INTER-SOCIETY COLOR COUNCIL

NEWS LETTER NO. 106

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NEW DEADLINE At a meeting of the Executive Committee held in New York in March, it was decided to make the deadline for receipt of material for the News Letters the first day of the current month of the News Letter issue. Further, the Editors were instructed to "hew to the line, letting the quips fall where they may." More exactly, perhaps we meant "gripes", but we said "quips" because we felt sure that none of our members wanted to help our chief editor to his third hospital stay (and worry over meeting the deadline was surely a factor in the previous cases). In other words, orders were to be adamant; so please note, secretaries of affiliates especially.

NEW MEMBER-BODY The twentieth Member-Body of the Council, accepted recently as such by vote of the Executive Committee, is the Tanners' Council of America. The Secretary of the Tanners' Council is Mr. Leif C. Kronen, 411 Fifth Avenue, New York, N. Y. Mrs. Helen D. Taylor, color consultant who has long been a member and contributor to the News Letter, is Director of the Color Bureau of the Tanners' Council. The following information is from a recent letter to ISCC Secretary Evans from Mrs. Taylor.

"The Tanners' Council of America is a non-profit organization serving all of the tanners in America. The Council issues standard leather colors seasonally, conducts many color meetings, works on color problems from tannery to retail outlet. We cooperate closely with the National Shoe Manufacturers and the National Shoe Retailers in forecasting colors for their seasonal needs."

NEW MEMBERS At the meeting of the ISCC Executive Committee held on 17 March 1953, the following were approved for membership as Individual Members.

Toshio Kimura, Ibaraki University, Watari-Mura, Higashi-Ibaraki-Gun, Ibaraki-Ken, Japan. Particular Interests: Color conditioning of schools, hospitals, factories, etc.; Synaesthesia of color perception; Internal relation between color and emotion; Character analysis through color. Member of: The Japanese Psychological Association; The Japanese Applied Psychological Association.

Royal C. Marshall, 2032 Beaufait Drive, Grosse Pte. Woods 36, Mich. Particular Interests: Color developments; Terms; Control; Nomenclature; Papers; Meetings; Usages; Lighting; Physical aspects; Psycological; Optics; etc.

Lucile H. Phillips, El Rancho Hotel, Fresno, California. Particular Interests: Color combinations in interior decorating.

Raymond J. Sobatzki, Rohm & Haas Co., Lennig Plant, 500 Richmond Street, Philadelphia 37, Pa. Particular Interests: Primarily interested in specifications, measurement methods; and quality control of products involving appearance and use of dyes and pigments in achieving desired color effects. Member of: American Chemical Society; American Society for Quality Control; American Society for Testing Materials, (Comm. Member, E-12).

THE COLORISTS OF WASHINGTON AND BALTIMORE

This affiliate of the ISCC met at 8 P. M. on March 30 at the Textile Museum, Washington, to see its magnificent collection of rugs and textiles and to learn something of their history, classification and production. The visit to the Museum was preceded by dinner at 6:30 at the Istanbul Restaurant and by a talk by Miss Louisa Bellinger, Curator-analyst of the Museum, her subject being "color as Used by the Early Handweavers before the Mechanical Age."

COLOUR COUNCIL OF TORONTO

This active affiliate of the ISCC was scheduled to meet on April 13 for a dinner meeting at Prince Arthur House, Toronto. The speaker of the evening was to be Mrs. Eleanor Brown, lecturer and chief of Staff training of the Interior Decorating Department of the Robert Simpson Co., Ltd. Her subject: "Colour and the Interior Decorator."

The group was scheduled to meet also on May 11th with a dinner meeting at the same place. The speaker of the evening, Miss May Waterworth, is also of the staff of the Robt. Simpson Company. She has recently returned from a visit to Spain, and her subject was announced as "Colourful Spain."

