Inter-Society Color Council *Newsletter*

NUMBER 213
July-August 1971

ISCC CONFERENCE ON COLOR OF FLUORESCENT MATERIALS

The Inter-Society Color Council is sponsoring a Conference on Color of fluorescent materials to be held in Williamsburg, Virginia on February 6-9, 1972. Eight invited papers on this subject will be presented covering a fairly large segment of the field. The object of the Conference is to point out the problems connected with the measurement and evaluation of materials containing fluorescent additives; discuss the contribution of fluorescent whitening agents to whiteness of papers, textiles, paints and printing inks; and, to stimulate research in this field.

The papers will be presented by experts in the field from here and abroad. After each paper, time for discussion will be reserved and a panel of experts in a particular field will be available to help answer questions which may arise. There will be four basic papers, one an introduction to the general problem, a second on the measurement of fluorescent samples, a third on special topics in fluorescence measurement (such as the separation of reflected and fluorescent light and the determination of quantum efficiency), and a fourth paper on fluorescence and fundamental light absorption mechanisms with practical applications to light fastness and photodegradation. Three of the papers will deal with practical applications: the first will be the application of fluorescence to textiles, the second on the application to paper and the third on application to printing inks. The last paper will be an application of fluorescence to art and design.

Some time will be devoted to demonstrations and exhibits to help illustrate the concepts involved. For further information write to Co-Chairmen:

Franc Grum, Research Laboratories, Eastman Kodak Co., Rochester, New York 14650,

or,

Eugene Allen, Lehigh University, Bethlehem, Pa. 18015.

COLOUR GROUP BIBLIOGRAPHY -- 1970

The bibliography enclosed with the March-April Newsletter (No. 211) covers the full year for 1970, and supercedes the one sent earlier. The cover sheet was incorrectly marked July to December, 1970.

Ed.

TENTATIVE PROGRAM FOR THE ISCC WILLIAMSBURG SYMPOSIUM ON COLORIMETRY OF FLUORESCENT MATERIALS

Monday Morning:	Basic Papers
G. Wyszecki:	Exposition of the Basics of Fluorescence Problem
F. Grum:	Measurements of Fluorescent Materials
Monday Evening:	
E. Allen:	Special Topics in Measurement of Fluorescence by Components and Determination of Quantum Efficiency
Tuesday Morning:	Application of Fluorescence to Industrial Problems
E. Ganz:	Detergents and Textiles (Fluorescent Whitening Agents)
A. Stenius:	Application of Fluorescence to Paper
Tuesday Evening:	
H. Hemmendinger:	Fluorescence and Fundamental Light Absorption Mechanism with Practical Application to Light Fastness and Photodegradation

Wednesday Morning:

R. Ward:	Fluorescence in Paints and Printing Inks
H. Aach:	Application of Fluorescence to Art and Design

DRY COLOR MANUFACTURERS' ASSOCIATION

The Annual Meeting of DCMA was held at the Greenbrier, White Sulphur Springs, West Virginia, June 21-23, inclusive. Speakers were secured from industry and they brought important messages and views on environmental problems and of economics facing the chemical industry with special emphasis on current legislation as it affects the color industry. Dr. Robert W. Burnham, Research Laboratories, Eastman Kodak Company, was a guest speaker on one of the days on the subject of "More to Color Than Meets the Eye." In addition, Nelson S. Knaggs, Vice President of Hilton Davis Chemical Company and a member of the Board of Governors of DCMA, gave one of his travelogues as a part of an evening entertainment program.

All committees of DCMA held meetings and continued the work in progress of these various groups.

Max Saltzman

MOLECULAR ARC LAMP

At the Spring Meeting of ISCC in New York City, a developmental tin chloride molecular arc lamp was demonstrated by Carl J. Allen, Large Lamp Department, General Electric Company. The lamp was characterized as a general purpose discharge lamp which produces a continuous spectrum sun-like quality white light without the use of a phosphor coating. Since the arc is small and the bulb is clear the lamp lends itself well to the design of efficient luminaires with good brightness control. It was pointed out that the lamp uses a regenerative cycle to keep the bulb walls clean throughout life. The life of the lamp is expected to be in the thousands of hours with excellent maintenance. The efficacy of the lamp is predicted to be in the range of 50 to 70 lumens per watt. Tin chloride has long been known to give a good white light when electrically activated but this lamp is the first to overcome the corrosiveness of chlorides. Previous attempts had resulted in very short lamp life.

While the lamp should have a wide variety of potential general lighting applications, it was described as particularly suitable for the lighting of merchandising areas. Department stores were cited as typical areas where good color rendering of clothing, fabrics and merchandising is essential and this lamp will help fill this need.

It was explained that the developmental category of the lamp implied that the lamp has been proven to be feasible and basic design parameters for optimum performance were currently being determined. No estimate was made of commercial availability.

SUMMARY OF ISCC COLLEGE & TECHNICAL, CREATIVE ARTS SCHOOLS QUESTIONNAIRE RESULTS AND COMMENTS THEREON

Questionnaires were sent to 179 out of 800 American colleges and universities in early January, 1971. Of these, 60 were returned by mid-March. The questionnaire was also sent to 44 technical, vocational schools and schools for the creative and performing arts, from which 9 replies were received.

In each case, the questionnaire was sent to the college or school without being directed to any specific department (although appropriate departments were suggested on the bottom of the questionnaire). Frequently it was filled out by one department but not circulated to any others before being returned.

Replies to the questionnaire ranged from listings of specific courses and accompanying course outlines, to copies of the school's or department's catalog with no covering explanation or comment, to general comments to the effect that all or many courses in a particular discipline (art, architecture, food technology) dealt with color and/or appearance at some point in the presentation of the course material, and that therefore it was difficult, if not impossible, to document the exact hours devoted to study of color and/or appearance.

Departments responding to the questionnaire included:

Technical, Vocational Schools and Schools for the Creative and Performing Arts:

Advertising	Fashion Design
Advertising Art	Foundation
Art	Furniture
Color	Graphic Design
Environmental Design	Illustration
Fashion	Interior

Colleges and Universities:

Architecture	Biological
Applied Art	Engineering
Art	Business
Basic Program	Administration
Basic Studies	Ceramics

Chemistry
Clothing & Textiles
Commercial Art
Creative Arts Program
Cosmetics
Design
Design Center
Drama
Electronic Technology
Engineering
Fabric Decoration
Fabric Design
Family Resources
Fine and Applied Arts
Fine Arts
Floriculture & Ornamental Horticulture
Food Science
Foundation Art
Foundations Program
General Education
Graphics
Home Economics
Horticultural Science
Humanities
Industrial Arts
Industrial Design
Instructional Technology
Landscape Architecture
Liberal Arts
Painting
Philosophy
Physics
Printing
Printmaking
Psychology
School of Design
Technical
Textile
Textile Chemistry
Textile Technology
Wood & Paper Science

The information given regarding hours of instruction and total hours on color and/or appearance varied so much that any meaningful tabulation is not possible.

The questionnaire elicited numerous requests for information and/or resources available from the ISCC in the field of color/appearance, and thus seems to substantiate a real need which could be filled.

Before undertaking any further efforts to assemble data on the study of color and/or appearance at the college or technical school level, the committee should define its objectives in more specific, precise terms. If the questionnaire technique is to be used again, it should be prepared carefully to obtain uniform, meaningful data.

