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# INTER-SOCIETY COLOR COUNCIL

## NEWS LETTER NO. 61

SEPTEMBER, 1945

News Letter Committee:

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NOMINATIONS The following list of nominations for officers and counsellors to serve in 1945-7 has been submitted to the Executive Committee. In accord with the Articles of Organization and Procedure the election will be held in November. Ballots will be mailed to voting delegates on October 31, and will be counted at a meeting of the Executive Committee to be held on November 30.

| | |
|---|---|
| For chairman: | Ralph Evans (SMPE) |
| For vice-chairman: | I. H. Godlove (AATCC, OSA) |
| For secretary: | Dorothy Nickerson (OSA, IM) |
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| " " : | Wm. F. Little (IES) |

This notice in the September 1945 News Letter is made 30 days prior to the mailing of ballots to voting delegates in order to provide ample time for receipt of additional nominations in accord with Article V, Section 5, of the Articles of Organization and Procedure:

> "Additional nominations may be made at the request of 10 accredited delegates, individual members, and/or sustaining members, provided they are forwarded to the secretary within 20 days after notices of nominations are sent out."

CORRECTION In the last issue there was a typographical error. Correcting this, we note that M. R. Boyer (not Bayer) is one of the new and added delegates to the Inter-Society Color Council from the Society of Motion Picture Engineers.

PHYSICS BUILDING FUND Large numbers of small contributions to the Physics Building Fund would show support by the great bulk of workers in fields related to this science. As color workers we all owe a debt to the science of physics. For that reason we urge each of you who may not have contributed already to this fund to read the enclosed message, reproduced at our request from the July 1945 issue of the Journal of the Optical Society of America, and thereafter -- before you have time to forget -- to sit down and forward a contribution, no matter how small. Not all of us can afford much in dollars; but there is strength in numbers. We would like very much to see the color workers well represented.

WASHINGTON AND BALTIMORE COLORISTS MEET

The Colorists of Washington and Baltimore opened their 13th season with an unusual and interesting meeting on pyrotechnics held on Monday evening, September 10, at the Naval Ordnance Laboratory Annex, White Oak, Maryland. Ensign J. A. Young, who specializes in color in pyrotechnics, talked to the group and demonstrated some of the work being done in the development and application of pyrotechnics in modern warfare, firing samples of modern types of flares and signals, and calling particular attention to the color. A special tri-stimulus colorimeter had been constructed for research and production control in this field.

The program committee has planned a full program for the coming season, with bimonthly dinner meetings to be held on December 3, January 14, March 11 and May 13. The committee consists of K. L. Kelly, chairman; S. W. Boggs, Waldron Faulkner, F. E. Wright and J. A. Young.

NEWS FROM SERVICE MEMBERS

In July we heard from WAC Lt. Isobel Moore. Lt. Moore is now stationed at Madizon Convalescent Hospital, Fort Lewis, Washington, as head of the Art Department. From former Corporal Harry H. Scheid we hear that he is home again, out of the army, and now established in New York at 56 East 53rd Street as Consultant Color Engineer. Good luck to you, Civilian Scheid!

WALTER GRANVILLE MOVES TO CHICAGO

Walter C. Granville, who started work in Chicago with Philip Ruxton, Inc., in 1929, is about to return there after eight years in New York with the Interchemical Corporation Research Laboratories. He leaves Interchemical to go with the Container Corporation of America where he will work in close association with Egbert Jacobson on the application and further development of the Ostwald principles of color order.

As members of the Council know, Egbert Jacobson is author of The Color Harmony Manual. At the time of its publication Walter Granville was associated with him in the measurement and specification of the color chips which appear in the charts of this manual. As part of the Symposium on the Ostwald Color System at the March, 1944, meeting of the Optical Society of America, Granville and Jacobson reported on Colorimetric Specification of the Color Harmony Manual from Spectrophotometric Measurements (J. Opt. Soc. Amer. 34, 382-95; July 1944). Mr. Granville was also co-author of another of the four papers on this program, Analysis of the Ostwald Color System. (pp. 361-81).

Walter Granville is also otherwise well known in the Council, for he has been active in its affairs for many years. He has been the guiding spirit of the New York Color Associates (local New York color group affiliated with the Council) for some time -- in fact, we do not quite know what they will do without him! Council committees on which he is serving will be more fortunate, for he has assured us that he not only expects to continue such activities but to follow them up even more closely in the future. He has our best wishes for success in his new work.