PHYSICAL SOCIETY COLOUR GROUP

The Thirteenth Annual Meeting of the Group was held on 25 March 1953 at 3:15 p.m. in the Physics Department, Imperial College, Imperial Institute Road, London S.W. 7. The report of the Committee for 1952-53 reported that at six Science Meetings (Nos. 66-71) the average attendance was 57 members and visitors. Also that membership had grown at year-end from 219 members in 1951 to 239 in 1952. As Chairman of the group, Dr. T. Vickerstaff was replaced for 1953-54 by Dr. L. C. Thompson. Mr. R. W. G. Hunt, recently guest of the ISCC, succeeded himself as Secretary.

The speaker of the day at the Seventy-second Science Meeting on 25 March was retiring Chairman Vickerstaff, noted physical chemist, colorist and author, whose subject was "Colour Problems in the Dyeing Industry." The following abstract of his address was copied from the notice of the meeting.

"Summary. Various colour problems encountered in dyeing will be discussed including the following:- The specification of the colour changes produced in dyeings by washing or light exposure and the use of a grey scale to render visual judgments less subjective. The rate of fading of dyes as measured by the Adam's colour difference formula and some anomalies. The effect of the background colour on the colour of white discharge spots in printing. Problems of visual colour matching

including observer anomalies, levels of illumination for colour matching and the small size of the colour differences accepted as a satisfactory match. The difficulty of measuring such small colour differences objectively. Uses of the recording spectrophotometer for dye standardization and the need for an integrator. The Librascope integrator and the I.C.I. Photoelectric, 100-Ordinate Integrator. Dyeing recipe prediction, past, present and future."

COLORIMETRY OF FLUORESCENT MATERIALS

The two major problems which face the investigator desiring to measure the color of fluorescent materials are: first, the establishment of a proper light source, and second, the decision as to a suitable apparatus for making the measurement. These facts were apparent at the meeting of the ISCC Subcommittee on Problem 13, the Colorimetry of Fluorescent Materials, which occurred at the Hotel Statler, New York, on March 19, 1953.

The measurement of the color of fluorescent materials is complicated by the fact that the sample, when exposed to light of a certain wavelength, does not only reflect light of the same wavelength, as is ordinarily the case with non-fluorescent materials. On the contrary, each incident wavelength excites a fluorescent light which ranges over a good portion of the spectrum. Furthermore, ultraviolet light as well as visual light is of importance in exciting fluorescence. These facts explain why the problems of fluorescent colorimetry differ from those of ordinary colorimetry.

The main problem in getting a good light source is to determine the spectral composition of daylight both in the UV and visual, and then to decide how to match this artificially. Once the spectral composition is determined, matching it artificially will not be an easy job. One suggestion for matching the UV part was to design a suitable liquid filter for incandescent-lamp light so that the transmitted energy would match the emission curve of the sky in the UV. Another problem relating to the light source is that industrial city daylight may differ considerably from country daylight, since it has been found that the quality of daylight depends to a large extent on the reflectance characteristics of the earth's surface. For example, snow, grass, and asphalt each will give rise to daylight of different spectral distribution. Furthermore, daylight is not the only light of interest in viewing fluorescent materials; certain types of artificial light are in wide use in billboard advertising, for example. Therefore, it may be necessary to designate several standard light sources as is done in ordinary colorimetry where CIE sources A,B and C are used.

There are two possible approaches to the problem of a suitable apparatus for the color measurement. These are, first, to attempt to separate the fluoresced light and the reflected light, and second, not to worry about the differentiation of the two forms of light but simply to take the color as it comes. If the former alternative is chosen, one may use an instrument with two monochromators: one to disperse the incident light, and the second to analyze the emitted light. If we are not interested in differentiating between the two forms of light, a more conventional type of measuring instrument may be used.

The members of the committee received samples kindly furnished by Dr. J. W. Libby and Mr. R. A. Ward, and will work on these in the interim until the next meeting. It is hoped that this work will help in clarifying some of the problems which were raised in the discussion. The next meeting of this committee will be held in Rochester in the fall.