The varying interpretations given to the terms "color" and "appearance" indicate one problem area. The ISCC committee should spell out the scope that it means to convey when using these words. One school listed a course entitled, "Personality Development," given in the Department of Business Administration. Would the committee's definition of its terminology include color and/or appearance concepts as used in this course?

Finally, the terms "hours of instruction" and "total hours on color or appearance" should be defined more precisely if this is the information that is being sought. Is the questionnaire calling for information on the number of hours of actual class or laboratory instruction, or is it calling for information on credit hours?

R. S. Hunter

TO MEMBERS OF THE ISCC

The American Ceramic Society represents the following industries: structural clay products: bricks, terra cotta, tiles, mosaics; whitewares: tableware and artware; porcelain enamel: curtain walls, home appliances and cooking ware; and glassware.

Besides the above categories, the Society also has Divisions for basic scientists and representatives of the material and equipment trade.

The Society has nearly 10,000 members from which about 3,000 attend the annual spring meeting. The 74th Annual Meeting of the ACS will be held in Washington, D.C. at the end of April, 1972.

The ACS delegates to the ISCC are planning sessions on color for the meeting next year. These can be in the form of symposiums or joint sessions among various groups.

Of interest to the ACS would be the following topics: color specifications, aptitude tests, measuring instruments, psychology, color standards, color in science, art and industry, metamerism, etc.

The delegations would welcome any help the ISCC could give in developing plans for this program.

I would appreciate any suggestions from you which I could forward to this meeting or present at a later time.

F. J. Von Tury
Chairman, ACS Delegation

ENVIRONMENT DYE EFFECTS

A comprehensive study of the effect of dyes on the environment has been authorized by the American Dye Manufacturers Institute, Inc. Named as chairman of the committee to supervise the study was Harry F. Clapham, of the du Pont Company.

"We are supporting four programs with leading universities across the country for the study of dyes in the environment," said Mr. Clapham, in commenting on the nature of the new committee and studies. "Although the industry as a whole has found little data to indicate that modern dyes have any effect other than color on the environment, we are authorizing these studies in the interest in updating the data on dyes in today's environment."

With the approval of the Institute's Board of Directors, the four studies will include the following:

1. A technical information study and statute survey to be conducted at North Carolina State University under

the direction of Professor Henry A. Rutherford, head of the Department of Textile Chemistry. Dr. Rutherford's study will be aimed at consolidating available technical information and legislation so that there will be a clearer definition of areas which may need further study and research.

2. A research program, pinpointed at the effect of dyes on aerobic systems. This program will be conducted at Rutgers University under Dr. A. Joel Kaplovsky, Chairman of the Department of Environmental Sciences.

3. A research program for the study of dyes on aquatic life, to be conducted at the University of North Carolina under Dr. James C. Lamb, Professor of Sanitary Engineering. Included in this study will be preliminary investigation on the possible effect of dyes on growth and photosynthetic activity of algae.

4. At the University of Purdue, under the direction of Dr. James E. Etzel, Professor of Sanitary Engineering, a research program on the effect of dyes on anaerobic digestion systems will be conducted.

All the programs are funded for a year's study. It is expected, according to Mr. Clapham, that the preliminary results of the studies will be available in the late fall of 1971.

These four universities were selected because of their recognized expertise in the field and their interest in participating in the program, according to ADMI officials. The Institute also feels that these studies will provide a good blueprint for the cooperation between academic research and industry which will provide unbiased information for the public.

GATF ANNOUNCES FALL SEMINAR SCHEDULE

The Graphic Arts Technical Foundation will present thirteen Seminars at its Technical Center in Pittsburgh, Pa., during the fall of 1971.

The courses, of special interest and importance to technical, management, scientific and sales personnel of firms in the graphic communications industries, will cover color reproduction, plates, photography, presses, web offset, papers, inks and quality control.

Courses, dates and instructors for Fall, 1971, GATF Seminars are as follows:

Halftone and Process Photography, (Nov. 3, 4, 5), Francis L. Cox, GATF technical services director; Lithographic Plate and Press Problems, (Oct. 7, 8; Dec. 2, 3), Edward J. Martin, technical program specialist and former GATF supervisor, reduction-to-practice division; Color and Color Reproduction, (Sept. 27, 28, 29; Nov. 15, 16, 17; Jan. 26, 27, 28), Francis L. Cox; Web Offset, (Oct. 11, 12, 13), David B. Crouse, supervisor, GATF engineering division; Paper and Ink Problems in Lithography, (Oct. 4, 5, 6; Nov. 29, 30; Dec. 1; Jan. 19, 20, 21), Dr. Nelson R. Eldred, supervisor, GATF chemistry division; and Process Quality Controls, (Oct. 27, 28, 29; Jan. 24, 25, 26), George W. Jorgensen, supervisor, GATF physics and quality control division.

For further information concerning the Fall, 1971, GATF Seminars, contact: Special Programs Department, GATF, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

REPRINTS -- 1966 WILLIAMSBURG CONFERENCE

Reprints are available of papers presented at the 1966 ISCC Williamsburg Technical Conference on

INSTRUMENTAL APPROACHES TO COLORANT FORMULATION:

Allen, Eugene. Matrix Algebra for Colorimetrists

Billmeyer, Fred W. Jr. Precision, Accuracy and Validity of Instrumental Color Measurement

Davidson, Hugh R. and Hemmendinger, Henry. Industrial Use of Instrumentation and Computation for Color Matching and Control

Hemmendinger, H. and Davidson, H. R. The Calibration of a Recording Spectrophotometer

Lewis, Edward L. Advances in Instrumentation for Colorant Formulation

Pobboravsky, Irving. Methods of Computing Ink Amounts to Produce a Scale of Neutrals for Photomechanical Reproduction

Smiel, Oscar. Color Problems in Gravure

Wright, W. D. Tolerances in the Design of Tristimulus Colorimeters for Use in Colorant Formulation

A set of reprints of these papers is available at $2.00 prepaid, to defray handling and mailing cost, from:

Information Service
Graphic Arts Research Center
Rochester Institute of Technology
1 Lomb Memorial Drive
Rochester, N.Y. 14623

COLOR FACTS

A new edition of Color Facts was published recently by the American Dye Manufacturers Institute, Inc. Note that this is a new name for the former Textile Dye Institute.

Distribution of this background material, which includes two new areas for the Institute (leather and paper), will be concentrated in the education field -- primarily schools and colleges which have made wide use of a former edition of Color Facts over the past several years.

Previous experience has shown that educators welcome this kind of back-up material in brief form since it affords them an opportunity to keep up with industry in its fast-paced changes.

For information, contact the American Dye Manufacturers Institute, Inc., 5210 Wapakoneta Road, Washington, D.C. 20016. (301) 229-2937.

FACTS ABOUT THE DYE INDUSTRY

It's been a long time since man lived essentially in a black and white world. There was a time when the color around him was either subdued, depressing, or just plain dreary.

Then came the color revolution. Although man had been using natural materials to color his garments and his surroundings for thousands of years, it was not until science entered the picture that man helped bring the rainbow down to earth.

