Inter-Society Color Council *News*

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IN THIS ISSUE

Report of President Joyce Davenport

Your Board of Directors met three times since the Annual Meeting in Pittsburgh, April 14-17, 1985; first in Toronto, September 26-27, 1985; second in Williamsburg, February 8-9, 1986, just before the Conference; and finally again in Toronto, June 14-15, 1986, just before the Annual Meeting. At these meetings the future course of ISCC is charted, problems encountered on the way are resolved, and the success or failure of previous programs evaluated.

Judged by almost any criterion, the Pittsburgh Annual Meeting last year and the Williamsburg Conference this year were each very successful. The subject matter was timely, and they brought together experts from a variety of disciplines to share our common interest – color. The success of any meeting is due in large measure to the hard work of the program chairmen. We take this opportunity to recognize those who shouldered the major responsibility for our meetings this past year. Joy Turner Luke was the dedicated Program Chairman for the Annual Meeting in Pittsburgh, and Jacqui Welker, the dynamic Chairman of the Federation/ISCC Symposium on Color and Appearance Instrumentation (SCAI) that followed the Annual Meeting. Robert Feller was our hard-working Chairman of the Williamsburg Conference, and Danny Rich was his co-chairman. Each meeting was successful financially as well as technically.

During the year the Board authorized three large but necessary expenditures for (1) printing a large stock of letterheads with the spectrum in color, (2) sending a memorial contribution to the Color Laboratory at Rochester Institute of Technology (RIT), and (3) producing a colorful, one-page brochure that defines ISCC, lists the member-bodies, states the organization and objectives, and outlines the procedures for achieving the objectives. We are indebted to a number of people for the development of the brochure, particularly, Anna Campbell Bliss, Bonnie Swenholt, Tom Webber, and the Graphic Arts Department of RIT.

A little over a year ago, a 15-item questionnaire was sent to the membership in an effort to document the percentages of members in various color categories, such as Art/Design, Education, Technical, and Research, and to evaluate how well the meetings and the newsletter were filling the needs of the membership. Ralph Besnoy conducted the survey and analyzed the results in a memorandum to the Board dated January 22, 1986. Although the number of members responding was only a small percentage of the membership, the results will provide guidance to the Board for future projects, meetings and communications.

During the year, ISCC lost by death several of its outstanding members – world-class citizens of the color community, specifically Dorothy Nickerson, Gunter Wyszecki, and Franc Grum. There were other dear colleagues who passed on, such as Sylvester Guth (Past-President of CIE), Robert Hoban (Past-Director of ISCC), and Charles Jerome (Past-President of ISCC). In a gesture of collective honor the Board voted to send a substantial contribution to the Munsell Color Science Laboratory at RIT. We trust that ISCC's leadership will encourage individuals as well as other organizations to make contributions to the cause of perpetuating color education and research at RIT or other institutions. Because Dorothy Nickerson was deemed to have contributed more years of service to ISCC during her lifetime than any other individual, the Board voted to designate the Service Award as the *Dorothy Nickerson-ISCC Award.*

One of my objectives when I became President was to have closer ties with the national color organizations of other countries. The furtherance of that objective was facilitated at the meeting of the International Color Association (AIC) at Monte Carlo in June 1985. About eighteen national society presidents attended an AIC luncheon honoring Robert Hunt, President of AIC (1981-1985), and Heinz Terstiege, President (1985-1989). We are pleased to have Dr. Terstiege and his family with us in Toronto for this joint meeting of ISCC and CSC.

Our meeting in Toronto reveals the advantages of having two sister societies combine their efforts. This is the first time that ISCC has held an Annual Meeting outside the United States. To accomplish this joint meeting required nearly two years of planning between the Canadian Society for Color and the Inter-Society Color Council. I wish to thank Shelagh Stewart, Alice Chui and Peter Kaiser of CSC for their contributions that were so vital to making this joint meeting successful.

There have been a few changes in appointed officers this past year. Harry Hammond volunteered to serve as Interim Editor of the Newsletter to relieve Mary Ellen Zuyus. She was elected a director and has now been appointed Chairman of Publicity. Justin Rennilson is the new By-Laws Chairman. Both of these offices were previously held by Thomas Webber who resigned for personal reasons. I take this opportunity to thank all the appointed officers who served this past year.

I thank the retiring members of the Board, Ralph Besnoy, Anna Campbell Bliss and Daan Zwick, for their service, and at the same time welcome the newly-elected Board members, Paula Alessi, Roland Connelly and Mary Ellen Zuyus.