E. Allen

INTERNATIONAL DESIGN CONFERENCE

We have received announcement of the third annual International Design Conference to be held on June 21-28, 1953, at Aspen, Colorado, under the auspices of the Aspen Institute for Humanistic Studies, 45 East 51st Street, New York 22, N. Y. The theme of the conference is "Design, a Function of Management." Aspen is an interesting spot high in the Rockies where a series of conferences has been held to provide cultural stimulation and physical relaxation in an informal, pleasant atmosphere. Leo Lionni, art director of Fortune was elected to serve as 1953 chairman. Principal speakers are Max Brill, director of the new German Bauhaus; Wallace Harrison, architect; Gyorgy Kepes, professor, M.I.T.; and Nikolaus Pevsner, editor of the British Architectural Review. Names of those interested, with registration fee of $35, should be paid to Aspen Institute, Aspen, Colo.

COLOR VIGNETTE NO. 17

After a surgeon cuts into or around the body of a patient, it is usually expected that, the operation completed, the severed parts are reunited. There are more than one hundred different sutures for this tailoring job. But surgical threads also come in different colors to give better contrast depending upon the organs being sewed; black for the eyes, blue for the skin or yellow for the intestine.

I.A.B.

A ROSE BY ANY OTHER NAME

Through the courtesy of Alex E. Javitz, Special Features Editor of Electrical Engineering, we received a brief article of this title written by Mr. Javitz for the "Research Horizons" section of the May issue of that magazine, and reproduce it here.

What's in a color designation? To an engineer it means the identification of a specific color in terms of, say, Munsell notations, I.C.I. spectrophotometric values, Ostwald notations, or other color systems (EM 10-50/104). To sales promotion people it may mean the use of a color name that may have a merchandising appeal to the ultimate consumer. In the field of electrically energized products, this factor would have particular cogency in the domestic and commercial appliances.

A current research project, now nearing completion at the National Bureau of Standards, will provide a voluminous report on color names, synonyms, and near synonyms. As summarized at the 22nd Annual Meeting of the Inter-Society Color Council in New York on March 18, it will list all names that relate to any specific color and will identify the color in terms of color-system notations. The report will most likely be published as a National Bureau of Standards circular.

DEATH OF DR. EDRIDGE-GREEN

Through the courtesy of Dr. David MacAdam we received a clipping from the Sunday New York Herald-Tribune of April 19, which recorded the passing of Dr. Frederich William Edridge-Green, outstanding British expert on color vision, who died at the advanced age of eighty-nine. Besides his many publications, Dr. Edridge-Green was known also for devising the tests by which recruits to the British Army and Navy are examined for color perception.

DR. DIMMICK AT OXFORD

We understand that Dr. Forrest L. Dimmick, co-chairman (with Carl E. Foss) of the ISCC Color-Aptitude Test Committee, went to England to demonstrate and lecture on the C.A.T. at Oxford University. We hope to have a report of his visit direct from him in a subsequent issue.

LETTER FROM OSTWALD'S DAUGHTER

Through the courtesy of Walter C. Granville, Assistant Director, Department of Design, and Egbert Jacobson, Art Director, of Container Corporation of America (and author of "Basic Color"), we received a letter to Mr. Jacobson from Grete Ostwald which we copy here. Miss Ostwald is the daughter of Wilhelm Ostwald, father of the science of physical chemistry and noted for his many books on color, as well as the Ostwald Color System, which the Container Corporation put into modern form as its Color Harmony Manual. A postal card from Grete Ostwald to Mr. Jacobson states that Dr. Judd's book has safely arrived for which "Hurrah and a thousand thanks." Her letter, dated 31 March, 1953, follows.

"My Dear Mr. Jacobson:

Thank you very much for your letter of March 4. and the bulletins. The book by Dr. Judd which of course would highly interest me and my brother has not yet reached me. I would be very sorry when it happened to get lost. But a little hope there still is. (Ed. Note: A postcard states that the book arrived a few days later.)

Yes I will no longer delay my answer, especially as I can tell relatively good news. Since years I did not come so well through a winter, and this one was very long and snowy. Apparently I thoroughly recovered from the exhaustion caused by my book.