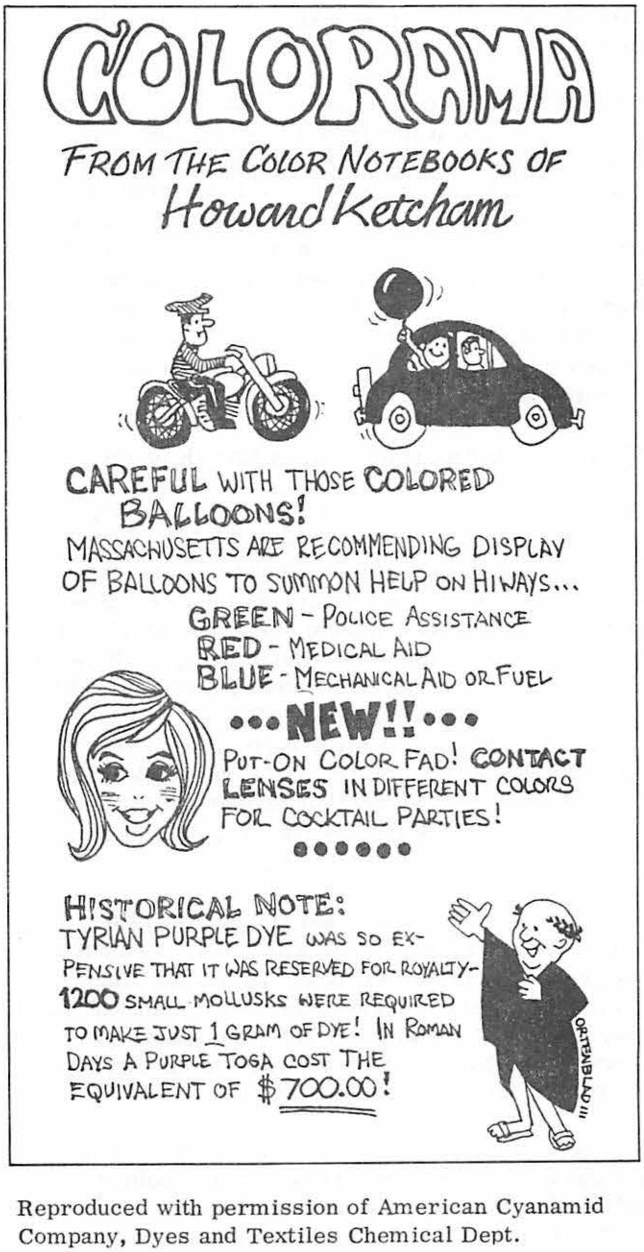
There is more than one theory about our being surrounded with thousands of colors in textiles, paper, leather and other materials. The most widely accepted one is that scientist William Henry Perkin was looking for another chemical and, during his experiments, produced a man-made mauve or purple color. From then (1856) until today, there has been a continual explosion of color. In fact, even in outer space which man has only recently penetrated, color -- and its absence -- was noted by the astronauts who put the first footprint on the moon. After commenting on the incredible beauty of fast-motion sunrises and sunsets, they were struck by the complete lack of color on the moon itself.

The point of this is not that we're living on the moon -- but that the world we now know is full of color. Nature started it, with plants, flowers, sunsets, sunrises and other beauties man can only contemplate, not duplicate. But man went on from there. He has come so far in color's space age that there are thousands of different dyes or combinations of dyes being created in test tubes and factories today. (And you worry about matching the living room draperies to the wallpaper?)

I. Way back: Some background facts

Although the progress of color and the development of new colors are in today's laboratories and tomorrow's plants, the roots of color extend back into history. Colorants are now a science -- but were once the casual result of chance discovery. Today's synthetic dyes are a far cry from those of the ancients, which came straight from nature; plants, shells, tree bark, to mention a few examples.

Making dyes from natural materials was no science; it was labor and guesswork. The exact products available today from chemically-controlled processes are a great advancement from the crushing of berries, shells or bark. The dye industry has had to keep up with the fast pace of other industries. Make a new kind of paper and you may need new dyes. Make a new fiber



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and it may require the use of new dyes or a new dyeing method. Leather? Dyes for leather require special processes and each one is a puzzler in the laboratory before it's a seller on the market.

The dye industry is, in part, a service industry. In response to needs and as the result of research, the industry, through the American Dye Manufacturers Institute, Inc. (ADMI) and its individual member companies, provides service to homemakers, home economists, i.e., the consumer in general. As a result, the dye industry has sorted out some of the information needed to help those who are both awed and overwhelmed by the number of choices they can now make from the color all around.

The premise of this background information is simple: help. The dye industry believes that there is a need for this brief, semi-technical reference to dyes and the types of material for which they are used.

The ADMI does not believe that what you don't know doesn't hurt you. It firmly believes that facts form a cornerstone of knowledge and that ignorance in the marketplace has long ceased to be bliss. These facts apply to both men and women. Housewives trying to sort out myriad colors on many materials; traveling men trying to tell what stained their only on-hand suit, shirt or tie and hoping the dry cleaner won't take out the dye with the stain . . . we could go on about the problems -- it would be better if we elaborate on the facts.

II. Dyes: What they are, what they do

It's been a long route from basic black (long considered the safe color to wear anywhere) to basic bright. The development of the bright colors -- in fact, any colors -- has required specific dye technology which is only available in the laboratories of today's chemical companies. Here, the specialty is in making both existing dyes and creating new ones. It's a far cry from crushing berries and shells -- the manufacture of dyes for many purposes is a highly specialized science. Following is a brief look at the seven main types of dyes. (For further aid, consult Section III for a look at the ways these dyes are applied to a variety of materials.)

Acid Dyes: Acid dyes are used to color fibers of a "basic" nature such as nylon, silk, wool, and modified polypropylene, as well as paper and leather. The group of acid dyes contains many members. In addition to the wide range of "normal" acid dyes, one special group (premetalized) is a metal complex. Still another (mordant) is metalized on the fiber.

Depending upon fiber-dye combination, the resulting wet and lightfastness properties can be excellent and capable of meeting rigid specifications. Some fiber-dye combinations can tolerate only mild hand-washing procedures. Many of the textiles used daily may be colored with acid dyes, such as clothing, automobile seat belts, upholstery and carpets. Other fields include leather and paper.

Azoics: These are dramatic dyes -- the color appears as if by magic as the chemicals react to produce the dye throughout the fibers without further production steps. Azoics supplement vats, particularly oranges and reds, especially for deep brilliant shades. They are widely used for dyeing cotton and linens, women's fashions, table cloths and yard goods. In general, they have good fastness to washing and light.

Basic or Cationic Dyes: Basic dyes are characterized by their brilliance of shade and strong tinctorial power. Originally, they were used for dyeing leather, paper, silk and wool, although they were fugitive to light and had only moderate fastness to washing on these materials. New basic dyes of high fastness had to be created for the new acrylic fibers and certain types of polyamides and polyester fibers. These dyes are used for carpets, fashion shades, knit and woven goods, as well as paper and leather products.

Directs: The class of direct dyes is so named because they were the first dyes capable of dyeing cotton and rayon "directly" (that is, without the use of auxiliary bonding chemicals). Modern direct dyes and commercial methods of application provide quality dyeings through chemical controls and after-treatments. Many direct dyes are lightfast to a high degree which makes them particularly suitable for application on fabrics for use as car upholstery, dry-cleanable draperies and many garment linings, blended fabrics, and other surfaces.

Disperse Dyes: Although this group of dyes is insoluble in water, the fine particles of dye penetrate the fiber when the dye bath is heated. With some fiber types, it is sometimes necessary to add special chemicals to the dye bath to accelerate the movement of the dye into the fiber. Properly used on fibers for which they are intended, disperse dyes provide very good performance characteristics. This group of dyes was invented for use on acetate but has proved adaptable to nylon, polyester, acrylic, modacrylic, triacetate, and polypropylene fibers. Consumers will find an extremely broad range of knitted and woven apparel fabrics as well as home furnishings including draperies, upholstery, and carpeting that have been dyed with disperse dyes.

