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INTER-SOCIETY COLOR COUNCIL

NEWS LETTER NO. 7

Notice from the Secretary

A word of explanation should be made with respect to the last news item appearing in this letter, under subject of "Proposed Gloss Definitions". While this information is being inserted as a matter of interest to the Council, it should be pointed out that the sub-committee proposing these definitions would welcome, informally, through this office, any comments or criticisms from interested individuals.

At the last meeting of the Council, it was requested that the Secretary arrange to secure and distribute to the full membership, copies of the papers presented at the Color Meeting of the Technical Association of the Pulp and Paper Industry. While it will be possible to obtain reprints of these papers, the Association does not know how soon they will be available. It has been suggested that the Council wait until the annual publication of Technical Association Papers, and at that time copies of the publication may be purchased by members of the Council at the same rate that they are sold to the members of the Technical Association. Price to non-members is quoted as five dollars (\$5.00) and to members as two dollars and fifty cents (\$2.50). The Association has indicated that individuals wishing copies at this reduced rate would have to obtain them through this office. The membership will be advised as soon as reprints of the papers on color are made available.

The newly adopted Articles of Organization and Procedure have been distributed to all secretaries of member-bodies, delegates, and individual members. The Chairman has enclosed a special covering letter to all secretaries, indicating the principal points of difference from the old Articles and emphasizing the necessity for cooperation upon the part of delegates if the member-body is to derive proper benefit from participation in the Council.

This News Letter contains all of the items which this office has at present on file, and no further letter will be issued until additional items have been furnished.

M. R. P.

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Forrest L. Dimmick, Psychology Laboratory, Hobart College -

THE SELECTION OF COLOUR WORKERS. By W. O'D. Pierce, London, Pitman & Son, 1934. Pp. xii, 134.

The primary purpose is to present the results of a series of investigations in which a color test was developed to determine the degree of color sensitivity and of color training typical of and necessary to, workers in various fields where color judgments are required. The presentation is much more than a technical report, however. The introductory chapter calls attention



to the importance of color matching in industry in general, and in several industries in particular, e.g., paint, dyestuff, paper, food. It briefly analyzes the problem, discusses several methods of color measurement, and cites a number of pertinent references. In Chapter II, Charles S. Myers, principal of the British Institute of Industrial Psychology, gives a general account of the research which orients the reader in respect to the methods followed, the tests rejected and the general implications of the work. In following chapters the preparation of the test, the details of procedure, the analysis of results and their application to industry are very adequately presented so that similar tests can be set up elsewhere for practical or theoretical purposes, and comparable results obtained. The comparison of the results from the major experiments with a number of other tests is a valuable addition. In three appendices the tests are analyzed further and a brief description of several objective measurements of color is given.

This book makes a valuable contribution to the experimental literature of color testing and summarizes a considerable amount of material on the significance of color perception in industry.

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R. G. Macdonald, Secretary, Technical Association of the Pulp and Paper Industry -

THE PRINTERS ART OF COLOR and COLOR DIMENSIONS. By Faber Birren, Crimson Press, Chicago.

To all craftsmen and designers utilizing color in any medium, these two books offer an original viewpoint not to be found elsewhere in color literature. The books are so written as to answer color problems in a practical way, summarizing as they do the extensive research, experience and knowledge of this very capable author.

In The Printers Art of Color the several chapters are replete with practical ideas. Facts are given on basic color science, the language of color, the effectiveness of color in merchandising - plus simple rules of harmony and the economical use of inks for elaborate effects. It is a specialized work and is of direct value to all workers in the graphic arts.

The chapter titles will indicate the scope of the work: Using the Single Color Effectively; Using Two Colors to Get Four Color Effects; Developing the Perfect Color Scheme; Human Side of Color Appeal.

In Color Dimensions is included a history of color systems, basic color facts, traditional and modern color harmony, the Birren Color Equation and its use in color definition.

The Printers Art of Color at \$1.50 per copy and Color Dimensions at \$2.00 per copy may be obtained from the TAPPI, 122 East 42nd Street, New York.

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Color Services offered by Razek Development Laboratories, Inc., Llanerch, Pa. -

This laboratory is now presenting a service that will be made permanently available for making commercial color analyses by spectrophotometric means that will be of interest to those who do not have sufficient work of this type to justify investment in apparatus and training of personnel.

The charge for this service is as follows:

Spectrophotometric test 400 to 700 mu	\$6.00 per sample
Calculation of visual brightness	1.00 " "
Calculation of trilinear coordinates (I.C.I.)	2.50 " "

A discount of 10% is allowed on five to nine samples submitted at one time, and a discount of 20% on ten or more samples.

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M. Rea Paul, Research Laboratories, National Lead Company -

PROPOSED GLOSS DEFINITIONS. News Letter No. 4 carried, under a similar title, the intention of Sub-Committee XVIII, Committee D-1 of the American Society for Testing Materials, to engage in the development of an adequate definition to cover the term "gloss".