This will be published in time for the 100 birthday, 2.9.53. The first publisher I asked in last autumn consented, a very pleasant surprise. It is Berliner Union G.m.b.H. in Stuttgart-N., Hospitobetr. (?) 12, a well known editor in the west zone. I am awfully happy to have this birthday-present! Perhaps it will be possible to have one of the Hans Hinberriber (?) color-compositions printed in the book, or one of my father's gray-harmonies, as a veritable token of the future. But probably that would dangerously raise the already high price of the book. Maybe that that impossible frontier between Germany and Germany is becoming a hindrance to my fee; of course that is secondary. Most important remains that the book will be published at all.-

The archives as well as myself have now come into the interest of eastern and western academies, societies and universities, and several memorial-celebrations are in preparation. My correspondence has swollen considerably. There even is some hope for a financial relief for my last years. But quite used to struggle alone, I don't cultivate illusions.

Fats and textiles again are very scarce. As long as western friends are allowed to send small quantities I have all I want. Thus don't be disquieted.

With gay laughter I met in your bulletins my postcard to our family-friend Dr. Martin Fischer, Cincinnati. As someone cautiously had corrected the certainly rather autocratic G. O. English, it was the first lesson again in that language I had for almost half a century. Yet all of you over there prefer my English to my German, as you say.

The color harmony manual is an attraction, sometimes a sensation, so the visitors I never fail to show. This summer and autumn there will be more visitors than usual. And your book Basic Color I have difficulty to keep with me; so many wish to take it home for some weeks.

Trusting you and your wife are in good health and strongly greeting all color workers, investigators and organisators.

I am very sincerely yours,

Grete Ostwald

P.M. My angora he-cat Ingo helps me prepare for the coming year of unmerited honors, being a prototype of dignity and calmness. We love each other very much."

PERKIN CENTENNIAL OF THE AATCC

The following notice was received from Dr. Edwin I. Stearns, ISCC Chairman, with a letter of April 22, 1953. "At the meeting of the Executive Council of the AATCC in New York on April 17, 1953, the following resolution was passed: that the AATCC sponsor a Perkin Centennial to honor the discovery of the first synthetic dye by Sir William H. Perkin, this centennial to be held at the Waldorf Astoria Hotel in New York the week of September 10, 1956, this centennial to be in the form of a comprehensive program which will include the annual convention of the AATCC and cooperation of other professional organizations, this centennial to be conducted by an Executive Committee composed of members of the AATCC and by subcommittees made up of AATCC members or of AATCC members and representatives of cooperating organizations. The American Section of the Society of Chemical Industry is to be invited to have this presentation of the Perkin medal be made as a part of the Perkin Centennial."

MORE ON PURPLE

On two or three occasions we have carried notes on the history of the word purple and of purple pigments and dyes. Our attention was called to another article on purple by Professor Gaertner of Lafayette College. This was on page 1 of the 1953 Latinitas, the magazine issued by the Vatican. The author was Josephus Del Ton; the title, De Vario Purpurae. In addition to calling attention to the fact, which we have already mentioned, that there were crimson and more violet purples from different ancient sources, and the connection of purple with royalty (and the ecclesiastical connections of red), the article pointed out many connections of purple with emotion, agitation and virility. We recommend a reading of the article to anyone familiar with Latin.

COLORS OF ANCIENT GREEKS

We had long thought that the controversy which raged in the time of the statesman Gladstone had been pretty well settled in favor of his opponents. But we learn from a monograph by F. Hiebel, "The Gospel of Hellas" (1949), that there are still those who believe that the meagerness of Greek color terminology was due to defective color vision. Wm. E. Gladstone claimed that the Greeks saw only white (leukos), black (melas), yellow (zanthos), red (erythros), purple (porphyrios) and indigo (kyaneos). In this connection the excellent monograph of Sigmund Skard, "The Use of Color in Literature" (The American Philosophical Society, Independence Square, Philadelphia 6), should be consulted. According to Skard, "In all decisive points the struggle has long ago been decided in Gladstone's disfavor." Gladstone had tried to prove the poet Homer's meager color vocabulary was due to color blindness. Long before him (in 1557) Scaligee pointed to a puzzling vagueness of the color terms in ancient writers. Aristotle and Xenophanes described the rainbow as: purple (porphyreos), red (phoinikos) and green (chloros); and the question was raised whether the Greeks did not perceive a pure blue and a pure yellow. W. Schultz (1904) thought the Greeks blue-yellow blind. The word for light(?) blue is aeroeides.