Fiber Reactives: This group of dyes means just what it says -- the dye and the substrate react with each other chemically, resulting in a "marriage" between fiber and dye.

Fiber reactive dyes can be applied to cotton and rayon by printing and by all conventional dyeing procedures. Their brilliant shades with excellent washfastness as well as good lightfastness, set them apart from all previous products. Certain fiber reactive dye can only be applied to wool.

The end uses of the materials to which they are applied are those which can utilize the brightness and fastness of these dyes, i.e., principally women's and children's wear, knit good and sewing threads.

Sulphurs: These dyestuffs fill a need for economical deep shades of black, brown, navy, and green on cotton with good fastness to bleeding and washing. Furthermore, they lend themselves to continuous dyeing processes that are very efficient. Their limited fastness to household bleaches restricts their use principally to textiles that are dry-cleaned or not expected to be colorfast to bleaches, such as automotive carpets, bed ticking, and certain denims.

Vats: This group of dyes is the most widely used for cottons and rayons, where a high degree of washfulness is required. You may have noticed that hotels and restaurants use colored linens in dining rooms which used to induce snow-blindness in patrons. Vat dyes as a class are safe to home and commercial laundering and are also safe to dry-cleaning. There is a reason for this: because of the chemical nature of vat dyes they do not dissolve in water -- even at boiling temperature. The reason is, once the textile fibers have absorbed the color, another chemical reaction restores the vat dye to its original insoluble form -- fixed in the fiber. The overall high degree of fastness makes this class of dyes ideal for use in draperies, upholstery, sheets and work clothing. Even some military specifications call for vat dyes.

III. Turn on with Color: Applications of dyes

For better understanding of the colorful world of dyes, you should keep in mind that not all dyes can be used for all purposes. As a blueprint for the uses of the major classes of dyes, the ADMI has prepared a breakdown of the different materials on which they are used. Even while you read this, someone in some laboratory may be developing a new material which will require new dyes -- it's a fast-paced industry.

As you see which dyes are used on which materials, you'll feel as if you're looking through a kaleidoscope or at a light show. We're sorry we can't provide background music -- but we can provide more background facts. Following are facts about fibers:

A. Cellulosics: It's doubtful if you ever went to a store and asked for a cellulosic suit, dress or drapery, but this fiber has been around for centuries. Cleopatra probably had some cotton or linen on that famous barge, but man-made fibers are only decades old. Some of these -- rayon and the acetates -- are cellulosics. The main difference from cotton is that they are man-made and not found on field or farm.

Why do we mention the type of fiber before talking of what dye can change it to almost any color you could imagine? Because dyeing is an exact science; the decision on which dye class to use is a chemical one. For the cellulosic group of fibers, chemists have a fairly wide choice. First, they determine what the end use of the fabric will be. This is a specialist's field, only those trained in the performance of dyes with fibers can determine which to select. That's why the textile chemist is not only a highly skilled professional, but he or she must know many industries in addition to their own. That's because a lot of questions precede the choice on dye class. Will it have frequent launderings or cleanings (such as work and play clothes)? Will it be used in draperies which have concentrated exposure to sunlight? Or will the final fabric live its life on the inside of a suitcase where it couldn't care less about being fast to light -- but might want to be fast to rubbing or crocking so that its color won't come off on your best (colorful) clothes?

Nailing down these facts: When a material must be colorfast, a group of dyes known as the vat dyes are the most widely used for cotton, linen and rayon. Cotton and rayon upholstery for your car can be dyed with direct dyes which are lightfast to a high degree (remember that last summer trip you took with the sun streaming in the windows). Direct dyes are also used for draperies, garment linings and many types of blended fabrics.

Moving into the world of fashion -- now most certainly a co-educational world, with men wearing the colors as much as the women -- several dyes star here. For fashions where color brightness is the focus, the fiber reactive dyes are the choice; for acetate fashion materials and for draperies of the same material, disperse dyes are used.

For some clothing, sulphur dyes are used since they produce inexpensive dark shades such as black, browns and navies. Fabrics dyed with sulphur dyes have good washfastness but should not be bleached. You'll find these dyes used on many articles made of cotton or rayon where cost (of both dye and finished product) is an important consideration.

Word to the wise: Note that in all cases here, and those to follow, dyes are carefully selected for their roles. If they are played out in public, many more standards must be applied. If they have a behind-scenes role (mattress covers), they need not have the versatility of dyes on fabrics in the public eye.

B. Polyesters: You probably know these fibers by their nicknames (registered tradenames to the industry). The group includes such names as "Dacron," "Kodel," and "Trevira" (all registered tradenames). Polyester fibers are characterized by great strength. They are often combined with other fibers such as cotton and wool. All polyesters can be dyed with disperse dyes. Properly dyed (and this does mean following the chemical rules), they have good fastness to light and laundering. Where are they used? For double knit dresses, men's and women's slacks, shirts and suitings, and carpets. Some of these fabrics are 100% polyester, some are blends with other fibers. Properly dyed, polyester fabrics are compatible with durable press finishes.

C. Acrylics: You've heard the term -- but think natural -- even though it's a man-made fiber. That's because this group most closely resembles natural fibers. Its other plusses: it has great warmth; it is a bulky fiber, feels luxurious; and can by dyed to brilliant shades. Included in the acrylics are such tradenames as "Orlon," "Acrilan," "Creslan," and "Zefran II" (all registered tradenames). All of these fibers, and others in this category, are dyeable with cationic (would you prefer "basic"?) or disperse dyes. If you can take your chemistry straight, you can see that the fibers are acid, the cationic dyes are basic. Combined, they form a dyesalt. And the result is excellent colorfastness for this group of fibers. Harking back to history again -- it was a cationic which was the first synthetic dye (the Perkin mauve). Today, you'll find acrylic fibers almost everywhere: sportswear, carpeting and almost all the fashion groups including coats and suits.

D. Polyamides: In this atomic age, it's interesting to note that this group of fibers is atomic in the sense that the term itself refers to a multiple linkage of atoms which results in a base as distinguished from an acid. You probably deal with this family of fibers every day, since nylon is a man-made polyamide, closely related to wool and silk. All of them have something else in common -- they can all be dyed with acid dyes. However, there are differences in dyeing procedures; wool and silk are usually dyed with acid dyes for brilliant shades (such as fashions); nylon can be dyed with both acid and disperse dyes. Another group of dyes, mordant -- no, not dead, just combining with metal, produces less brilliant shades, but better fastness. Again, properly dyed, these fabrics can be laundered. However, wool and silk usually require a lot of T.L.C. (Tender Loving Care -- or at least washing by hand). Nylons can usually be machine washed, with some attention to their companions in the wash load. Polyamides are extensively used in carpets, hosiery, lingerie, upholstery and automotive fabrics.

E. Polypropylene: This test tube product has now been established as a durable, long-wearing fiber especially useful for certain applications. For instance, it is moisture and stain-resistant to a high degree and has been seen in places not usually reserved for carpeting -- such as kitchens and patios. Along with the resistance to moisture and mildew goes strength: hence its application to heavy traffic areas in homes, offices, schools, and other public buildings. This, one of the newest fibers, has required whole new dye processes. Though the color range is still not wide, it is increasing constantly and dye processes are still turning up new colors for this special-use fiber.