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## A Message to All Interested in Physics

*From the Chairman of the Building Fund Committee American Institute of Physics*

YOU have probably heard the story of the young mother of the baby that was a year old before the last payment was made to the doctor. Her exclamation was, "Now we own the baby." The headquarters building has been occupied for over a year but we don't yet "own the baby."

The only thing that has been asked of physicists and friends of physics is that they give a firm, decisive "Yes or No answer" to the question, "Will you help in the purchase of the Physics Headquarters Building?" and that a "Yes" answer be accompanied by a pledge or contribution. No firm of experts has been hired. No high powered methods have been used. A committee of physicists has done the work.

It has been hoped that practically all physicists and many friends of physics would make a contribution even though small. In some departments of Physics in universities there has been a 100 percent response, with graduate assistants necessarily giving small contributions. A large number of contributions of between one and ten dollars are needed as well as some more of the larger contributions from those who "have not yet got 'round to it."

The amount necessary for the purchase of the property and essential repairs was $81,000, of which $6,000 remains to be subscribed by *individual physicists and friends of physics*. The amount needed for adapting the building to present needs and furnishing it was $30,000, of which $4,000 remains to be contributed by industrial organizations interested in physics.

Frankly, I am proud of the fact that physicists and friends of physics have already raised over $100,000 to help promote the science of physics and thus show our interest and our faith in the future of our field. But I am disappointed in lack of response on the part of a large number. If you are one of these, I appeal to you to send a contribution, no matter how small, to the *Headquarters Building Fund Committee*, care of the *American Institute of Physics, 57 East 55 Street, New York City*, or to me at *Norwich University, Northfield, Vermont*.

If, by any chance, you are not familiar with the project it is suggested that you refer to the Review of Scientific Instruments, August 1943, page 241; and the Journal of Applied Physics, September 1943, pages xi and xii, and October 1943, pages 499–509.

HOMER L. DODGE
*Chairman, Building Fund Committee*

REORGANIZATION OF THE BRITISH COLOR COUNCIL

Owing to an expansion in the membership and activities of the British Colour Council, an organization in Great Britain similar to our Textile Color Card Association of the U. S., Inc., a reorganization has been made which sectionalizes the services into six Divisions, viz.: Women's Wear, Men's Wear, Children's Wear, Interior Decoration, Transport in all its branches and Colour Printing other than that of textiles. Each Division has its own Management Committee, consisting of not less than five or more than 15 members. The Board of Management, controlling the general policy of the Council as a whole, will in future consist of ten nucleus members elected from the membership of the Council and the Chairman and two other members of each Divisional Committee.

Consultative Committees on Leather, Millinery, etc., already in existence, will be augmented so that, in the case of wool, for example, spinners, dyers, weavers, merchants, retailers, etc. may discuss the color services in relation to their own particular industry. These Consultative Committees may meet regionally, but each will have its delegate on the appropriate divisional committee where general policy is discussed and recommendations made to the Board. (From J. Soc. Dyers & Colourists, vol. 61, no. 6, June 1945).

1946 SPRING WOOLEN COLORS

The Textile Color Card Association of the United States, Inc., according to its Managing Director, Mrs. Margaret Hayden Rorke, has recently issued its advance woolen collection for Spring 1946, commemorating the triumphant theme of Victory and Peace by means of Colors of Freedom. These brilliant colors include: Hope Turquoise, Pacific Lime, Orange Glory, Peace Blue, Brave Red, Triumph Gold, Gallant Coral, Victorious Blue, Valor Rose and Heroic Green. They are smart for sports and play clothes and contrast with more neutral colors for townwear.

In a lighter and softer register are the summery Frappé Pastels, which include Lemon Ice, Glacé Violet, Frosted Mint, Ice Aqua, Crushed Peach, Pistachio Cream, Ice Cream Pink, Rum Frappé, Apricot Mousse and Candy Blue. This pastel range has interest for resort and children's wear but may also be combined with darker colors like navy and black. Wide fashion acceptance for the green range is anticipated and is represented by Plaza Green, Coolgreen, Lime Jade, Sun Olive, Aquadew, and Seaway Green, the last two being bluer greens. Among the basic colors of a neutral type are Champagne Blonde, Cream Caramel, Pearl Oyster and Flotilla Grey; while more exciting colors are: Mandarin Rose, Celestial Pink, Exotic Turquoise and China Peacock, reflecting Chinese inspiration; and California Blue, Midship Blue, Terra Cotta Red, Rose Melon, Chili Spice, Cloud Coral, Violet Dawn and Wild Clover.