Ochron means ocher-colored, originally colorless. Chloros referred to the color of leaves, honey and resin, so was probably a green-yellow or olive (dark yellow), not pure green. Temples were painted with red and with blue (laxourion, which is the pigment lapis lazuli, or natural ultramarine). Pliny called the latter "sapphire, an ultramarine-azure shade." But lazourion was not distinguished from black; and blues and blacks more generally were not distinguished. Homer often spoke of the blue hair of Agamemnon, meaning what we would now call black hair. To him the wine-red ocean was the blue water of the Agean Sea. Therefore some persons thought that the Greeks saw blue either as black, or as purple or wine-red. Counterblows against the Gladstone theories were delivered by Grant Allen (1879) and by Miss F. E. Wallace, who started out to prove them but ending by saying that "The physiological color sense of the Greeks perhaps was higher developed than ours."

GONE THE CRYSTAL BALL

Through the courtesy of ISCC Chairman Stearns we received copy of an address on Color in Market Research by George W. Ingle, which is so packed with information and ideas that it is difficult to abstract in the space available. Mr. Ingle is Group Leader in the Color Research Group of the Plastics Division, Monsanto Chemical Company. His address was delivered on December 11, 1952, before the Chemical Market Research Association in Chicago. The complexity of the problem is introduced by estimating that even if we do not mix transparent, translucent and opaque media in plastics, we could produce a billion discriminable colors. This number is enormously reduced by the effect of consumer color preference. The Color Names Dictionary of the Container Corporation of America lists 1200 commercially acceptable colors. The lecturer chose the history of styrene molding powders as an example to illustrate the commercial factors which determine the production and sale of colored plastics. The Plastic Materials Manufacturers' Association specified eighteen colors as standard. These are all sold at one price per pound. For Matches of "non-standard" colors, the price rises rapidly as the order size decreases from the 20,000 pound level. This standardization assisted in nearly a fourfold growth of styrene molding powder volume between 1946 and 1952. But such standardization implies that consumers' color preferences are static; and the objection has been raised that actually they are dynamic. In 1949, red and ivory accounted for one-third the total volume, and four other colors for another third. But will they remain as such leaders?

Today gray, not even included in previous standards, ranks fourth or fifth, similarly chartreuse and coral, which rank high. Other shifts include gains for yellow, white, maroon and medium blue, losses for baby blue, pink, black and transparent red. These shifts seem to be cyclic; and require careful statistical study to understand them thoroughly. In considering the costs of new standards, it is estimated that one match in four may bring in new business; and one has to remember that special colors drain personnel and knowhow, useful elsewhere in improving output and quality. Two methods of controlling the costs of introducing new colors were explained, however, by the speaker. He next went on to discuss the necessity for color research and to explain how color styling operates. One must consider even such factors as distribution of sunlight hours over the United States. As an example, preferences for average home furnishings are listed: green, gray, red and lime are high today; white, blue turquoise and purple unpopular. But it can be predicted that blue will make a comeback, because all color-preference studies have shown its dominating position. These mass-market preferences are said to originate in the high-fashion markets. Sales acceptance screens the colors offered there. In the housewares market red, yellow, chartreuse, gray and coral are most popular, blue currently low. A study of high-fashion trends in clothing and home furnishing may show what to expect ultimately in the mass market.

A brief paragraph deals with consumer preference in food packaging. Here orangy reds and oranges are highly appetizing and desirable, yellow-oranges less so. Other acceptability peaks lie at yellow and green; but blue-green, violet and red-violet are low, with yellow-green at the bottom. Blue, which has few direct associations with things to eat, provides an excellent foil or background. In the packaging field generally it has been recently confirmed that perception of contour and discrimination of detail of merchandise is best achieved by using distinguishing colors. New was the conclusion that harmonizing colors, rather than complementary contrasts, and certainly not black and white, are most effective in creating the desire for possession. The psychologists explain this by saying that, since harmony is the esthetic measure of satisfaction and pleasure, it is the stimulant which causes these emotions and initiates the desire to obtain their source.