IV. Paper: Color it anything

Color has taken a front-row seat in the paper industry. Some form of colored paper is a backdrop to many parts of our lives. It's on the walls, it's in the kitchen (colored paper napkins, towels). A small gift in gaily colored paper "comes on" like a trinket from Tiffany's.

By chemical definition, paper should really come under the heading of cellulosics, since paper is made from cellulose, primarily wood fibers, and also may contain natural fibers such as cotton. A wide range of papers and nonwoven products are also being made today with synthetic fibers added for both strength and durability.

In the graphic arts field, colored paper is both big business and a basic necessity. Colored paper can also be an identifier (look into any well-organized file cabinet and you'll see file folders "color coded" by simply using different color file markers).

The selection of dye for paper is based on the end-use of the paper to be dyed. Paper is dyed with acid, basic and direct dyes -- depending on which will serve the purpose for which the paper is intended. Dye fastness varies from the textile trade in some cases and is similar in others; dyes for paper are selected for fastness to light, water bleeding, chlorine, caustic and bleachability.

The selection of the proper quality dyes for paper must be done by highly skilled specialists. Colored paper finds a multitude of uses: Colored tissue and towels are generally dyed with direct dyes. Basic dyes are valuable for kraft boxboard, packing boxes, bright decorative paper. Other types of paper require acid dyes for brightness.

V. Leather

Only the figleaf is an older form of "clothing" than leather. Man began to convert animal skins into leather long before he learned other uses for natural materials at hand.

Dyes are very important to the marketing of leather goods. One of the reasons is that leather can be dyed with just about every dye class and is almost always colored by combining compatible dyes from various classes.

As with all materials, it is the end use of leather which is the determining factor in what dyes are used.

For instance, some dyes are used for penetrating while others are for surface coloring. (This is an important distinction because surface coloring is not dyeing in the true sense -- it is like painting.) On leather products some dyes must be checked out for fastness to crocking (rubbing against other materials) and other end-use fastness such as exposure to light (your favorite suede jacket?). Most leathers require special care in cleaning. As with quality dyes, which establish confident colors, cleaning processes must protect these colors and the materials on which they are used.

VI. Miscellaneous:

Other uses for dyes are for coloring foods, drugs, cosmetics, and some inks. Before they can be used for food, drugs, or cosmetic purposes, they must be approved by the Federal Government and each individual batch of manufactured dye must be certified.

VII. The Dye Industry: Somewhere over the Rainbow

Many people -- especially those contemplating new careers -- overlook the opportunities to be found in the many facets of the dye industry. As the preceding pages show, it is a diversified, growing and exciting industry. It also has room. It has room for the career chemist, the business administration-minded, the factory employee, the secretary -- and, always, the inventors who may emerge from almost any of these groups.

This is probably why the manufacturing of dyes is an essential part of industry in the United States. The yearly cost of dyes per person, for all materials which use dyes, is about $2.00 -- a small sum. But this modest figure tells an important story and takes us back to when the wearing of colored garments was so expensive that only the rich were colorful. That's where the term "royal purple" had real meaning. After all, how many men and women had to be used to crush the berries and shells which, after long and tedious labor, would result in a dye which only a very few (and none of those who made them) could afford.

Today, according to the U.S. Tariff Commission, the total domestic production of dyes in 1969 was approximately 240 million pounds. And that's not the end; the industry is still growing, proving that there really is no end to the rainbow.

American Dye Manufacturers Institute, Inc. is a non-profit organization of all leading U.S. manufacturers of quality dyes.

It has several purposes:

1. For the consumer: to define the uses and properties of dyes so that the consumer may be better informed.

2. To assist the industry itself in technical areas (such as research, statistics, surveys).

3. To cooperate with the Federal Government for fulfilling government contracts requiring dyes. The Institute (under another name) was formed in 1956. Its membership now is the most representative in its history.

4. The American Dye Manufacturers Institute is actively studying the effect of dyes in the environment. While available information indicates that dyes do not pose a serious environmental problem, the ADMI is supporting research programs at several universities to study the effect of dyes and waste effluents.

Reprinted from Color Facts
American Dye Manufacturers Institute, Inc.

FEDERATION OF SOCIETIES FOR PAINT TECHNOLOGY ANNUAL MEETING

The Annual Meeting of FSPT will be held at Cobo Hall in Detroit from October 27-30.

The theme of the Annual FSPT Meeting this year is "Man and His World of Colour."

There will be three symposiums on color:

(1) "New Optical Effects" with papers on Interference Color, Liquid Crystals, Electroluminescent Coatings, and Bubble Coatings.

(2) "Design" with papers on Design in the Automotive Industry and Design of Consumer Colors.

(3) "New Techniques" with papers on Hiding Power of Colored Pigments, Exposure, Methods of Test for Color and Appearance, and Relating Down-Flop Characteristics to Pigment Transparency.

Strictly personal
SLURS REGARDLESS OF COLOR

by Sydney J. Harris

A reader who works for a "human relations commission" is upset by a recent paragraph of mine about "white lies." I wrote that "a white lie, used often enough, becomes gray and dirty, and finally black from usage."

He calls this "racism in language" because of the positive connotation of the word "white," and the negative connotation of the word "black." He absolves me of any conscious prejudice, admitting that our language is structured that way, but thinks I ought to be more careful in my usage.

I FIND THAT ridiculous and somewhat paranoid. It is true that "black" has many negative connotations in our language -- blackball, black-hearted, black list, blackmail, black sheep, and so forth -- but "white" is far from being universally positive in English usage.

Raising the white flag is surrendering; showing the white feather is a mark of cowardice; white-livered is also cowardly or mean; to whitewash a person or inquiry is to conceal or condone bad behavior, a whited sepulcher in the Bible is a pious hypocrite; a white elephant is an unwanted and expensive possession; white trash is a common derogatory expression used by Caucasians.

To imagine that "white lies" have anything to do with the color of the person uttering them is to imagine that mostly Indians are guilty of having red tape, or being in the red, or being caught red-handed, or living in red-light districts, or drawing a red herring across the path, or drinking red eye.

We call a coward yellow with no reference to any possible Oriental origin. And a yellow dog contract, a phrase echoed by the U.S. Supreme Court, is simply an illegal contract forbidding employes to join a union. The yellow press did not refer to Oriental publications, but to wholly white and American newspapers of a sensational nature.

THE FRENCH call a mystery a "black" novel, while the Italians call it a "yellow" novel. What we term the "cold war" is a "white war" to the French. Our "red" cabbage is "blue" to the Germans, and "black" to the Italians. In medieval Italy the warring Guelphs and Ghibellines were known as "Whites" and "Blacks."

In Germany, one is "yellow" with envy, not "green" with it; in France, to be "blue" is to be amazed, not sad; and our "white lie" is called a "pious lie" there. To find racial slurs in the color-imagery of language is to suggest that the old barrel-house tune, "I'm Blue Turning Gray Over You," was written by an aging Druid.

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PROBLEM 31 MEETING

The subcommittee concerned with Standard Methods of Measuring and Specifying the Color of Exposed and Processed Transparencies met at the time of the annual meeting.

Problem 31 was stated by Mr. Abraham Anson, Chairman of the meeting, and discussions were held regarding multiband photography versus the three layer photograph and human observation with regard to colors viewed on color photography. Examples of color aerial photography, 9x9 inch size transparencies, were projected on a screen so that the group could reconcile the aerial view of the terrain and the peculiar problems in describing small scale color imagery. The greatest problem in laboratory processing is how the technician would know what colors he should emphasize in printing color photographs. There was some discussion and examples of color orthophotos shown.