SIMPLIFIED USE OF HUNTER-SCOFIELD TOLERANCE FORMULA

The June issue of the Official Digest of the Federation of Paint and Varnish Production Clubs contains an article (pages 281-7) by Andrews and Biskup of the Philadelphia Navy Yard entitled: Simplified Method of Color Specification and Control. The authors present a simplified method of specification and color control for a purple-toned white paint, using the Hunter Multipurpose Reflectometer. The reflectance reading and the difference between the blue and green readings obtained on the reflectometer suffice for the determination. Three hundred and fity samples of paint were examined during the development of the method, and hundreds have been satisfactorily inspected by its use since adoption at the Industrial Test Laboratory of the Philadelphia Navy Yard. Data are given, with four charts, to show how the method is evolved to obtain the following simplified specification: "The color shall be considered an acceptable match when the apparent reflectance with the green filter is not less than 78.0 per cent and when the blue filter reading exceeds the green filter reading by not less than 1.0 per cent nor more than 6.0 per cent."

The authors point out that the method may not be applicable to colors in which both the "a" and the "b" components vary proportionally with the "L" component, and that any attempt to use the method for colors other than purple-toned whites (such as are required in the specification) must first be investigated in a manner similar to that presented in their paper. They further note that since the specification, 52P22 (INT), is a mandatory-formula type specification which specifies the type of toner and other ingredients, this method was especially suitable. "If the specification had only performance requirements, the method might not have been applicable since different pigments suitable for the purpose could have different spectral response."

In commenting on this article to the secretary, Mr. Scofield, chairman of the Federation of Paint and Varnish Production Clubs delegates to the Council, says that as far as he knows this is the first large-scale test of the validity of the Hunter-Scofield color formula under limited production conditions. He continues: "One item of interest is the tremendous simplification, both in measurement and calculation, which the formula permits when certain limitations are put on the problem. Thus, in this particular case, only two reflectometer readings, green and blue, and two arithmetical operations, both of which can be done in the head, are necessary. The saving in time and skilled manpower which this permits is obviously great." "I am calling your attention to this feature in particular, since I have always felt that in your study of the comparative validity of various methods of expressing color differences you did not give sufficient weight to the simplification which this method permits for many special cases."

The secretary commends the report of Lt. Andrews and Mr. Biskup, who reported the qualifying conditions for the validity of their method. It is sometimes quite feasible to apply simplifications of any of the general types of tolerance formulas to a specific situation. Cut-and-try methods and short cuts may work with a number of instruments available today, such as the Hunter instrument, the disk colorimeter, etc. It should be kept in mind, however, that it is important to distinguish between formulas that have general application, as those reported in Table 1, page 8 of the report of the Council's Symposium on Small Color Differences in 1944, and formulas that may be worked out to suit specific and limited problems. The latter certainly have a place, and the authors of the article under discussion seem to have found a satisfactory answer to their particular problem.

**COLOR CHARTS FOR APPLE GROWERS** Color charts from which fruit growers can determine approximately the amount of nitrogen their apple trees receive from the soil, are now being printed. The preparation of the master standards and the matching of inks for printing the charts is reported in "Color Standards for McIntosh Apple Leaves; preliminary studies of leaf color in relation to nitrogen fertilizer," Cornell Univ. Agr. Expt. Stat. Bull 824, of which Walter C. Granville, well known Council member, is co-author with O. C. Compton, D. Boynton and E. S. Philips of Cornell University.

McIntosh apples are graded according to size and color and how well they will keep in storage. One of the factors which must be controlled, in order to produce the greatest possible number of apples of high quality, is the nitrogen content of the soil. Because too much as well as too little nitrogen will curtail his production and lower the quality of his crop, it is important that the fruit grower have some method for quickly and easily determining whether he is using the optimum quantity of nitrogen fertilizer. The amount of chlorophyll in McIntosh apple leaves depends upon the amount of nitrogen utilized by the tree. Since color of the leaf and chlorophyll content are related, a color chart could be made up for the grower to use in checking the effect of the nitrogen fertilizer he is applying. Samples of leaves were collected, and it was found that seven different greens could be distinguished conveniently by the eye. The percentages of nitrogen and of chlorophyll in leaves of each group were determined. Basic color specifications for each of the seven groups were set up from spectral reflectance curves run on the General Electric recording spectrophotometer at the Interchemical Research Laboratories.