The lecturer concluded his stimulating address by urging resort to continually improved statistical studies of consumer's purchasing performance, taking into account the several determining factors which he listed.

COLOR MEASUREMENTS OF COTTON

We have received a 38-page monograph of this title, by Dorothy Nickerson, which is the second report on the application of the Nickerson-Hunter Cotton Colorimeter. The first (preliminary) report was published by the U.S. Department of Agriculture in April, 1950. Color is an important aspect of cotton grading for quality. The 1950 report announced the development of the newly developed automatic colorimeter and described some of its applications and limitations. The present report goes into more detail regarding factors considered in preparing grade standards, color change that may be expected in storage of cotton, and the degree of color variation existing in bales selected to be as uniform as possible. The history of cotton standards and related problems are also discussed.

The instrument, developed in cooperation with R. S. Hunter of the Henry A. Gardner Laboratory, is well known to many of our members. It is electronic, self-standardizing and automatically indicating. The operation is so automatic that it is not necessary to be expert in colorimetry to operate and apply the instrument adequately. It is designed for use in the classing room. In the present report, Miss Nickerson gives many tables and graphs of data obtained in practical cotton grading, along with pertinent discussion of the problems involved. A reading of this report will repay many even who are not directly interested in color grading of the various types of cotton.

I.H.G.

FALL 1953 GLOVE COLORS

An April 10th release by Mrs. Margaret Hayden Rorke, Managing Director of the Textile Color Card Association of the U.S., announces 13 new colors for women's gloves. Rich color notes in the turquoise, coral and golden oranges are represented by Scarab Blue, Coral Glint and Porcelain Yellow. Also featured are favored shades in the fashionable pink to red range, namely: First Lady Pink, recently described in the News Letter, Red Chianti (a garnet red), and Fire Red. A creamy beige is Champagne Sec; a neutral is Greysmoke. Paris Moss and Irish Green are yellowish greens. Completing the list are Twilight Beige, Regal Purple and Copper Lacquer, while black, brown, navy, white and chamois are also recommended.

COLOR PREFERENCE AND HARMONY

Through the courtesy of Mrs. Blanche Bellamy, we have received reprint of one of the most interesting articles in this field we have ever been fortunate enough to read,

especially since it is apparently based upon sound experimental techniques. This article, whose title is "Objectivity of Colour Preferences," was by Dr. G. W. Granger of the Psychology Department, Institute of Psychiatry, Maudsley Hospital, London, S.E.5. It was reprinted from Nature 170, page 778 (Nov. 8, 1952). The paper is only a general summary, for it is stated that detailed accounts of the individual experiments will be published elsewhere, though the reference is not given.

The author starts out by calling attention to three very different points of view concerning preferences for individual colors and their combinations. The first of these, which the author calls the "subjective" viewpoint, and with which the names on von Allesch and Chandler are prominently connected, is that color preferences are entirely a matter of personal taste, depending on individual associations and other subjective factors. Numerous experimental studies apparently support this view. But Dr. Granger states emphatically that the conclusions of von Allesch, Chandler and others were not warranted by their own data, being arrived at on the basis of inadequate statistical procedures. The second point of view is that of some Gestalt psychologists and estheticians who declare the whole realm of color esthetics to be beyond analysis by the ordinary atomistic and dimensional methods of science. But, to anticipate somewhat, Granger's evidence "seems overwhelmingly in favour of objective and fairly atomistic hypotheses", which is the third point of view, confirmed in this country by Guilford's work. The conclusions in this direction will be elaborated below.

