COLOR AND APPEARANCE

Some days are yellow.
Some days are blue.
On different days I'm different too.
You'd be surprised how many ways
I change on different colored days.
On bright RED days how good it feels
To be a horse and kick my heels!

—My Many Colored Days, by Dr. Seuss

In food products, especially meats, fruits, and vegetables, the consumer often assesses the initial quality of the product by its color and appearance. The appearance and color of these products are thus the primary indicators of perceived quality. The importance of color and appearance can also be demonstrated when we think of drinking milk from a Coca-Cola bottle, when we choose bananas in the grocery store (a green-yellow-black continuum that indicates ripeness), when a friend serves green-colored bread and beer on St Patrick's day, and when someone serves us a watermelon with yellow flesh instead of the more usual red. In food processing and cooking, color serves as a cue for the doneness of foods and is correlated with changes in aroma and flavor. Simple examples include the browning of baked and fried foods. For other foods, color or lightness is important to identity and grading, such as the lightness of canned tuna fish. Scientific studies have also shown that the color of the product affects our perception of other attributes, such as aroma, taste, and flavor. For example, DuBose
and Cardello et al. (1980) found that the number of correct identifications of fruit-flavored beverage flavors decreased significantly when the beverage was atypically colored, and that the number of correct identifications increased when the beverages were colored correctly. Christensen (1983) found that when sighted panelists scored the aroma intensity of appropriately and inappropriately colored cheese, soy analog bacon, margarine, raspberry-flavored gelatin, and orange drink, the perceived intensity of the appropriately colored product was higher than for the inappropriately colored product. Interestingly, the bacon analog was a notable exception. The effect on perceived flavor intensity was less pronounced, and there was no effect on perceived texture of the products. However, not all reports of the influence of color on flavor intensity have been consistent or repeatable (Christensen, 1985). The effect of color on flavor is not very clear. In some cases the effect seems pronounced (Christensen 1983); in other cases it does not seem to occur at all. It is difficult to tell from the literature whether the lack of evidence of interaction between color and flavor occurs because there truly is no effect, or whether the study did not have enough power (due to too few panelists, too small an effect relative to individual differences) or was performed sloppily.

Johnson and Clydesdale (1982) found that panelists scored perceived sweetness of dark-colored sugar solutions 2 to 10% higher than a lighter-colored control, even though the darker solutions actually contained 1% less sucrose than the lighter solution. Maga (1974) showed that the color of a solution can affect the taste thresholds for the four basic tastes. Specifically, he found that yellow-colored solutions had a significantly higher threshold value for sweet than colorless solutions, and green-colored solutions had significantly lower threshold values for sweet than colorless solutions. Green- and yellow-colored solutions had higher threshold values for sour than colorless solutions had, and red solutions had higher threshold values for bitter than colorless solutions had. This study has not been repeated, so it is difficult to make any generalized conclusions. However, one could speculate that the differences in threshold values were due to the differences in panelists' expectations. They may have associated green and yellow solutions with "unripe fruits" and therefore have expected the solution to be less sweet, thereby needing more sweetener to reach the threshold for sweetness. A similar argument may be made for higher sourness thresholds for green and yellow solutions. The panelists expected these solutions to be sour and therefore needed a larger quantity of acid to actually perceive the sourness. In the United States, red drinks are often very sweet, and the panelists may not have perceived the added bitterness in these solutions because they were expecting the solutions to be sweet.