The color chart is designed in two convenient forms. In one, the seven color samples are arranged in a row along one margin of the paper. In the other, they are hexagonal in shape and so arranged on the page that a leaf may be checked against three color standards at once by viewing through one of the holes cut in the paper at the points where the hexagons join. The color charts are printed on opposite halves of a sheet of white stock and bound into black covers. The covers provide a backing of constant reflectance for the semi-transparent leaves and printed charts. The McIntosh apple grower can carry the chart with him to his orchard and by comparing leaf samples with the colors on his chart determine whether his trees are receiving the proper amount of nitrogen from the soil, or whether the quantities of nitrogen fertilizer should be changed. (Abstracted from Interchemical Review, Summer 1945).

**REPORT ON WORK OF MORTON C. BRADLEY**

During the June meeting of the Executive Committee, when its members were the guests of Professor Arthur Pope at the Fogg Art Museum (see News Letter No. 60, p. 9), many of the group met Mr. Morton C. Bradley for the first time. Some were already acquainted with Mr. Bradley's ideas through his papers in the Technical Studies in the Field of Fine Arts, published by the museum, and our Secretary and Dr. Judd had already had the pleasure of seeing some of his work several years ago in Washington. Mr. Bradley has a combination of traits unusual in an artist, being able to think quite as clearly about color in terms of mathematical symbols as in the medium of paint. Thus in a series of simplified paintings he has been able to demonstrate color relations developed on a quantitative basis. We found Bradley's work of such interest that when the editor prepared a report of the meeting for the last News Letter he asked that Mr. Bradley's work be described separately for this issue.

It is of real importance to color workers that there are artists and teachers of art who are willing to think of color in a quantitative manner. Following Denman Ross at Harvard, Professor Pope has been teaching his students to do this. In 1925 he gave a paper before the Optical Society (J. Opt. Soc. Amer. 11, 127-8; 1925) that colorists are only now beginning to understand. His paper in Art Studies, 1925, "A Quantitative Theory of Aesthetic Values" should be required reading for anyone in the field of color who has the slightest interest in esthetics. It serves as an excellent introduction and illustration of Mr. Bradley's purposes in preparing the paintings shown to us at Cambridge.

In common with other scholars, Professor Pope believes that "order of some sort or other forms the basis for all aesthetic experience...." In <u>An Introduction to the Language of Drawing and Painting</u>, vol. 1, <u>The Painter's Terms</u>, p. 64, Pope says, "Elsewhere (i.e., in the article in <u>Art Studies</u>) I have attempted to show that aesthetic experience is a question of reaction to emotionally, as opposed to intellectually appreciable order, and that the relative value of different aesthetic experiences depends on the quantity and perfection of this appreciable order...." In the Art Studies he says: "Mere preference is not a part of aesthetic experience, but simply a condition of it," and concludes that there is nothing incompatible between the idea of order as a basis for esthetic experience and all the vagaries of our reactions to order. Therefore he defines the experience of beauty as "an immediate emotional reaction to a perception of order of organization, of harmonization of some sort, even though this emotional reaction cannot be definitely predicted under varying conditions." Also, "Certain simple examples of design we may analyze completely, and others we may analyze far enough to realize the general nature of the whole."

This suggests a quantitative theory of esthetic values, "and that lower and higher forms of aesthetic enjoyment are possible." Pope says that one thing frequently in the way of sound conclusions in esthetics is that arguments are so often based on examples too complicated to be satisfactorily analyzed. The beauty of the human figure is an example of a hopeless starting-point, because so many factors are involved in one problem. Professor Pope suggests that there is great advantage in applying the principles of order to the elemental factors in drawing and painting, reducing them to the simplest possible terms, so that the various possibilities of design may be considered one or two at a time with comparatively little interference of extraneous circumstances.

