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July 7, 1974

Dear Rolf,

Thank you very much for the additional credit you have given me in the development of color matching as incorporated in the Historical Background enclosed with your letter of June 25.

There remain some differences of opinion which I am afraid cannot be resolved by correspondence. One is the importance of Kubelka and Munk. Contrary to your line 5 "definable" on page 1, I think it is unnecessary to have a theory to explain the relationship between the additive function of reflectance and concentration. I think color matching does not depend on Kubelka and Munk. I think they never made a color match in their life. I think they never told anyone how to do it. As evidence I point to the successful IMP system of ICI which made no use of Kubelka and Munk. I think K & M have a theory which explains the observed relation between addition function and concentration, but the explanation is entirely unnecessary to the art of color matching.

Second is the difference between quantitative analysis and color matching with different colorants in the match and target. The Pineo method and cam was designed for quantitative analysis. Pineo never told anyone how to calculate a match using different dyes. The Cyanamid laboratory was interested in finding the relation between reflectivity and colorant concentration, but Pineo's chief interest was in justifying the observed relationship. One of his early formulas was published by Adam Hilger about 1931 (I don't have the reference) in a spectrophotometer manual. He derived

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the K & M relation independently using Bessel functions and Park embarassed him by pointing out that his formula had been derived previously by K & M. This is a somewhat different picture than the one presented on the bottom of page 1.

Third, the main contribution of the P & S 1944 article was the proposal that color matching with different colorants could be carried out by 4 steps, 1) the selection of an additive function, 2) an initial approximation, 3) an evaluation of goodness of match, and 4) iteration to negligible difference. This seems simple today, but noone had thought of it at the time. In the subsequent 30 years people have tried to improve on the individual steps, and particularly the initial approximation step has been improved upon, but these four steps are the basis of all colormatching today.

Incidentally on p. 3 when you say an important step in the mid-sixties was the development of two constant color matching you are ignoring much earlier work, including my U.S.Patent 2,540,798 issued Feb 6, 1951 but applied for May 7, 1946 entitled "Color Predictor for Pigments". This used the two constant theory for an initial approximation. It is true that I did not propose an iterative method for producing a final match, so perhaps your comment is proper.

Again, thank you for permitting me to comment on your history presentation.

Yours sincerely,

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