The specific objectives of the committee were discussed. Dr. Burnham suggested that a study be made of the gamut of color range in aerial photography and its detectability. The importance of the colors should then be weighted. Thus a modified universal color language could be developed. Dr. Billmeyer then added that a further study of the sizes of color differences that could be tolerated in observation and the significance of those differences to mapping with color photography be made.

Two methods of attacking the problem were suggested:

(1) Use a standard color with the plane; employ it to standardize processing.

(2) Photograph a standard on the ground or possibly the pilot's interpretation of the scene's color as a guide for processing.

Another suggestion was that a transparent color scale be incorporated into the marginal data. It was also suggested that reflected standards be used under standard viewing conditions. Another question raised was the placing of a color scale on the film prior to exposure; thus improve the consistency of processing.

The photographer's viewfinder in the aircraft might be used to enable the photographer to determine color of a scene during photography. A further question raised was whether the observer could go through color matching with a light mixing apparatus.

All of the questions raised at the meeting were interesting although they strayed away from the central problem which is depicted in the title "Measuring and Specifying the Color of Exposed and Processed Transparencies." All of those attending participated in the discussions and agreed to do further work on the problem.

NOTE: Questions on Problem 31 should be addressed to Mr. John T. Smith, Jr., Chairman, Problem 31, American Society of Photogrammetry, 105 N. Virginia Avenue, Falls Church, Virginia 22046.

Abraham Anson
Chairman

SPSE SYMPOSIUM

The Society of Photographic Scientists and Engineers (SPSE) will present its third Symposium on Unconventional Photographic Systems at the Marriott Twin Bridges Motor Hotel in Washington, D.C., on Thursday, October 21 through Saturday, October 23, 1971.

Unconventional Photographic Systems are defined as other than those photographic systems which use conventional silver halides to form images.

Three sessions are planned, each devoted to a particular group of related systems and introduced by an invited state-of-the-art review paper covering the significant developments in the field since the last report in this Symposium series. The major topics and Sessions Chairmen are: Non-Conventional Silver, Chairman (to be announced); Electrophotography, Dr. Arthur G. Tweet, Xerox Corporation; Organic-Based Imaging, Dr. J. David Margerim, Hughes Research.

The materials of photography will provide the focus of the technical papers. These will be supplemented by discussion sessions and workshops on the various applications including:

Photoresists	Microphotography
Radiography	Holography
CRT Recording	Facsimile Transmission
Graphic Arts	Office Copy

COLOUR GROUP (GREAT BRITAIN)

Report of the Seventy-eighth Meeting of the Group Held in May, 1971

The ninth meeting of the 1970-71 season was the occasion on which Dr. R. A. Weale presented his Retiring Chairman's Address entitled "On Art and Colour Vision." The aim of the talk was an attempt to consider a specific group of paintings in the light of scientific principles and to see what inferences or conclusions could be reached. Value Judgements were excluded except in so far as they commented on the extent to which the artist achieved what he had set out to do; for instance, comments on the correctness of the spatial arrangements in Hogarth's paintings could be made without saying whether they were good or bad.

A very convincing and amusing demonstration of the illusion which can be created by a picture was given by Dr. Weale when he shaved Franz Hals' "The Laughing Cavalier" to show that the gentleman in question was not really laughing, the illusion being created by the angles of his moustache and his head and cockiness of the baroque-age hat.

Although problems of aesthetics, style and composition were ignored, the question of technique was very important because it is a vital link in the chain of communications between the artist and his public. An ambiguous composite picture such as Borings "Wife and Mother-in-law" figure results from an unambiguous technique; clearly the dual nature of the picture would be destroyed if it were coloured rather than black and white. Thus an unambiguous technique has produced a diversity in the stimulus and the response it evokes.

Outstanding examples of this are shown by pointillist paintings such as that by Seurat of his mistress powdering her face. There is an apparent greyness about this picture at a first glance, but on closer inspection, although the atmosphere is misty, there is no powder settling on any of the surfaces. From really close quarters, the picture appears to be loaded with countless hues but the contours of the objects disintegrate.

What was the object of painting in dots when for centuries artists have used brush strokes of varying lengths to achieve their effects? The answer is to be found in the fact that pointillism was consciously based on scientific principles. Knowledge on the nature of vision and colour vision expanded considerably in the late eighteenth and nineteenth centuries and it was grasped by Seurat and applied to pointillism. The object was to enhance the luminousness of paintings by colour mixtures produced by juxtaposing small coloured elements and letting the eye do the mixing.

The problem, however, is complicated by the effects of simultaneous contrast but Seurat was aware of this and designed his spectral mosaics accordingly. The principles he used were the laws of Chevreul who devised a contrast circle on the circumference of which he placed coloured pigments so that complementary colours (and hence high contrast colours) lay at opposite ends of diameters. His system of colour harmony was based on the idea that the greater the angle between the radii joining two colours to the centre of the circle, the greater the contrast between the two colours. Now what Seurat missed, although Chevreul was obviously aware of it, was that contrast with large patches is easier to achieve than with small ones.

The various processes involved in viewing result in pointillist paintings appearing to be grey when seen at a distance but at close quarters the colour dots can be clearly observed. Dr. Weale demonstrated this by projecting pairs of similar slides of Seurat's paintings, one of each pair being projected so that it was linearly three times smaller than the other which simulated the effect of distance. Opinion was divided among the members as to whether the smaller projection was greyer but of the course the demonstration was complicated by the varying viewing distances of the members of the audience.

It was in 1884 that Seurat conquered Paris overnight but by 1889, when his work was being exhibited in Brussels, his contemporaries said the paintings looked grey. Pissaro, the well-known contemporary and follower of Seurat was at great pains to explain away his master's limitations. A painting, he said, should be seen as Nature is seen, namely at a sufficient distance to allow colours to blend. Pissaro quantified this distance as three times the diagonal of the painting. This advice, which shows how far his scientific grounding fell short of Seurat's, could begin to make sense only if the size of the dots of the painting bore a fixed relation to its size. Assuming that the diagonal of a given painting is 100 cms in length and the component dots are 3 mms in diameter, at Pissaro's minimum distance of viewing, each dot subtends at the eye an angle of about 3' of arc. The minimum angle of resolution of the normal human eye is nearer 1' of arc but this is for high-contrast targets and with low contrast, the value approaches that computed according to Pissaro. Of course, Seurat's paintings did not all conform to the above ratio of dot diameter/picture diagonal.

The ironically tragic thing is that Seurat died at the age of 37 in 1891 just three years before König discovered that when patches of colour are small we tend to confuse them -- the effect now known as foveal tritanopia. In painting his pictures, Seurat was hardly likely to step back to view them to a distance sufficiently large for foveal tritanopia to occur.

Finally Dr. Weale mentioned some work by Daw on the eyes of goldfish which has some bearing on the problem since they contain a system of contrast sensors similar to those in our eyes. Daw illuminated the centre of the field with one colour and the surround with another and found that the response was diminished if the colours were the same. If the colours were different, the response was enhanced, but this depended on the relative sizes of the centre and surround. If the central area was too small, a colour contrast in the surround was of no avail.

Thus, it would appear that the disputed failure of Seurat's paintings can be attributed not to psychological difficulties, problems of style or aesthetics, but to the way in which our retinae are organised.