As a student, Morton Bradley was much interested in Professor Pope's quantitative theory of esthetic value. He agreed that it makes at least a good working hypothesis, and that it is best demonstrated in simple cases. In the paintings he showed us at Cambridge, he had attempted to isolate certain types of color relations and thus to demonstrate their nature and their esthetic value more clearly and effectively than is possible in more complex paintings. The simplifications consisted in the reduction of the objects represented to a few simple geometric forms, the restriction of the "local colors" to a few uniform colors, the elimination of color transitions, and the use of diagonal projection instead of perspective projection. The first series of paintings illustrated color relations in nature; that is, the color of objects as they appear in full illumination and as they are modified by shades and shadows, distance from the source of light, transmission through a colored medium, reflection from a surface, scattering and overlaying by scattered light. The second series illustrated relations of nature; for example, departures from the normal relations of hue and visual purity* as colors model from light into shade. In both series, the colors were determined theoretically and plotted in a modified Munsell color space. Mr. Bradley is now working on the reproduction of some of these paintings by a special method of color printing. It is hoped that some of his work may be shown at a future meeting of the Council.

So much of color arrangement is taught and written in terms of conventional hue relations of complements, analogous schemes, etc., that it is refreshing to find other treatments used. Bradley's ability to illustrate in color examples worked out quantitatively is a real contribution. We know of other individual teachers, Milton E. Bond at Rochester, for one, and writers, as Maitland Graves and Norman C. Meier, who tie up the teaching of color to color space treated quantitatively

* By "visual purity" is meant purity based on maximum visual efficiency rather than purity based on the spectrum as the limiting or unit purity. Discussion of saturation and visual purity by Dr. Judd will appear in an early issue.

in such a manner that a good student should have opened before him the widest possibilities in the world of color. But such thought in color teaching is still too infrequent and too incomplete. It is unfortunate that any artist today need slavishly follow a too restricted palette, or any set of rules, because he is not better acquainted with a quantitative color space and with general esthetic principles that would allow him so much greater freedom of expression.

Published papers by Mr. Bradley should be noted. The first four listed below appeared in Technical Studies in the Field of Fine Arts published by the Fogg Art Museum, Harvard University, from 1933 to 1939. Two of these papers are on color; but all show the same type of analytical mind at work in their preparation.

A Theory of Tone Attraction, II (1933), 3-10;
The Perspective of Andrea Pozzo, VI (1937), 3-16
Systems of Color Classification, VI (1938), 240-76
The Academic Point of View, VII (1939), 139-55
Sentence Structure and Sentence Form (copyright 1944, mimeographed report, pp. 1-5)

The field of color that enters the domain of esthetics would profit if there were more clarifying discussions by artists themselves. To be most useful, these must be in quantitative terms; but to date most of the color work in quantitative terms has been by non-artists. Artists, when they discuss such matters, usually speak in generalizations. It is heartening therefore to see work being done by artists in a quantitative manner. We hope such work will continue, and that this report may be a stimulus to others. We also hope that the Council may serve as a discussion center to increase this stimulation. Pages of the News Letter are always open for discussions of this sort.

D. N.

**THE FIVE "SIMPLE COLORS"**

The Editor recently chanced upon a historical note indicating that an 18th century writer recognized the existence of five "simple colors." An article by J. F. Corrigan, in J. Soc. Dyers Col. 38, 222-4 (1922), gives some notes on the 1705 English translation of the work of an unknown German author which is entitled "The Whole Art of Dyeing." Here the "Five Simple Colours" are given as "blew," red, yellow, brown and black. That our civilization in advancing has become more complex is evident from the writings of Faber Birren, who in his works lists about 18 "simple colors" (for the purposes of sales in mass markets). In his latest book, "Selling with Color," page 194, after citing the estimates of the number of discriminable colors, which run into millions, he wisely says: "So I repeat, colors may be few or many, depending on the way a person goes about thinking of them and looking at them."

**MISS MURRAY ATTACKS THE NEW "NUMBERS RACKET"**

In News Letter No. 58 (March 1945), in a signed article which we headed "Test Coaching," Elsie Murray attacks with caustic and potent pen what she has described as "a new 'numbers racket' .... which has sprung up since Pearl Harbor." This racket is the training of colorblind individuals to read the numbers on the test charts of the Stilling-Ishihara type which are intended to weed out or differentiate these defectives from the normal. In a paper, "Alleged Cures of Color Blindness," Amer. J. Psychology 58, 253-62 (April 1945), she states at the outset that the coaching of applicants for Army or Navy service in the color-tests which they must pass to qualify, may "well be costing the lives of thousands of American soldiers on the Pacific and long the Siegfried line." According to her, well-meaning amateurs and less beneficent practitioners have together convinced the general reading public that no one is either color-blind or color-deficient. He is merely "confused" by the juxtaposition of hues in the usual test charts, or is merely color ignorant and needs more training. Attacking these and similar fallacies, Miss Murray goes on to state some of the real facts as well as the fancies of color-vision testing.