At this meeting two awards will be presented. To present awards intelligently requires a hard-working chairman to ferret out eligible members and then select the most deserving. I take this opportunity to thank the Chairman of the Dorothy Nickerson-ISCC Service Award Committee, Ralph Stanziola, and the Chairman of the ISCC-Macbeth Award Committee, Charles Sherman.

Many individuals have helped me during my term as President of ISCC and I take this opportunity to thank each of them.

The office of President is indeed an honor to be conferred on anyone. Thank you for giving me the opportunity to serve you. I hope that I have fulfilled your expectations.

The transition to a new president should be a smooth one as I have endeavored to work closely during the past two years with your President-Elect, Allan Rodrigues.

Allan, I present you with this gavel, your symbol of office, and wish for you a very successful term as ISCC President.

ANNUAL MEETING REPORTS

Business Meeting

The 1986 annual business meeting of the Inter-Society Color Council (ISCC) was held on June 18, 1986, following the annual business meeting of the Canadian Society for Color (CSC). Both Society's meetings were held at the end of the Business and Awards Luncheon.

After calling the meeting to order, President Joyce S. Davenport thanked all participants for their presence at the first joint meeting of CSC/ISCC. She then presented the report of the president.

President-Elect Allan B.J. Rodrigues spoke briefly on the status of the Project Committees.

Secretary Therese R. Commerford reported on the number of new individual members in the ISCC this year and referred to her report to be published in the Annual Report issue of the ISCC News. Treasurer Edward T. Connor briefly summarized the reports of the Treasurer and the Finance Committee which will be reported in detail in the Annual Report issue.

President Davenport announced that the new directors for 1986-1989 are Ms. Mary-Ellen Zuyus, Ms. Paula Alessi and Mr. Roland Connelly. Certificates of Appreciation were presented to: retiring directors Ms. Anna C. Bliss, Mr. Daan Zwick and Mr. Ralph Besnoy; Past President Louis A. Graham; former Arrangements Chairman Bonnie K. Swenholt; and former By-Laws and Publicity Chairman Thomas G. Webber.

The Nickerson Service Award was presented to George Gardner by President Davenport who read the citation.

The Macbeth Award for 1986 was presented to Max Saltzman by Ruth Johnston-Feller who read the citation. It was followed by a standing ovation.

The gavel was passed from Out-Going President Davenport to Incoming President Rodrigues.

The Meeting was adjourned at 2:00 p.m.

Respectifully submitted,

Therese R. Commerford, Secretary

Report of the President-Elect, Allan B.J. Rodrigues

By recent tradition, the primary assignment of the President-Elect has been to chair the Problems Committee. The ISCC currently has twelve active Project Committees, ten of which met at the Annual Meeting in Toronto. In addition, as a result of the very successful 1986 Williamsburg Conference, a group is exploring feasibility of a project on "Color Restoration and Presentation." The American Institute on Conservation has indicated an interest in co-sponsoring such a project. During this past year:

Committee #25D, Strength of Colorants, Dyes closed. The American Association of Textile Chemists and Colorists, co-sponsor of this committee, indicated to us its pleasure with the success of this committee over the years.

Committee #38, Philatelic Color Designations, turned in a closing report. This report is available from the ISCC Secretary.

Committee #27, Indices of Metamerism, published an article "New Terminology for Metamerism Revisited" in Color Research and Application.

With the approval of the ISCC Board of Directors, we have instituted some changes in the Problems Committee. We have streamlined the responsibilities of the Coordinators and Project Committee Chairmen to improve communications to the membership and to the Board. These include:

– A schedule of reports to ensure timely publication in ISCC News.

– Synopses of the Committees' work and an agenda for the Annual Meeting to help attendees plan which committees they wish to participate in. This was used at the Toronto Meeting.

– Board review of each committee every two years. This is to determine that the committee has meaningful and achievable objectives and any necessary support of the Board.

Finally, chairmanship of the Problems Committee will no longer be automatically assigned to the President-Elect. This is a major task and should be the primary responsibility of an individual within the ISCC. Other responsibilities of the President-Elect detract from the demands of the Problems Committee. The Board has appointed Mr. Hugh Fairman to chair the Problems Committee for the next two years.