The first part of the experimental work dealt with preferences for individual colors. Sixty sets of standard Munsell colors, well distributed in the color solid along its three dimensions, hue, lightness and saturation, were arranged within each set in order of preference by 50 observers (half men, half women). The background was a neutral (Munsell) mid-gray; the illumination Macbeth daylight (6500°K). All observers were of normal color vision, as assured by three test methods. Statistical analyses of subjects' rankings for each set showed clearly that "the subjects were not independent in their preferences; on the contrary, they showed a remarkable degree of concordance". Further, the general order of preference for any one attribute of color ("which remained invariant at different levels of the color solid") was dependent on stimulus properties in the following ways: (1) hues of shorter wave-length (cool hues) tended to be preferred to those of longer wave-length (warm hues); (2) the more saturated colors were preferred to the grayer ones; (3) the colors which contrasted least in lightness with the background were ranked higher than colors showing maximum lightness contrast; and (4) there were no marked differences in the preferences of men and women.

In the next experiment, 20 subjects studied four sets of color combinations. Three of the sets represented variation along each of the "dimensions" of color; for these three sets background and illuminant were as before. Again there was excellent agreement, with preference appearing to depend on objective stimulus properties. Thus, preference tended (1) to increase with increasing "hue distance" between the component hues of combinations, (2) to decrease with increasing lightness, and (3) to decrease with increasing saturation. There was almost perfect correlation between preference and magnitude of hue interval between component colors. In item (2), Granger's and Guilford's data are not in agreement (see ISCC News Letter No. 25, p. 6 (June, 1939)).

The fourth set of experiments in this group were done with "fully saturated" hues on a black background, repeating and confirming work reported by Clarkson, Davies

and Vickerstaff of the Imperial Chemical Industries Dyestuffs Division in 1950 ("Colour", p. 81).

The results of the last paragraph referred to the case where one component of a given series remained constant while the other varied. Dr. Granger next went on to the more complex case where the component colors were both varied throughout a given series. Moon and Spencer, on the basis of a classification of harmonies and the work of Birkhoff on "esthetic measure" (1933), set up a formula which claimed to predict preferences at the more complex level. Formulas due to Guilford and to Clarkson, Davies and Vickerstaff were not mentioned by Granger; but the latter workers themselves very sensibly did not claim too much for their formula. Granger found experimentally that the predictive value of the Moon and Spencer formula is negligible. The reason for this failure, says Granger, is that it "leans too heavily on deductive procedures which fail to take into account results of experimental research in aesthetics." For criticisms of Moon and Spencer's work by Professor Arthur Pope see ISCC News Letter No. 58, p. 11 (March, 1945); and for criticisms of their experimental work by the present reviewer see News Letters Nos. 53, (May, 1944) and 54, (July, 1944). Clarkson, Davies and Vickerstaff also criticise the vagueness of Moon and Spencer's report of their experimental work. Granger states that he has found a simpler formula, "derived not from assumed higher principles but from the results of previous experimental work on 'hedonic summation' and colour harmony," which accounts for 70 per cent of the variance in preferences without taking into account the lack of perfect reliability in the observer's preference judgments. The new formula, "conceived along frankly atomistic lines", depends on two sets of factors: (1) preference for the component colors, plus (2) a rational term concerning the combination as such, - in C. Spearman's words, upon "fundaments" and the "relation" between them. Clarkson et al expressed the summation of the factors by the general equation $V_c = V_1 + V_2 + V_{12}$ where V_c is the esthetic value of the combination, V_1 and V_2 the esthetic values of the separate components, and V_{12} is the esthetic value which may be attributed to the juxtaposition of the two colors. L. R. Geissler (1917) claimed that V_{12} in this equation is zero; others (as Kirschmann, 1900 and M. F. Washburn (1921) went not so far, but recognized the importance of the factors V_1 and V_2.