In the same issue of the same journal, on pages 276-9, Miss Murray reviews Dvorine's Color Perception Charts (The Waverly Press, Baltimore), in a way which was forcasted for our readers by her article in News Letter No. 58. We need not dwell on the article in the journal, as it is fairly readily available, and there is also the News Letter article to consult. Miss Murray speaks with the authority of a broad knowledge of color-blindness testing; and the articles testify to her ability to make her meaning very clear by deft wielding of a very pungent pen. Incidentally, Miss Murray corrects the statement of the publishers that the Dvorine work is "the first diagnostic set of pseudo-isochromatic charts developed by an American." She states that in 1936 Milton B. Jensen of the American Psychological Association issued a practice-proof four-chart color test of the Stilling-Ishihara type, designed to segregate four types of color deficiency.

GEOMETRIC DESIGN — Under this title we gave, in the September, 1944, issue of the News Letter (No. 55, pp. 7-9), an abstract of a paper by member Edwin M. Blake entitled "A Method for the Creation of Geometric Designs." We have recently received from the author a paper having a similar subject, which we can heartily recommend to our readers. It is: "Method for the Creation of Geometric Designs Based on Structure," and is in J. Amer. Ceramic Soc. 28, 156-67 (June 1945). Here the method is based on a study to discover, collect and classify the geometrical figures and ideas of value to artists and designers in the field of geometric or abstract art. The program includes modeling, sculpture, drawing and painting, with their applications to pottery design and decoration, and also abstract "movies." The article is profusely illustrated with 29 figures. Section VIII (one of nine sections) is on the coloring of domains.

OVERLAPPING TRICHROMATIC EXCITATION CURVES — In a brief letter to Science (v. 102, pp. 207-8; Aug. 24, 1945), S. E. Sheppard, an outstanding American scientist, revives a suggestion made by Professor Selig Hecht in 1930 and kept alive by a paper by J. Mandelbaum & E. U. Mintz (Indus. Engin. Chem., Anal. Ed. 16, 111; 1944). In his paper, "The Development of Thomas Young's Theory of Color Vision," J. Opt. Soc. Amer. 20, 231-70 (1930, Dr. Hecht proposed a set of trichromatic "excitation" curves whose peaks are not widely separated in wavelength as in the conventional ones incorporating the data of Koenig, Abney and Wright, but are closely overlapping, with maxima in the yellow-green range near the region of maximal photopic luminosity. Hecht spoke modestly of "variations on a theme by Thomas Young," but Dr. Sheppard suggests that "there has been so radical a transformation of the theme as to create a new symphony." The threefold idea of Young is replaced by a "numerical discontinuum" not essentially and always equal to three. While Mandelbaum and Mintz suggest that slight differences in spectral absorption could arise from small chemical changes (rearrangements or actual slight changes in chemical composition), Sheppard suggests that we should consider a different (more "physical") explanation. He points out that "well-ordered and physico-chemically controlled modifications of the absorption spectrum exist in dyes of many types, which would permit the closely overlapping curves of the Hecht theory to arise from the same dye...." Such alterations "can be determined by molecular aggregations of a reversible character, controlled by the parameters of the thermodynamic environment." For such variations, Sheppard proposes the name "allelochromy" (alternative or contrasting coloration); and calls attention to two principal directions in which we may seek conditions for fulfilment of the closely overlapping trinity -- or multeity -- of sensitivity curves. These are: (1) spectral absorption variation by dimerization of pairs of two ions, and (2) by heteropolymerization of dyes in lyotrope mesophase formation (Sheppard, Rev. Modern Physics 14, 303-40; 1942). The two possibilities are distinct processes, though liable to appear with the same dye molecules, for both depend upon the possibility of sterically unimpeded side-by-side parallel coherence. In the first case, there are pairs of ions; in the second, there is a kind of one-dimensional or filamentous quasi-crystallization of large numbers of like dye molecules acting as a unit.

The first type of variation can be produced by changes of concentration and medium, and should occur in the case of pronouncedly "amphipathic" substances, such as the nucleo-protein of nerve-fiber. The other type is better known from the work of Jelley (1936) and Scheibe (1937). The independent work of these two workers has concentrated attention upon dyes whose mesophases yield narrow absorption bands; they are those of symmetrical dyes. But Sheppard (Science 93, 42; 1941) had found that asymmetrical dye molecules can give cooperative spectra which are much broader. These, by small variations of the proportions of reversibly hetero-polymerized ions, allow controlled variation of the absorption. In this case, with two not too dissimilar but isomorphous dye ions, A and B, three packets of A, AB and B could give curves of near overlap.