M.B.H.

DESIGN AID COMMERCIALLY AVAILABLE

The Butterworth Group has published the ICI Colour Atlas, an unique visual aid which illustrates over 27,500 shades. For the past year the atlas has been available only to customers of ICI Dyestuffs Division. Eight years' research and development by a technical team went into the production of the atlas, which represents a striking advance in the field of colour identification. Previous reference documents covered at most 2500 shades.

An entirely new principle of design enables the 1379 colours illustrated to be permuted into 27,580 by using a set of 20 optically graded filters which are provided. The atlas is simple to use; colours can be easily identified and communicated.

ICI have arranged with Butterworths that practical demonstrations by trained personnel shall be available to prospective customers. These can be arranged through ICI sales offices and Butterworths offices and agents both in Britain and internationally.

The atlas is intended for use by colourists, designers, textile and paint manufacturers, printers, and all who have occasion to employ a wide range of colours. It costs £ 110.

From Chemistry and Industry
27 February 1971, p. 235

CERAMIC COLOUR STANDARDS (GREAT BRITAIN)

The Pilot Studies

In 1967 the British Ceramic Research Association and the National Physical Laboratory Metrology Centre were separately approached by ICI Dyestuffs Division for advice on maintaining the calibration and monitoring the performance of the various types of photoelectric tristimulus colorimeter used throughout the world in their pioneer instrumental colour-match prediction service. After appraisal of the problem a working party was formed, with representatives from the three organizations and the Society of Dyers and Colourists, to consider the problem as a general one facing all industries involved with colour control or measurement problems.

BCRA was mainly concerned with advising on the general properties of ceramic materials and with the problem of procuring and investigating suitable material from their member firms, whereas NPL was concerned with the more general standards aspect. It was felt by NPL that if a suitable set of reflection colour standards could be produced in large numbers and used on a widespread scale in industry, then not only could the problem of monitoring the consistency of colorimeter operation be solved, but also two other more fundamental aspects could be covered at the same time, namely the diagnosis of specific types of functional error in instruments, and the elimination of inter-laboratory discrepancies caused by uncertainties in the calibration of white reference standards.

Nineteen types of ceramic wall tile were selected for examination in more detail, this initial selection being based on some preliminary work by ICI and B Ceram R A. These prototypes were given an exhaustive spectrophotometric investigation at NPL covering the ultra-violet, visible and infra-red regions of the spectrum (200 nm to 2000 nm). The use of different combinations of source, detector and geometry allowed analysis of any fluorescence or thermochromism. Results were later published in NPL Report MC2 "The spectrophotometric properties of a selection of ceramic tiles."

As a result of this study a final choice was made of the twelve types to be used to make up a set of Ceramic Colour Standards. The factors which influenced the choice were the shape of the spectral reflection function, the colour specification (chromaticity co-ordinates x, y and luminous reflectance Y), the surface finish, certain manufacturing considerations, and any fluorescent or thermochromic properties.

The Ceramic Colour Standards and their Properties

The twelve types chosen were manufactured in an improved form in special mass production runs during Autumn 1968, and all standards of a particular colour type were made in a single run. This ensured that for a particular colour type not only were the colours closely similar, but also the spectral and spatial reflection properties. Thus a statistically homogeneous population of 1000 colour standards was produced for each colour type, and it became possible to indicate the distribution of individual variation within the population of 1000 by making careful measurements on an adequate sample of 60 of each colour type. This part of the work was carried out at B Ceram R A using a direct-reading tristimulus colorimeter.

NPL has now determined as accurately as possible the spectrophotometric properties of a Master Set chosen to be of near average characteristics. Three geometries of illumination and view were used, and Cary 14 spectrophotometer measurements were checked against those made on the NPL high accuracy spectrophotometer. At present NPL is engaged in measuring fifty sets for supply as calibrated standards and in order to determine the relative variations. In addition the goniophotometric properties have now been determined. Ceramic Colour Standards are available in uncalibrated form at a very low price, and most industrial users will find these adequate for their purposes. Previously they used the data on the prototypes in NPL Report MC2 for information and calculation but are now able to use some of the data on the NPL Master Set which has been circulated to all purchasers. In this way they have available a calibration to a level of certainty sufficient for most industrial purposes. This is only valid because of the homogeneity of manufacture that was exploited in this work. Other users such as manufacturers of colorimeters and spectrophotometers, laboratories of large firms in the colour industries, and other national standards laboratories need a high accuracy of calibration, and they can purchase individually calibrated standards from NPL.

One advantage of the scheme is that a user needing several sets of standards to cover different factories can calibrate them all to a high level of accuracy if he obtains just one NPL calibrated set. This will be valid even if he only has instruments of doubtful accuracy available (provided the precision is adequate), because of the similarity in spectral and spatial reflection characteristics among tiles of the same colour type.

To date approaching 500 sets have been sold since November 1968 by the British Ceramic Tile Council, who represent the manufacturers and who are handling the supply and distribution. NPL has had firm orders for the calibration of about 30 sets, and we estimate from enquiries that all 50 sets will have been bespoke by 1973. These figures are in excess of the rates of ordering predicted by the working party, and it is most unlikely that there will be any wasted material or effort.

Uses of the Standards in Industry

The most common use for Ceramic Colour Standards is checking the consistency of operation of a firm's colorimeters and/or spectrophotometers. This is often of greater concern to a manufacturer than the absolute accuracy of the measurement. Checking the accuracy is an obvious second category of usage, and this becomes important when several firms are trading with each other in products where the colour is important: discrepancies of measurement (usually of unknown origin) have been a major obstacle in this field for many years.

When discrepancies are checked using the standards and the offending instrument or instruments are identified, the question of diagnosis of the origins of the errors has to be tackled, and Ceramic Colour Standards are particularly useful here. Errors due to non-linearity of the photoelectronic system are readily checked using the three grey tiles in conjunction with the white reference standard, allowing six points on the reflectance scale to be verified. Errors due to inappropriate spectral responsivity are much more difficult to analyse so as to derive the precise cause: here NPL provides an unique service to users of Ceramic Colour Standards involving the use of a special computer program to process results measured on the nine spectrally selective tiles. Finally, discrepancies due to differences in the illuminating and viewing geometries of the instruments involved can be resolved by making use of the NPL goniophotometric data, which apply to all tiles of a given colour type to an accuracy of about 0.1% in reflectance.

For further information please contact:

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England

BOOK REVIEWS

Goethe's Color Theory

Rupprecht Matthaei, Ed. Translated from German by Herb Aach. New York: Van Nostrand Reinhold, 1971. 275 pp., $27.50.

After half a century studying Goethe's scientific writings, the Editor, Rupprecht Matthaei, a physiologist and Director of the Goethe Archives at Weimar, extracted from all of Goethe's writings on Color Theory what he considered useful, both historically and in a present-day sense. These were published in German in 1970, then translated and published in English. The translator, Herb Aach, a member of ISCC, is a well-known American artist with a special interest in color.

At first glance this reviewer wondered why, in the span of a year, two publishers (MIT Press and Van Nostrand Reinhold) would reproduce facsimile copies of the 1840 Eastlake translation of Goethe's "Farbenlehre." However, even a casual perusal revealed that this splendid publication is far more than a mere repetition. The Eastlake translation is quite incidental to the rest of what is presented, many articles for the first time in English.

Following a foreword by the translator, and an editor's preface, there is a first section from Goethe's "Contribution to Optics" in which he first announced (1791) a thesis on color. This section had not previously been translated.

