

# Preface

Color is life and life is color!

We live our life in colors and the nature that surrounds us offers them all, in all their nuances, including the colors of the rainbow. Colors inspire us to express our feelings. We can be “red in the face” or “purple with rage.” We can feel “blue with cold” in winter or “green with envy,” looking at our neighbors’ new car. Or, are we perhaps the black sheep of our family? ....

Color has accompanied us through the mists of time. The history of colors is indissociable, on the cultural as well as the economic level, from the discovery of new pigments and new dyes. From four or five at the dawn of humanity, the number of dyes has increased to a few thousands today.

Aristotle ascribed color and light to Antiquity. At the time, there was another notion of the constitution of colors: perhaps influenced by the importance of luminosity in the Mediterranean countries, clearness and darkness were dominating concepts compared to hues. Elsewhere, colors were only classified by their luminosity as white and black. Hues were largely secondary and their role little exploited. It should be said that it was rather difficult at that time to obtain dyes offering saturated colors. During the Middle Ages, the prevalence of the perception of luminosity continued to influence the comprehension of color, and this generally became more complicated with the theological connotations and with the dual nature of light declining in *Lumen*, the source of light of divine origin (for example, solar light) and *Lux*, which acquires a more sensory and perceptual aspect like the light of a very close wood fire, which one can handle. This duality is included in the modern photometric units where lumen is the unit that describes the flow of the source of light and Lux is the unit of illumination received by a material surface. This design based on clearness, the notion taken up by the painters of the Renaissance as well under the term of value, continues to play a major role, in particular for graphic designers who are very attached to the concept of the contrast of luminosity for the harmony of colors. In this philosophy, there are only two primary colors, white and black, and the other colors can only be quite precise mixtures of white and black. We can now measure the distance that separates our perception from that of the olden times.

Each color carries its own signature, its own vibration... its own universal language built over millennia! The Egyptians of Antiquity gave to the principal colors a symbolic value system resulting from the perception they had of natural phenomena in correlation with these colors: the yellow of the sun, the green of the vegetation, the black of the fertile ground, the blue of the sky, and the red of the desert. For religious paintings, the priests generally authorized only a limited number of colors: white, black, the three basic colors (red, yellow and blue), or their combinations (green, brown, pink and gray). Ever since, the language of color has made its way through time, and today therapeutic techniques use colors to convey this universal language to the unconscious, to open doors to facilitate the cure.

In the scientific world, although the fundamental laws of physics were discovered in the 1930s, colorimetrics had to await the rise of data processing to be able to use the many matrix algebra applications that it implies.

In the numerical world, color is of vital importance, as it is necessary to code and to model, while respecting the basic phenomena of the perception of its appearance, as we recall in Chaps. 1 and 2. Then color is measured numerically (Chap. 3), moves from one peripheral to another (Chap. 4), is handled (Chaps. 5–7), to extract automatically discriminating information from the images and the videos (Chaps. 8–11) to allow an automatic analysis. It is also necessary to specifically protect this information, as we show in Chap. 12, to evaluate its quality, with the metrics and standardized protocols described in Chap. 13. It is with the two applications in which color is central, the field of art and the field of medicine, that we conclude this work (Chaps. 14 and 15), which has brought together authors from all the continents.

Whether looked at as a symbol of joy or of sorrow, single or combined, color is indeed a symbol of union! Thanks to it, I met many impassioned researchers from around the world who became my friends, who are like the members of a big family, rich in colors of skin, hair, eyes, landscapes, and emotions. Each chapter of this will deliver to you a part of the enigma of digital color imaging and, within filigree, the stories of all these rainbow meetings. Good reading!



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