Report of Secretary Therese R. Commerford

Since my last annual report, the Council has suffered the death of two former presidents, Mr. Charles (Chuck) Jerome and Dr. Franc Grum. Mr. Jerome served as president from 1976 to 1978, and Dr. Grum from 1978 to 1980. Dr. Grum was the recipient of the 1985 Godlove Award, in recognition of his many contributions to the field of color. Both gave generously of their time in service to the Inter-Society Color Council. They will be missed for their many contributions to color science, and for the enthusiasm and guidance they provided to us and the Council.

The following table lists the number of ISCC members in each of several categories, as of June 1, 1986. The numbers fluctuate monthly, as new members are added and old members deleted because of resignations or addresses unknown.

Membership Category	*Number of Members*
IMG: United States	595
Canada	12
Other Foreign Countries	75
IMGR (Retired)	19
IMGS (Students)	11
Honorary Members	10
Delegates	200
AIC Representatives	23
Member-Body Liaison	33
Library Subscribers	19
Total Membership	907

Since many delegates and AIC representatives are also IMG's, the total membership is not the sum of the various categories listed.

Report of Treasurer, Edward T. Connor

The year 1985 produced a favorable financial result for ISCC. The Income Statement gives the exact figures of income and expense. For the following analysis the figures are rounded.

Our income of $64,100 was derived from meetings (75%), dues (16%), interest on investments (8%) and misc. sources (1%).

Expenses were $54,500 of which 68% were associated with meetings, 24% for the Newsletter and the balance of 8% for all other items.

Income exceeded expenses (on a cash basis) by $9,600 – bringing the Council's accumulated surplus to approximately $58,000.

Looking ahead, we are budgeting a light loss in 1986 in recognition of printing and publicity costs which do not occur every year and substantially lower net from meetings.

I wish to extend my thanks to the Officers, Directors and Finance Committee of the Council for their strong support to the Treasurers Office during this successful year.

INCOME STATEMENT FOR YEAR 1985

INCOME	$ 9,951.00	Dues Receipts
	360.00	Newsletter Subscriptions
	687.00	CR&A subscriptions
	30,810.34	Williamsburg Conference – 1985
	17,126.00	Annual Meeting – 1985
	5,165.24	Interest on investments
	$64,099.58	
EXPENSE	$ 70.25	President's Office
	750.18	Secretary's Office
	285.29	Treasurer's Office
	223.97	Directors' Meetings
	59.83	Committee Expense
	9,346.40	Newsletter
	3,683.79	Newsletter Covers (40K–4 yrs.)
	25,791.63	Williamsburg Conference – 1985
	11,229.27	Annual Meeting – 1985
	979.00	CR&A subscriptions
	740.49	Stationary, Letterhead, 20 reams
	202.33	ISCC brochure – layout/prep.
	185.67	Publicity – General
	151.60	AIC dues, 4 yrs. – 1982-1985
	351.02	Godlove Award ($300 mold for redesign, $51.02 engraving & postage)
	409.25	Service Award ($158 T&L Mrs. Davidson, $251.25 award prep. et al)
	88.94	Bank charges (foreign check cashing)
	$54,548.91	
SURPLUS	$ 9,550.67	

E.T. Connor, Treasurer
June 11, 1986

ISCC *News*

Gavel Passes, Davenport to Rodrigues

Outgoing ISCC President, Joyce Davenport, passes gavel to incoming President, Allan Rodrigues at Annual Meeting in Toronto, Ontario, June 18, 1986. Photo by Harry Hammond.

Principal Officers, ISCC and CSC

Principal officers of Inter-Society Color Council (ISCC) and Canadian Society for Color (CSC) at opening of first joint meeting of the two societies, Toronto, Ontario, June 15, 1986. Left to right: Allan Rodrigues, ISCC President-Elect; Joyce Davenport, ISCC President; Shelagh Stewart, CSC President; David Chesterton, CSC President-Elect. Photo by Harry Hammond.

MACBETH AWARD TO SALTZMAN

Citation by Johnston-Feller

It is a great pleasure for me to present some remarks about my old friend, Max Saltzman, appropriate to the occasion of his receipt of the 1986 Macbeth Award. First, I would like to remind you of the basis for selecting a recipient. Norman Macbeth, long-time treasurer of the ISCC and former Chairman of the Board of Kollmorgen Corporation which included in its member divisions the Macbeth Color group, established the Award in memory of his father, Norman Macbeth, Sr. It is awarded every two years for contributions to the field of color made, preferably, in the last ten years. One might expect this criterion would favor youth. However, it certainly applies to those who retire from one type of work and then build a whole new career in a different field of endeavor.