Next there is a transition section written partly by the editor but including material on color submitted by Goethe to Schiller as early as 1792. This section provides the background for the "Color Theory" which follows, and which, as the major part of the book, is an improved translation of sizeable parts of Goethe's "Farbenlehre." For example, Eastlake had translated Farbenkreis (color circle) as "color scale" and "color gradient."

The book terminates with an epilogue that spans the years from 1805 to 1829. The epilogue contains a series of excerpts from Goethe's writings which had not previously been available in English.

The editor eliminated sizeable portions of the Color Theory for clarity and ease of reading, but felt that the full Eastlake translation should be included at the end to satisfy the reader who really wanted the full text. It made it possible also to check differences in the present translation as compared with the earlier one (although it is largely the same).

This reviewer would suggest, as a preliminary to reading this book, that the reader first consult the Introduction by Deane Judd in the 1970 MIT translation. It gives an excellent, yet concise, introduction to Goethe's color theory. (ISCC Newsletter No. 208, p. 7).

The book was beautifully printed in Germany, and is profusely illustrated with color. Its 9-1/2 x 12 inch format made it possible to include hundreds of annotations in the borders of the pages. They comprise a running and highly helpful commentary at the places in the text to which the annotations refer, not found in other editions. For the first time, too, Goethe's illustrations appear directly in their specified places for ease of reference.

This is a book that anyone interested in color should add to his library.

Robert W. Burnham

Behind Appearance

C. H. Waddington. MIT Press, Cambridge, 1970. 256 pp. $25.00.

The ambitious plan of this book is to study the relations between science and painting during the twentieth century. The author would seem to have excellent qualifications for this task. He is Professor of Animal Genetics at the University of Edinburgh and in addition has visited many art museums and has many friends within the art world. The book contains 71 excellent color plates of modern paintings and 136 (it should have been 137!) black and white illustrations; it is worth owning to have these alone.

Unfortunately I feel that the author has failed to show anything more than an obvious, trivial link between science and painting. Most of the quotations from artists referring to the influence of science on their work show that they have absolutely no grasp of the scientific principles that they mention; it is half-understood science. Of course painters talked about Einstein's theory, but so did the man in the street with equally little understanding. The experiments with new representations of objects in paintings would have taken the same direction whether or not Einstein's theory had been formulated. The apparent similarity between certain modern paintings and photographs of the microworld is surely a coincidence; these scientific studies did not have appreciable influence on this school of painting.

After a discussion of the role of chance in modern painting through the use of such techniques as allowing paint to trickle down a canvas or throwing or flicking it at the canvas, or blotting or squashing it, Waddington states that this whole range of techniques "is clearly connected with a view that the structure of the universe is not so fundamentally deterministic as had previously been thought." On the contrary I cannot find any clear-cut evidence in this book to support this point of view.

Unfortunately much of art criticism is absolute gibberish. Many authors apparently feel that the more impenetrable their verbiage, the more impressed the reader. This time-honored tradition in art criticism is continued in this book. A few quotations from among many possible examples illustrate the point. "Arp's intuition that stochastic or chance processes are one of the fundamental aspects of natural processes could scarcely have arisen before. Darwin and the quantum physicist between them had loosened up the framework of strict determinism into which men had previously tried to force the universe around him." All of this is in a paragraph that discusses a painter who allows a string to fall at random on a canvas and then sticks it down. I am sure that he could have performed this act just as well regardless of whether or not quantum theory or the theory of natural selection had been developed.

Another quotation which needs no comment: "Participation is a general feature of much recent painting . . . this characteristic is fundamentally allied to the Whiteheadian or biological synthesis between the opposing physicists' views about perception, represented on the one side by Heisenberg (in science man confronts himself alone) and on the other by Schrödinger (science attains a reasonably successful world view only because man and mind are totally excluded). This is a major and pervasive way in which recent painting is congruent with the most advanced scientific outlook of today."

There are well-written and thoughtful passages in the book, such as "The scientist does not go to the painter for a representation of scientific objects, but for the enrichment and deepening of his consciousness, which comes when he finds a painter in whom the climate of scientific thought has penetrated into the spirit, leading to the production of works in which some of the deeper, less easily expressible, features of the scientific outlook are 'shown forth.'"

There are interesting descriptions of the works of many modern painters. On the other hand the descriptions of modern scientific theories will not interest our readers; in addition they are often misleading and inaccurate. Anyone purchasing the book should check the binding first. The review copy arrived with one entire section loose that had never been sewn into the binding. These pages fell out every time that the book was opened. The book provides a summary of the many different trends in modern art, but it does not show any substantial influence of modern science on the artist.

Gilbert N. Plass

Reprinted with permission from Applied Optics, Vol. 10, 1971, p. 1140.

ISCC PROBLEM PROPOSAL

Title of Problem: Methods of Improving Communication Between Art and Science in Color.

Problem: The problem is essentially that defined by C. P. Snow (Two Worlds). While there is a body of opinion that denies the reality of any such special communication problem, there is sufficient contrary opinion and evidence to justify a systematic investigation within the ISCC, an organization that is notably, and perhaps uniquely, qualified by its constitution for such a study.

Scope: Solution of the problem would require:

1. Definition of the subject fields.

2. Delineation of differences, if any, among subject fields with respect to objectives and methods.

3. Recommendations for resolving such differences as might be found.

R. M. Hanes

GRAPHIC ARTS TECHNICAL FOUNDATION

Seventeen graphic communications firms became members of the Graphic Arts Technical Foundation during the second quarter of 1971, GATF Executive Director William H. Webber announced recently.

Total Foundation enrollment now stands at 2258, including 1005 company members and 1253 contributing members. The latter are employees of GATF-member firms or teachers and students in the graphic communications field.

The new firms include: Cy Aaron Publication Co., Inc., Detroit, Mich.; Color Press, College Place, Wash.; Duquesne University, Pittsburgh, Pa.; Mo Och Domsjo Aktiebolag, Ornskoldsvik, Sweden; P. R. Publishing Co., Inc., Humacao, Puerto Rico; P. T. United Can Co., Ltd., Djakarta, Indonesia; and Syncreators Limited, Port of Spain, Trinidad, West Indies.

Also: Graphic Service Inc., Pittsburgh, Pa.; A. Hoen & Co., Inc., Baltimore, Md.; Interstate Printing Co., Omaha, Neb.; Lockwood Folding Box Corp., Norristown, Pa.; and Waterbury Republican and American, Waterbury, Conn.

Others include: Fabricas Monterrey, Monterrey, Mexico; International Artcrafts Co., Ltd., Stratford, Ontario, Canada; Keys Printing Co., Greenville, S.C.; The Public Press Ltd., Winnipeg, Manitoba, Canada; and V. G. Reed & Sons, Inc., Louisville, Ky.

Company membership in GATF is open to all firms interested in the promotion and performance of graphic communications research and education.

Contributing membership is open to all employees of GATF-member firms and all full-time graphic communication teachers and students.

Additional information concerning GATF membership may be received by writing: Department for Foundation Advancement, Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

ENCLOSURES

1. Leaflet: "Sources of Color Science" selected and edited by David L. MacAdam.

2. Reprint: "Colorimetry of Transparent Materials" by Ruth M. Johnston, Kollmorgen Corporation. Interim report of ISCC Subcommittee 14.

3. Flyer: "New Improved Diano/Hardy Recording Spectrophotometer"

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