At a recent meeting of this sub-committee, held at Johns Hopkins University, the general opinion was expressed that the term "gloss" as used in various industries covered a multitude of phenomena which influenced the general appearance of the surface, including factors which might be placed under the general heading of texture effects along with certain psychological and physiological phenomena. For this reason, it was generally agreed that the only way to clear up the subject and to reduce certain of the factors involved to quantitative measurement would be to set up basic definitions from which to work.

The following factors were put forward as being the most important in determining the general appearance of the surface:

1. Subjective gloss.
2. Objective gloss.
3. Image reproducibility.
4. Texture effects in which the size of the imperfections are large in comparison with the wave lengths of light, such as brush marks in the case of painted surfaces.

It was agreed that the first factor should be defined in terms of the ratio of specular, plus diffused reflection, to diffuse reflection, and should be referred to merely as gloss.

*Gloss =  $(R_s + R_d)/R_d$ , hence a mirror surface possesses gloss =  $\infty$ ; the usual definition is  $R_s/(R_s + R_d)$*



$$G_{\text{loss}} = \frac{A_{(45^\circ, 45^\circ)} - A_{(45^\circ, 0)}}{A_{45,0}} = \frac{R_s - R_D}{R_D}$$

It was suggested that the second factor be defined as polish rather than objective gloss. Reflection measurements from which the gloss and the polish could be evaluated would require illumination of the surface at some specified angle (say  $45^\circ$ ), and measurement of the reflected light both at the normal and specular angles of observation. The gloss would then be obtained by subtracting the apparent reflectance when measured normal to the surface which is essentially a measure of the diffuse component from the angle which includes both specular and diffuse components, this difference being divided by the apparent reflectance measured normal to the surface. The polish would be obtained by subtracting the apparent reflectance when viewed normal to the surface from the apparent reflectance when viewed at the specular angle and dividing by the specular reflectance at the same angle of incidence of a theoretical surface of the same material having perfect polish. If the index refraction of the surface in question is known, the specular reflectance of the perfect surface can be calculated from the Fresnel equation provided the material is of the vitreous type. Because paints, paper, fabric, etc., have approximately the same refractive index as glass, a piece of polished black glass could be used as a practical working standard. The reflection measurements are influenced by the source at the surface being measured. This angle should be specified or parallel light used.

It was felt that the property of image reproducibility could best be measured in terms of ability of the surface to resolve the images of two parallel slits or wires. It was suggested that this might be accomplished by observing the specular images of two small wires set closely together and varying the angle of incidence until the two images could be recognized as distinctly separate. The angle of incidence needed to resolve the images would then be taken as a measure of the image reproducibility of the surface.

It was realized that definitions based on those three factors would by no means include all phenomena at present associated under the general term "gloss". It was felt, however, that definitions based on these factors would serve as a starting point toward separating the various factors and classifying the different phenomena which are now grouped under the general term "gloss". It was believed that the only feasible method of attacking this general problem was to separate the various factors and evaluate them separately, rather than to try and devise some sort of composite evaluation, since the factors will be weighed differently by each observer depending upon the particular surface characteristic he is attempting to evaluate.

With this viewpoint in mind, the following tentative definitions were prepared by the sub-committee. The definitions as presented are not as specific as they would have to be in the event that they are generally accepted. It was felt, however, that they are sufficiently specific to define the general opinions of the group proposing them.

1. Gloss - Gloss shall be expressed as the ratio of the sum of the specular and diffuse reflections to the diffuse reflection only. The sample is illuminated at a  $45^\circ$  angle of incidence. The diffuse reflection is measured



normal to the surface. A measurement of the apparent reflectance at the specular angle yields the sum of the diffuse and specular reflecting powers. If the illumination is not parallel light, the solid angle subtended by the source at the surface of the sample should be specified.

2. Polish - Polish is defined as the ratio of light reflected specularly from the material in question at a stated angle of incidence, to the intensity of light reflecting specularly from a perfect polished surface of the same material at the same angle of incidence. The angle of incidence chosen will depend upon the degree of polish of the surfaces being compared. Surfaces having a low degree of polish should be measured near grazing incidence, those having intermediate polish, at 45° angle, while those of extremely high polish should be measured in the neighborhood of normal incidence. In the case of vitreous materials, such as paint, paper, fabrics, etc., an optical polish surface of black glass can be used as a suitable working standard. Metallic surfaces may be compared against a mutually agreed upon highly polished surface of the same metal as under question.

3. Image Reproducibility - Image reproducibility is defined as the angle of incidence at which the specular images of two parallel wires, .3 mm. in diameter and .3 mm. apart, are just resolved as two distinct images, the wires being illuminated by a diffusing background.

It is now the desire of this sub-committee that the tentative definitions given above be submitted for comment to interested individuals, in order that some idea may be obtained as to whether those primarily concerned with this subject feel that the tentative definitions set up by this sub-committee are really safe as fundamental definitions from which to attack the problem of ultimately creating a standard method for the determination of that characteristic generally termed as gloss.

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All notices, abstracts, and requests for further information regarding any of the items appealing in this letter, should be addressed to M. Rea Paul, 105 York Street, Brooklyn, New York.

April 9, 1935.