On this basis Max qualifies beautifully.

Before discussing his latest career, however, I would like to review briefly his career up to the date of his retirement from industry in 1973.

Max graduated from the City College of New York, fifty years ago, at the ripe old age of nineteen. Prior to beginning his work for Harmon Colors in 1947, Max worked in less colorful areas such as medical instrument research during the war years.

At Harmon Colors beginning in 1947 he became involved in making objective color measurements, in developing methods for identifying organic pigments and dyestuffs and in defining criteria for the selection of pigments for specific applications.

In 1961, when Harmon was acquired by Allied Chemical Corporation, Max became technical assistant to the Vice-President of the National Aniline Division, where he was responsible for planning and budgeting research on pigments and intermediates. His interest in the measurement of color and use of computers for color matching continued. In 1966, when he chaired the first ISCC Williamsburg Conference, he established the highly successful format which has been so important in making the Williamsburg conferences so rewarding and enjoyable. Also during this period, he and his very good friend made during the war years, Dr. Walter Bauer, dreamed of establishing a program for graduate training of scientists in the science of color. Dr. Bauer, an eminent rheologist, was Dean of Science at Rensselaer Polytechnic Institute. Learning that Dr. Fred W. Billmeyer, Jr., then working for duPont, would be happy to undertake establishing such a program, the Color Science Laboratory at RPI was established. The rest is history. Max served as adjunct professor there from 1965 until 1982. The two books, "Principles of Color Technology," editions 1 and 2, coauthored with Fred, were published during this time. The second edition of their book is dedicated to the memory of Dr. Bauer.

In 1973, Max retired from Allied Chemical and moved to the West Coast. He was now able to devote much more time to one of his other major interests, the study and identification of ancient – and not so ancient – dyestuffs in textiles. He established a color identification laboratory in the Institute of Geophysics and Planetary Physics at the University of California at Los Angeles. He has continued his interest in industrial color problems by serving as an industrial consultant. However, his work in the identification of ancient dyestuffs led him to a new career in the area of the conservation of historical textiles and other objects. His interest took him, in typical Saltzman "back to basics" fashion, to the mountains of Peru to collect authentic examples of the dyes, and sources of those dyes, used in ancient Peruvian textiles. Fascination with historical textiles also led him to authorities and institutes of entomology in Europe, to obtain rare insect specimens from which the ancient red dyestuff, Kermes, was obtained, whence he was able to "correct the textbooks" concerning the true source of Kermes. These are examples of some of the important contributions that Max has made in his recent endeavors.

Meanwhile, he became active in the American Institute for Conservation of Historic and Artistic Works (abbreviated AIC also) of which he is now a Fellow. This organization, in 1984, honored him by asking him to present the George L. Stout Memorial Lecture, one of the most prestigious honors bestowed by this organization. When the J. Paul Getty Conservation Institute was established, Max was asked to become a consultant, a position he continues to fill.

We know Max as a generous and enlightening teacher, devoted to approaching problems by first defining and studying their basic concepts. The organizations he belongs to attest to his broad interests: American Chemical Society, American Association of Textile Chemists and Colorists, Federation of Societies for Coatings Technology, who in 1969 presented him with the Bruning Award for his outstanding contributions to color in the coatings industry, Society for Plastics Engineers, Society of Dyers and Colourists (U.K.), The Colour Group (Great Britain), the Optical Society of America, the International Institute for Conservation of Historic and Artistic Works (IIC), the American Institute for Conservation of Historic and Artistic Works (AIC), and, of course, the Inter-Society Color Council (ISCC) which made him an honorary member in 1984. Max is listed in American Men and Women of Science.

In this year of 1986, during our joint meeting with the Canadian Society for Color, whose basic purpose is the study of color in industry, science, education, and art, I can think of no one person who better exemplifies the union of these disciplines than Max Saltzman, recipient of the ISCC's 1986 Macbeth Award.

Ruth M. Johnston-Feller

SYMPOSIUM REPORTS

Color Reproduction: State of the Art

Report by Joann M. Taylor

The jointly sponsored Inter-Society Color Council / Canadian Society for Color (ISCC/CSC) Meeting was held at Ryerson Polytechnic Institute in Toronto, Ontario, Canada, June 15-18, 1986. In addition to project committee meetings and special subject workshops, this meeting featured a topical symposium entitled, "Color Reproduction: State of the Art." A broad range of applications was covered by the eight speakers, each of which discussed special areas of expertise and particular color reproduction concerns.

