In the Eye of the Beholder

by Dr. H. Marc Cathey

AMONG THE greatest gift we humans enjoy is our sense of sight, including the amazing ability to see in color, in three dimensions, and to be able to focus from closeup to far away. Human vision is outstanding, yet our incredible eyes can still be fooled.

Take, for example, the phenomenon of three-dimensional (3-D) video. During the early 1970s, my older brother—who was a physics professor at the University of South Carolina at the time—and two colleagues invented 3-D television. The idea for this research was based on my dad's old story of how a one-eyed chicken can cross the road without getting hit. Dad told us that the bird puts its one "good" eye in the middle of the plane of vision and moves its head rapidly, creating the illusion of three-dimensional sight. Of course 3-D television and film have gone on to become a staple of the entertainment industry, as well as to yield many scientific benefits.

Another way in which our eyes can be fooled is through the appearance of objects under different kinds of lighting. You may have noticed this when shopping for clothing—an item that appeared to be one color in the store under fluorescent lighting may look quite different in sunlight. The color our eyes see differs with the wavelength of light that is reflected back from fluorescent light than from sunlight.

About 20 years ago, some grocery stores came up with the idea of using green fluorescent lamps in the produce section. Under that lighting, vegetables looked fresh, green, and healthy. But this practice was soon abandoned because consumer groups complained that it was misleading.

I learned about a new twist on this at the Centennial Conference of the American Society for Horticultural Science, held in Providence Rhode Island last fall. During one of the presentations I attended, scientists affiliated with the National Aeronautics and Space Administration discussed a new kind of lighting they were testing to grow plants in space in growth chambers. The end goal of the research was to feed astronauts on the space station or long duration flights.

The scientists reported that the lighting, which is made up of red and blue light-emitting diodes (LEDs), proved successful in growing plants, but to the human eye the appearance of the plants growing under these specialized lights was off putting—their foliage looked as if it were metallic black. That's because under normal lighting, most plants absorb red and blue wavelengths and reflect the green (and sometimes yellow)—which is what we expect to see. Under the red and blue LEDs there was no green light to reflect back.

To conquer any potential squeamishness on the part of astronauts, the NASA researchers indicated they are going to try adding low levels of green light from fluorescent lamps in future experiments.

Further research along these lines will also benefit the growth of larger plants in space, because light wavelengths in the red and blue range are absorbed by the first layer of foliage they hit and won't reach leaves lower down on taller plants. Some wavelengths of green and yellow light, on the other hand, will penetrate the top layers of foliage and filter down to allow photosynthesis to occur near the base of large plants.

The challenge in a confined space with finite energy resources is to make the most of that energy supply with a lighting system that still provides everything plants need to grow successfully, and at the same time making edible plants look appealing to the human eye.

Dr. H. Marc Cathey will discuss lighting for indoor plants during an AHS Garden School session on "The Amazing World of Indoor Plants" at River Farm on April 2 during Washington Blooms!, AHS's annual spring celebration. For more about the AHS Garden School sessions and other events, see the ad on page 31

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