, Robert Fletcher; lighting Richard Devin. Note the strong but realistic use of directional light coordinated with the facing of the actors. Photo Richard Devin.

**Plate X. *Orféo.*** This plate, and Figure 15.1, illustrate the effectiveness of close integration of projection techniques into a production. Scenic projection and video techniques are used in this production of *Orféo* in a way that allows the actors to appear to interact with the projected images, not merely playing in front or behind them.

*Orféo*, an adaptation of the Orpheus legend, is a one-hour music/dance/multimedia presentation co-produced by Theatre Français du Centre Nationale des Arts, Ottawa, the John F. Kennedy Centre, Washington D.C. and l'Usine C., Montreal. Creative concept/theatrical direction by Michael Lemieux and Victor Pilon; associate director, Ginette Prévost; music, Michael Lemieux; costume designers, Gabriel Tsampalieros and Carole Courtois; stage projections design, Victor Pilon with the assistance of Marc Bilodeau. Photo courtesy Victor Pilon.