The first speaker, featured at Monday evenings banquet session, was internationally renowned potter, teacher, lecturer, and author, Robin Hopper. In his lecture, entitled "Color from the Ground Up – The Ceramic Spectrum," Robin discussed the clay and glaze materials which evolve from the earth and provide the artist with a medium that, despite a limited number of materials, is capable of tremendous color variation. He also focused on the works of some current potters. Many illustrations demonstrated how the influence of an art history rich in color and form has manifested itself in these more current works of pottery.

The day long session of the symposium that followed on Tuesday, June 16th was led off with a presentation on hand printmaking techniques by painter and printmaker, Steven Sorman. Examples of different techniques, including engraving, relief printing, and lithography, as well as intaglio and printing utilizing multi-viscosity inks illustrated some of the numerous methods for rendering colors in hand printmaking. Various requirements for each method were discussed in addition to design considerations and media limitations.

Richard Ingalls, of Target Color Technology, began his discussion of accurate hardcopy rendition of color video images with an original poem that chronicled the users of color throughout the ages, the evolution of those users who became increasingly more concerned with color, and finally, the continuing growth of the understanding of the science of color. The emphasis of the remaining discussion focused on achieving color matches between video and photographic renderings obtained using target color exposure control. The utilization of color instrumentation to obtain matches within the color gamut of the media and the need to produce images which correspond to the users individual color standards were stressed.

A tutorial on color reproduction in photography detailing the two stage negative/positive photographic system, with discussion of new developments, was conducted by Paula Alessi of Eastman Kodak. Reviewed were the ways in which film composition can be altered and the ways in which spectral sensitivity, sensitometry, and color correction can effect changes in the color of the final photographic print. The overall color reproduction goal is to make the image as close as possible to the original in terms of colorimetry. The color correction technology embodying masking and inter-layer interimage effects was discussed, and its utilization in Kodak VR-G 100 film was illustrated.

Stanley Quinn, of the Canadian Broadcasting Company, reviewed the standards which presently define color rendition in television as well as opportunities for improved implementations in the future. Discussion focused on technical performance of the various TV system elements (i.e. receiver, camera) as well as the theory of the current National Television Systems Committee (NTSC) Standard. The possibilities for new color rendition standards, particularly the High-Definition Television (HDTV) standard being developed internationally within the television industry, were discussed primarily in terms of development considerations and the potential for improved resolution.

The next topic considered by Robert Buckley, of Xerox, was non-impact printing technology, principally color xerography. A description of the physics and mechanics of the xerographic process was given in light of current state of the art. Discussion followed on overlapping color capability and the three pass process used in xerography. Special media requirements were reviewed and the advantages and disadvantages of competing technologies were assessed.

Color reproduction in the automotive industry is a task confounded by the complex appearance attributes that are difficult to quantify in terms of current color descriptors. Helen Delp, of DuPont, discussed the challenges of working in this field and used many illustrative scenes from nature to demonstrate how pattern, texture, gloss, illumination, and, of course, color contribute to appearance and are thus factors in color reproduction. The properties of various high-technology finishes and the effects of their utilization in automotive applications was reviewed. Reproduction of color in a chemical sense was contrasted with reproduction in terms of the stylists mental concept of color. In conclusion, aspects of reproducibility and other color quality control parameters were considered.

The final symposium presentation by Roland Connelly, of Burlington Industries, dealt with color reproduction in textile applications. Prior to the late 1920's, the coloration of textiles was exclusively an art form, but it is now a combination of art and science. Discussion focused on the interdisciplinary nature of color science as well as various methods and related features used in coloring of textiles. Outlined were the important steps in making a color, including measurement, formulation, quality assurance, and customer satisfaction. The presentation concluded with a review of some of the future aims of the industry to incorporate new technologies in the process of textile color reproduction.

On the whole, the symposium gave an overview of a few of the many areas in which color reproduction concerns are currently being addressed. Kudos to Paula Alessi and Peter Kaiser for assembling a diverse group of speakers with far ranging interests and expertise. This group of presentations was illustrative of how the scientific and artistic aspects of color are being worked on jointly and expanded continually to meet the needs of industry.

Color Reproduction Symposium

Report by Harry Hammond

The Symposium began Monday evening after the banquet at Ontario Place where Robin Hopper spoke on *Color from the Ground Up.* He has a fine sense of humor. For example, his brief biography published in the meeting program stated that "... in 1877 he became the first recipient of the Saidye Bronfman Award, Canada's most prestigious award in the crafts." So what did Hopper do but play the part? He obtained a theatrical costume, and, after a fine introduction by Shelagh Stewart, appeared at the podium as an old, heavily bearded, hermit! His entrance was hilarious. It caught the amateur photographers without their cameras ready; so we have no picture.