In connection with the interesting suggestions of this paper, the Editor is constrained to make two or three comments. The first is to call attention to the remarkable effects of small additions of a certain substance to the solutions of certain dyes, effects reported by H. H. Taylor and F. T. Simon in a paper which is considered in the following article in this News Letter. These observers report the bathochromic shift and increase in colorimetric purity which often results on adding to the dilute solutions of dyes small amounts of a nonionic type of polyethylene oxide condensate. Both of these effects, the latter one evidenced by a "sharpening" of the absorption curve, have been frequently observed by the Editor since they were first called to his attention by Dr. Taylor. Following Valko, the authors suggest that the product referred to forms unstable addition compounds with dyes, yielding larger colloid aggregates. Having in mind the two possibilities listed by Sheppard, it would be interesting to consider the altered dyes in terms of the steric (geometric) factors and inter-molecular forces (electrostatic, van der Waals and repulsive) indicated by their chemical structures.

The second point the Editor wishes to bring out is that Dr. D. B. Judd many years ago considered the question whether the excitation functions incorporated by Hecht in his theory were consistent, within the precision of the observations, with the experimental data on retinal sensitivities then extant. For his conclusions on this question and related ones, the reader should consult his paper: D. B. Judd; J. Opt. Soc. Amer. 20, 647-60 (1930); "The mixture data embodied in the tentative curves of Hecht's theory of vision." Our third point is the reminder that Dr. Sheppard, in the article to which we have referred, did not definitely advocate and attempt to sponsor the Hecht theory in part or in its entirety; rather he pointed out certain considerations "as a mere suggestion for possible further prosecution by physiologists and biochemists..." These considerations we have briefly reviewed. It remains only to remind our readers that Dr. Sheppard is one of the brilliant lights in the domain of modern science whose work has illuminated a very broad field of chemical, physical and technological subjects. It is never wise to take any suggestion of his lightly.

STABILIZATION OF DYE SPECTRA

In the preceding article in this issue we have referred to a paper by H. H. Taylor and F. T. Simon, both well known to workers in the dye, textile and color fields. The paper is "Polyethylene Oxide Condensates as an Aid in the Spectrophotometry of Dyestuffs;" Amer. Dyestuff Rptr. 34, 319-21 (Aug. 13, 1945). We have referred to the changes produced in dilute dyestuff solutions by small additions of textile auxiliaries of this type; the authors, however, were more interested in another aspect of the question. They were more interested in the stabilization of the solutions which occurs on making such additions. It is well known that the dilute solutions such as are used in the analysis of commercial dyestuffs by spectrophotometry are subject to changes due to variations in pH (hydrogen ion concentration), aging and the effects of light and inert salts. Taylor and Simon find that polyethylene oxide condensates of the nonionic type, about 0.2- 1 per cent of commercial product by volume in the final solution analyzed, stabilized dyestuff solutions generally, so that more accurate spectrophotometric analyses can be made and more reproducible results obtained. It was found that in general such additions reduce to a minimum the susceptibilities of the dilute dye solutions to the variations in pH, salt concentration, irradiation, ambient temperature, dissolving temperature and aging. "Aging" refers to the change in apparent strength of the solutions on standing for some hours. These changes may in some cases be considerable.

Another useful property of the condensates is that of preventing the interaction between similar dyes which occurs unexpectedly on mixing the dilute solutions of many of them. When such interaction occurs it destroys the property of additivity of absorptions upon which spectrophotometric analyses are ordinarily based, and may lead to gross errors. This interaction of dyes in solution was discussed by us in News Letter No. 52 (March 1944) on pages 9-10. Additions of pyridine have been advocated for the prevention of this inconvenient effect; but Taylor and Simon find the polyethylene oxide condensates not only more convenient (less toxic and unpleasantly odorous) but more effective. Other uses for these condensates are in the preparation of dispersions of the normally water-insoluble cellulose-acetate and vat dyes, the latter especially in the form of their leuco compounds. These dispersions can be treated almost as if they were true water solutions of the dyes, which are stabilized by the additions sufficiently well for spectrophotometric analysis.

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