Chapter 24
Mayer, Tobias 1723–1762

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Tobias Mayer, born February 17, 1723 in Marbach, Germany, a mathematician, astronomer, cartographer, and physicist, was the only child of a fountain builder and his wife. Mayer was 10-years-old when his father passed away and he grew up in impoverished circumstances in the nearby city of Esslingen, spending some years in an orphanage. He taught himself mathematics and in his later teens earned some money teaching it. Mayer also showed early interest and capabilities in drawing and

R. Shamey and R. G. Kuehni, *Pioneers of Color Science*,
https://doi.org/10.1007/978-3-319-30811-1_24

painting. He moved to Augsburg to obtain more training, working for the engraver and publisher J. A. Pfeffel. When 18 he wrote and published an elementary book on mathematics and at 22 a much more detailed work on the same subject [1].

His capabilities and the fact that he had designed an accurate map of Esslingen, later published, provided for him in 1746 an offer to join the firm of the cartographer Homann in Nürnberg, at the time perhaps the most important map publisher in Europe. In 1751, he married Maria Gnüge and a year later their son Johann Tobias was born, in his later life mathematician/physicist. In the same year, Tobias Mayer's reputation as a scientist resulted in an offer of a professorship in economy and mathematics at the University of Göttingen, where he remained until his untimely death on February 20, 1762 due to a typhus infection. In 1754, he also became the supervisor of the Royal Observatory of Göttingen, built some 10 years earlier. His major scientific achievements are a data table of the moon and highly detailed drawings of the surface of the moon based on a new methodology to achieve high accuracy, and the development of a new much more accurate methodology for the determination of longitude. The latter effort resulted in his widow receiving a 3000-pound sterling award from the British Parliament. One of the craters of the moon is named "T. Mayer" [2].

24.1 Double Triangular Pyramid Color Solid

Mayer's combined interests in mathematics and painting resulted in an attempt to develop a mathematical model of the relationships between colors. Not accepting, on practical grounds, Newton's idea of seven main colors in the spectrum, Mayer decided to base his model on the painter's primaries yellow, red, and blue. He placed these at the corners of an equilateral triangle and divided the lines between them into 12 presumably perceptually equal parts which, he assumed, could be represented by corresponding weights of the pigments used as primaries. These grades were to represent perceptually noticeable differences of comparable size. The interior of the triangle is filled with colors that are mixtures of all three primaries. All of them are identified numerically, such as $r^8g^2b^2$ consisting of eight parts of the R primary and two parts each of the G and B primaries (Fig. 24.1). The 91 colors of the triangle of Fig. 24.1 can also be lightened or darkened, by addition of white or black pigments, again in twelve increments each. As these scales must end in single white or black he gave the resulting solid the form of a double triangular pyramid, with a total of 819 defined colors [3]. In his German translation of the original Latin text H. Lang defined Mayer's system as attempting to meet five then novel conditions:

1. All possible object colors are represented.
2. All colors are the result of mixtures of three primary colors.

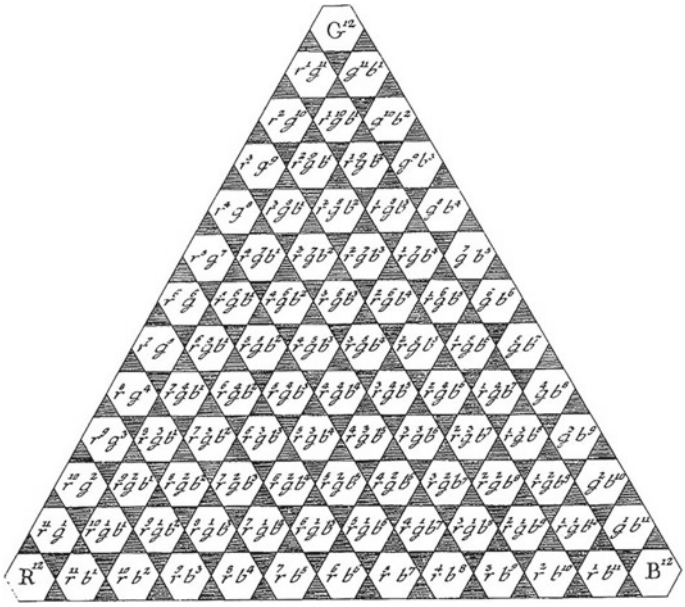

Fig. 24.1 Central plane of Mayer's double triangular pyramid color solid [3]

3. Each color is represented by a triple number indicating the content of the three primaries.
4. The totality of all colors in the system is contained in a three-dimensional color solid.
5. The differences between neighboring colors correspond to perceptual differences [4].

Mayer presented his ideas in 1758 in a public meeting of the Society of Sciences in Göttingen, a report of which was published in the newspaper *Göttingische Anzeigen von gelehrten Sachen* some three weeks later [5]. This report was the basis of J. H. Lambert's work on his triangular color pyramid [6]. Mayer had not done much experimental work to implement his system. As pointed out by Lambert, Mayer had not been aware of the varying coloristic strength of the three primaries, requiring consideration for the purpose of obtaining perceptual uniformity of the scales.

In 1958, Mayer also invented a new coloration method for prints. He proposed, and produced an example, the coloration to consist of sections of wax containing different amounts of pigments to achieve different colors [7]. Multiple prints could then be produced from the wax collage. The idea proved to be too complex to be practical and was not pursued after his death.

References

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