The seven papers presented the following day were all interesting. Among the interesting innovations at the morning session was Richard Ingalls' introduction of his paper, *Accurate Hard Copy Color from CRT,* by means of a poem he wrote for the occasion, entitled *The Colorist, What Next?* Many of us have come to recognize Ingalls as a very resourceful and ingenious fellow, but few of us knew of his ability to write poetry. Your Editor asked Ingles for a copy of the poem and he kindly supplied it. Is he a possible candidate for poet laureate of ISCC? You be the judge. Here is the poem, right from his word processing computer.

The Colorist, What Next?

First, we used our eyes, and that was good,
because we thought we understood.
We were not in awe, of what we saw,
because our food was eaten raw.
For a million years our light was the sun
it helped us get our days work done,
blue was blue and red was red
and color helped us make our bread.

What Next?

Then someone wanted to wear a green, a red, or something in between.
They made a pigment, or a dye, from a plant or special fly.
And put color into our dress, to improve our cheerfulness.
Paint our houses, paint our boats, decorate our cats and goats,
makeup our checks, our nose, our eyes, create a colorful disguise,
fabrics woven with such hues, that kings and queens would pay their dues.
Potters, weavers, cooks and bakers, jewelers, printers, and shoemakers,
using color to foretell, what their shops were going to sell;
using chroma with ease and skill to put a shekel in the till.

What Next?

Someone said, "I want a pink, something special in a mink."
Make a hat in burnt carmine, and a belt in bluish green.
Broccoli brown, bronze, or buff, cinnamon, for sleeve and cuff.
Fawn, russet, olive gray, there was a color to make their day.
The salesman knew if they'd dislike it, there'd be a color that would make them like it.
"I want my shoes to look the same, in wood, or straw, or local game."
"Match this red, this green, this blue, do it all with this one hue."
The colorist said "where can I go?, there's so many things I need to know."
"Color comes from light," Sir Isaac said, "mainly indigo, blue, green and red."
"There's yellow, orange and violet too," with a million jobs for us to do.
"Now that's a switch," the colorist said, "I've been eating light instead of bread."

What Next?

Artificial illumination changed our visual sensation.
Spectral power distribution wrote a brand new constitution.
The way we saw objects appear put us in another sphere.
We had to know more of what we saw, to understand the visual law,
to learn the principles of light, and understand the sense of sight.
Reflection's something we can see, absorbtion's spectral trickery,
we find that light includes refraction, plus a lot of other action.
Dispersion makes the waves appear, diffraction bends them far and near
transmission turns the colors free, in motion pictures and TV.

Interference, iridescence, scattering and phosphorescence
test perceptibilities and try our new psychologies.
We find, we do not see alike, from great observers like
David Wright.
We research, study, and agree, there's more to learn, much
more to see.

What Next?

Lets understand and make it right, measure it and expedite
the analytical persuit, to control color absolute.
Purity and harmony, hues in elliptical geometry
record the red in xyz, chart the spectral curvery.
L*a*b* too, there must be other things to do.
Color difference in delta e, through spectrophotometry
calculate the chemistry, just why we see metamerically,
try, colorimetry and the eye, visual theories to show us why
the rods and cones do what they do, that ageing modifies our
view.

What Next?

Now there's color that we see, dancing on the CRT
manipulating reality with graphics and photography
conceived with flexibility, and cerebral agility.
Combining text, changing hue, modifying value too,
enlarge, reduce a nose or tie, make a house look like a fly.
Tickle the computer keys in your own computerese and
image scenes you've never seen, on a phosphorescent screen.
Save it all in memory right and send it off by satellite
in a visual anecdote to a place that is remote.

What Next?

With all of this image magic, something seems a little
tragic.
Something we forgot to do, in reflection, match a hue,
Resolution, high or low, technologies have to go
toward a means to make a match, now there's a trick,
there's the catch.
How to make the CRT look as real as it can be
and make a real sample that, looks like this one,
in a mat.
Make hard copy, just to hold, underneath your chosen light
and see the sampling unfold, merging colors that look right.
Colors that you can place, in a file you can trace.
Colors that you can send to Peoria or South Bend.

What Next?