Dr. Granger turned next to the effects of background and of area. Several different chromatic and achromatic backgrounds were used. It was found possible not only to predict <u>when</u> a significant change in preference would occur, but also, to some extent, the direction it would take, on the basis of the earlier results here reviewed. The effect of area is generally recognized by estheticians and by practicing artists, who often claim even that ". . . . the choice of quantity is more important than the choice of colour" (see J. Littlejohns, J. Roy. Soc. Arts 81, 592; 1933). Washburn studied the effect of area so early as 1911. In the general practice of artists a small area of highly saturated color is balanced by larger areas of grayer colors; and the principle is sometimes extended to lightness, balancing the "darks" against the "lights". A. H. Munsell and his followers sometimes used a rule which might be expressed as making the triple product of area, Munsell value and chroma constant for each component color (or area times the "power" constant). Moon and Spencer claimed that a pleasing balance is obtained when the product of each area and its distance from the "adaptation point" in a special color space (defined by them) is the same. In passing, it may be mentioned that Moon and Spencer, in spite of Washburn and Munsell (and in spite of his own studies varying area communicated to Moon and Spencer by the reviewer), claimed to have been the first to take into account the effect of area. Granger's observers, adjusting areas of two colors to give the most pleasing balance in the pair, found

that the Munsell formula accounted for 40 percent of the total variance, a reasonably satisfactory result. Moon and Spencer's formula gave "very small and insignificant correlations" between observed and predicted preferences.

Finally, Granger assigned "scores" to his observers in accordance with the correlation of their individual preferences to the general order of preference of all observers. This procedure has previously been validated by H. J. Eysenck (1940) and others. These scores were then compared with scores on the Maitland Graves test of design judgment, which involves the ranking of black-and-white designs only. Scores on preferences for single colors and especially for color combinations, correlated very well with scores on the achromatic design test. Granger states the main conclusion from his experiments as follows: color preferences are objective in the sense that (a) they are to a considerable extent independent of personal taste, and (b) are dependent to some degree on inherent stimulus properties. There is no justification for an extreme subjectivist or an extreme Gestalt point of view. This suggests that preferences "rest on a firm biological foundation in the perceptual equipment of the individual." This view gains support from the re-analyses made by Eysenck (1941) and later by Granger, with new statistical tecnhiques, of the older preference data." The evidence everywhere indicates a substantial measure of agreement.

The reviewer will await with great interest the full publication of Dr. Granger's experimental work, for it will be remembered that the presently reviewed paper is only intended as a summary article. He will impatiently await also the statement of the Granger rule for prediction of preference for color combinations. The author alludes to the broader biological and psychological significance of his experimental conclusions; and in this broader field the reviewer hopes that the author or others with some temerity may branch out a little into the realm of speculation. For example, the reviewer recently discussed with ISCC Secretary Evans, who is noted for his lectures on the "expressiveness" of colors, a possible more fundamental basis for the dislike of "ambiguity" in the hue interval between component colors of a combination, as this term has been used by two or three authors. The ambiguous hue intervals are those which lie between the intervals of contrasting and similar hues. Having in mind certain ideas of F. Ian G. Rawlins reviewed in News Letter No. 33, page 10 (Jan., 1941), which may have gone too far in a special sense, the reviewer expressed wonder whether dislike of ambiguity may be due in turn to a more fundamental dislike of mental effort. In some cases at least, it requires expenditure of effort to decide whether two hues are similar (and naturally so or intended to be so), or whether they are contrasting or complementary. To go deeper into the realm of speculation, Granger's finding, that colors contrasting least with the background are the preferred ones, may also be an example. For it is well known that our sensitivity to color differences, is at a maximum where the differing colors contrast least with the background. When contrast is greater, sensitivity is less, hence mental effort greater. Complexity, by requiring mental effort may give a negative value to Clarkson's term V_{12}, while any element which satisfies a sense of order should be positive. Birkhoff put order in the numerator of his equation for esthetic merit, complexity in the denominator. Variety, the "spice of life" (and design), is of course a positive element.

Previous discussions of color harmony may be found by interested persons in the following News Letters: No. 16 (Jan., 1937), pp. 22-4; No. 25 (June, 1939), 6; No. 33 (Jan., 1941), 10-11; No. 36 (July, 1941), 2-3; No. 49 (Sept., 1943), 8; No. 53 (May, 1944), 5-9; No. 54 (July, 1944), 6-9; No. 58 (March, 1945), 11-14; No. 61 (Sept., 1945), 5-7 and 74 (Jan., 1948), 6-10. The reviewer's experimental results, which agree with Dr. Granger's at most points, may be found in the May, 1944, issue just cited.

I.H.G

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