



The Chroma Zone

Munsell Color Science Laboratory Newsletter

Spring 1992

Welcome to the Munsell Color Science Laboratory's first newsletter, *The Chroma Zone*. The purpose of this newsletter is to report to our supporters every quarter on an informal basis. You might wonder who, in addition to yourself, is an MCSL supporter? They include research and scholarship sponsors, companies that donate instruments and computers, colleagues that we frequently interact with, former students, and our advisory board.

During the development of our newsletter, we hope to improve the quality with each quarterly report. This is the product of our teamwork and pooled efforts so we can share with you some of our daily trials and tribulations, informally. Some of the subjects you may be reading about are color at RIT, our research, and our students. Any thoughts or comments are welcome. We hope you enjoy it!

-Roy Berns

New Color Modeling Laboratory

One of our small research laboratories is currently undergoing a redesign. The color modeling laboratory is being set up as a prototypic laboratory for colorimetrically accurate cross-media color reproduction. The heart of the laboratory is a Macintosh Quadra 900 workstation with 52MB RAM, 1.2 GB disk storage, and a 16" 32-bit color display. Adjacent to the computer display is a D65 viewing booth with adjustable luminance levels and capability to display both reflection prints and transparencies. Two high-quality output devices will be incorporated with this system -- an MGI Solitaire 16 film recorder and a Kodak XLT7720 dye-diffusion printer. The system is also attached to an ethernet network allowing access to a wide variety of other systems and input/output devices. The room and furnishings are being designed for psychophysical experimentation under optimum viewing conditions. The two walls adjacent to the CRT display are painted gray with a reflectance of 20%.

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The opposite walls are painted black to eliminate glare from the CRT face. Eight fluorescent lighting fixtures with independent switches and reflective grates have been installed. This allows control of luminance level and color temperature of the ambient illumination while minimizing unwanted specular reflections. Lastly, modular gray office furniture was specified for the laboratory to set up optimum viewing conditions. One objective of this laboratory is to have a well-characterized system for colorimetric color reproduction that can easily demonstrate the advantages of device independent approaches. In addition, several research projects will be carried out using this facility. These include the colorimetric calibration of the film recorder for photographic transparencies sponsored by MGI, development of colorimetric image processing routines for analyzing and manipulating images of textile fibers supported by BASF, and a long-term project looking at the application of color appearance models to cross-media color reproduction funded by Kodak. We are eager to begin work in this new facility. It should be completed early this summer. If you are in the area, please feel free to stop by for a demonstration.

-Mark Fairchild

Student News

Those who have an educational background in some aspect of color will agree that there seem to be as many angles to its study as there are colors in the spectrum. Generally speaking, the range of applications of such knowledge is anchored between two worlds: *art* and *science*. The former is characterized as being highly *qualitative*—color is used as one of a number of tools in the creation of artwork—and final assessment is typically based on visual and emotional satisfaction. In contrast, the latter is characterized as being highly *quantitative*—color is broken down into its elemental components, revealing physical and chemical properties—and is then analyzed based on its

application to any number of scientific disciplines. It is important to note, however, that the ultimate goal of color science, too, is visual satisfaction.

Like many others, I have always possessed an affinity for color—finding it intriguing, mysterious, and all the while pleasant. As an undergraduate design student, my first real experience actually working with color was in a foundation-level course: Color Theory. Having completed several "color studies" based on the traditional theories of Albers and Itten, my growing interests in color compelled me to pursue a major in color science—under the direction of Dr. Nancy Jo Howard, at the Philadelphia College of Textiles and Science. This transition, in conjunction with my art background, provided the well-rounded approach I was seeking. As to where this would eventually lead...I was not certain. My vision of color was not one of art **or** science; but rather, one of art **and** science. I later earned a Bachelor of Science degree in color science, with concentrations in both design and psychology.

Upon acceptance to the Master of Science program in color science at the Rochester Institute of Technology (RIT)—under the direction of Drs. Roy Berns and Mark Fairchild—I realized that if I were to continue my education, some kind of focus must be sought. After all, such concentration is generally assumed at the graduate level. I then began to investigate disciplines that could potentially bridge the ever-prominent gap between the two worlds. Computer graphics was the answer. While attending RIT, my coursework consisted of a color science core with a concentration in computer graphics design. Although I was well into this concentration by the end of the first academic year, the true niche was found while assuming a summer internship with Apple Computer, Inc. While there I interacted with graphic designers, user-interface designers, and engineers. User interface design involves the study of how color, computer graphics, and (sometimes) sound are integrated as a whole to provide good interaction between user and computer. This invaluable experience represents a milestone of my career; and has provided insight into several potential thesis topics.

In developing a thesis topic, I wanted to attempt to build a bridge of my own. Realizing that the existing gap has basically resulted from a lack of communication between artists and scientists, I selected a topic which would teach various aspects of color science as they relate to using color in computer graphics; of course, on a level which computer graphic artists, and artists in general, could readily understand. Essentially, the emphasis is placed on presenting technical, scientific information in graphic form with minimal on-screen text—quite a challenge indeed! The title selected—COLOR LOGIC: Interactively Defining Color in the Context of Computer Graphics—was created around the idea that six major components of color science are essential to understanding its use in computer graphics. They are: *color vision*, a

presentation of how color is detected by the eye; then, to how *light and objects* interact with one another; to *color perception*, which is how color, once detected by the eye, is interpreted by the brain; followed by the theories and usage of color in *art and design*; then by two theoretical systems used for organizing color—*color order*; and finally a selection of practical systems used for selecting and editing colors—*computer color models*. The finished product is a hypermedia-based, interactive tutorial aimed at undergraduate college students who use Apple Macintosh computers to generate artwork.

- Brian Rose

Roy & Mark's Soap Box

During the week of Rochester's worst snow storm of the season, I commuted downtown every day to attend a four-day seminar on quality and productivity taught by Dr. W. Edwards Deming. Following my visit to Japan last December and the CORM conference here at RIT last May, I have become interested in management philosophies and their influence on the quality of products. MCSL is a service organization where our products are knowledge and educated students who are prepared to make contributions to industry. During the CORM conference, David Porter described Taguchi's quality definition where quality was equated to minimizing the detriment to mankind. While in Japan, I came to realize that although Taguchi is well respected, Deming, an American, is revered and honored yearly by the Deming Prize. I became curious about this; as luck would have it, he presented his philosophy to 1000 enthusiastic and "willing workers." My most important lesson was the criticality of management in creating the atmosphere for quality and success. The red bead experiment exemplified that despite best efforts and commitment, quality is impossible if the environment is flawed. The environment depends on a proper management philosophy. As a consequence of my new-found knowledge, I am evaluating our environment in terms of a Shewhart cycle and trying to define the philosophy of our programs such that my staff, colleagues, and students develop their full potential without barriers. I will strive to continually evaluate our programs, improve our services and product, and avoid slogans, if possible. (RIT is besieged by "total quality management.")

In fact, this newsletter is a result of our evaluation. We recognized that our communications with our supporters needed improvement. A once-a-year annual report was not timely enough. We also wanted a vehicle less formal. In time, you will see many small, but I believe significant, changes in the Laboratory.

-Roy Berns

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