In our minds there is a means to send color to New Orleans
and make a matching sample to a special red or special blue
measuring in density, or spectrophotometry.
Note the target in cap Y, and little x, little y,
program in basic or other lingos, processing binary jingles
and let the computer do its boot, with a colorist's salute
additively printing with light, making hues from black and
white.
Making color matches that shall, create a color festival
in reflective reality, in hard copy you can see
in a size that we can use, in a form that's hard to lose
composed with mental infinity, composed upon the CRT
and brought to you by Marjorie, by Target Color Technology.

Richard Ingalls
June 1986

EDITOR'S NOTE:

Your Editor failed to ask each author for a copy of his paper, but he did ask Helen Delp for hers because it was so well organized and presented. She provided a copy of the manuscript, less the 18 colored slides. It would be nice to have the paper published in a journal with the colored illustrations, but that would be costly. However, your Editor decided that with a little editing and deletion of the references to the slides, it would be suitable for publication in the *News*. Now some people object to turning the *News* into a journal, and your Editor is not in favor of that either. However, it is hard to condense a beautifully written manuscript. Besides some readers have been asking for more substance and less stale news. So here is the paper, a bit long and only slightly edited.

REPRODUCTION OF COLOR IN THE AUTOMOTIVE INDUSTRY

by Helen R. Delp, E. I. Dupont Company, Wilmington, Delaware

Color reproduction has many different meanings, depending on the field under consideration. Frogs have become rather adept at color reproduction because often their survival depends on their blending into the background. Color reproduction is important in art, science and industry for other reasons. In this presentation, we'll concentrate on industry and discuss color reproduction from the viewpoint of those who supply finishes to the automotive industry. We'll describe special appearance properties that complicate color, with emphasis on the techniques that can be efficiently used in applying color science to automotive finishes.

Color reproduction has three specific interpretations in the automotive industry. In styling, which involves the initial creation of colors to enhance the image of a car, color reproduction means the creation of a finish to match a concept or a mental image. The stylist may see a striking image in nature or in fashions and, like an artist, will strive to re-create the color impression on an automobile. This effort can be challenging, and indeed often isn't possible, since the lighting and materials available to the stylist are limited compared with nature.

In formulation, which involves the creation of a formula for each color, color reproduction means copying colors found on automobiles. This task is necessary to provide body shops with paints for repair or to provide the same color in finishes having different chemistries or appearances. In formulation the challenge is how to make the color. The problem is simplified by the fact that, since the color exists, it can be measured. It is this phase of finish manufacture that we emphasize here.

In shading and spraying, color reproduction means the consistent production of a given color. It involves precise control of the manufacturing process, so that batches of paint and automobiles on the assembly line are identical in color and appearance to the eye, although they are made at different times, in different locations, and under different conditions.

The ability to reproduce color is important in selling paint. Precise color control by paint suppliers is critical. Painting automobiles would be expensive for the manufacturer if custom matching were required to accommodate parts made at different locations. Color is also an important attribute of the final product, the car. Color contributes to the image and appeal of an automobile. The colors used on an overland rover help to convey the impression of rugged durability; they tend to be light and bright for a perky economy car; and conservative or subdued for a luxury limosine. Buyers frequently select a car on the basis of color preference. And most important, color uniformity and consistency influence judgments of the overall quality and reliability of an automobile. Because color has high visibility, its quality reflects on the quality of the products associated with it.

Appearance Properties of Color

Perceived color is determined not only by the interaction between light and the object but by the relative color and intensity of all other light in the field of vision. The natural world is filled with complex visual stimuli: a wide variety of color combinations, naturally occurring patterns, and complex surfaces. Shiny kelp and rough sand are approximately the same color but look quite different because of their surface textures. Specular reflections on the kelp result in a perceived color which varies from white to dark brown. The sand, on the other hand, diffuses the light and appears more iniform in color.

Pattern can interact with color. Linear patterns in flower petals can be distinguished from the circular patterns in the flower centers of the same color. To reproduce the appearance of either area, the pattern must also be reproduced. Sometimes, under special lighting conditions, patterns of unnatural color combinations can occur, as in a red maple leaf with yellow veins. Either color can be reproduced, as can the average color, but the visual sensation created by a complex pattern cannot be reproduced without also reproducing the pattern.

Variations in the color and direction of light can create unusual color sensations. A beavertail cactus is colored by predominantly blue lighting except where it catches direct yellowish sunlight. The color contrast is accentuated by the different color and intensity of the two light sources. Rocks that catch a spotlight of the setting sun, can create a warm, golden-reddish hue and an almost flourescent appearance. Sometimes the directional light source is much brighter than the overall lighting. In this instance, a canyon wall and the moon appear to be sources of light.

In a beach photo, the color of the sand and water can change gradually from pink and yellow in the background to pink and blue in the foreground, although the illumination and surface properties are constant over the surface. The effect is caused by a gradual change in the angle of observation from grazing to the perpendicular, causing different parts of the sky to be reflected in the water. Under typical lighting conditions, many of these effects would diminish or disappear. The directional multicolored lighting conditions must be reproduced to re-create the effects. A slate banked pool is seen reflecting a golden arch and the sky and clouds above it. Pebbles and rocks disturb the surface of the pool and appear to become part of the reflection. The combination of real objects with reflections creates a confusing image, similar to many effects seen in automotive finishes. Reflections in a partially frozen lake illustrate the difference between diffuse and specular reflection. Where the water is liquid, the mirrorlike specular reflection images the hills, trees, and sky above the lake. The frozen surface, however, because of its roughness, diffuses light from all directions to the observer. Dark regions where dark trees would be reflected are detectable although blurred. The difference in appearance between the two regions is caused by the difference in the directional properties of reflection.

The variables of pattern, texture, direction and color of illumination, and direction of viewing are integral parts of color perception and thus of color reproduction. Although visual stimuli produced by automotive finishes are limited compared with those encountered in nature, the same variables are present. When related to automotive surfaces, many of these properties are traditionally called appearance; color, however, cannot be isolated from them. A single measurement of color pertains only to a specific lighting and viewing condition. Color cannot be reproduced without reproducing pattern, texture, and directional variations in reflection.

Matte, Glossy, and Metallic Finishes

Let us consider the directional characteristics of finishes in more detail and their relationship to appearance. Many appearance properties of a finish can be reproduced by measuring and duplicating these characteristics.

The appearance of an object is defined by the light reflected from it that enters the observer's eye. For a painted object, the light can be divided into an external and an internal component. The external component is reflected from the surface and has a color identical to the light source. The internal component is selectively scattered and absorbed by the pigment particles. This uniformly colored light is emitted uniformly in all directions in a diffuse pattern of reflection. Light reflected from an object is the sum of the colored diffuse component and the uncolored surface component.

With a perfectly smooth surface, parallel rays from a distant light source such as the sun are reflected at the mirror reflection angle and remain parallel. A point light source creates brilliant white highlights wherever the observer is looking at the mirror-reflection angle. Away from the highlights the surface reflection does not enter the observers eye so the color is determined by the diffuse colored component. The surface reflection also creates a mirror image of surrounding objects.

Different pieces of a rough surface are at different angles and reflect light in different directions. For a perfect matte surface the external component is reflected diffusely, that is, uniformly in all directions, in the same pattern as the internal colored reflection. Since both reflections are diffuse, they combine to make a color uniform over all viewing angles. The usually white external reflection tends to dilute and lighten the colored reflection of the object. Real finishes are somewhere between the extremes of the ideal matte and smooth surfaces.

The relative amounts of light that make up each component depend on the refractive index of the material and on the angle of incidence of the light. For a shiny surface, the angle of observation will thus determine at any point how much of the object color is blended with reflected images.

Spheres can be used to illustrate the difference in appearance between rough and smooth surfaces because different points on a sphere are at different angles to the light source and the eye. The smooth surface has a sharp white highlight at the specular angle and, away from the highlight, is darker and more saturated than the rough sphere.

One of the most desirable finishes available on today's cars is the color-coat/clear-coat finish, so called because the colored layer of paint is covered with a completely clear layer to achieve an almost perfectly smooth finish. The result is a high-gloss finish with sharp highlights, mirrorlike reflections, and a deep saturated color, which makes color-coat/clear-coat finishes very appealing. The same effect enhances the color of rough rocks when they are put under water.

The difference in surface texture between an ordinary finish and a color-coat/clear-coat finish actually causes a color difference, which makes it difficult to match the color of one finish with the other. The color of a color-coat/clear-coat finish is so deep and saturated that its color often cannot be achieved without a glossy surface. Matches between lines of paint can be accomplished only by increasing the smoothness of the ordinary finish without applying a clear coat, or by adding flatteners to the clear coat (reducing its glamorous appearance), or by compromising and achieving a desaturated match. Similar problems with different textures also occur in attempts to match the color between metal, plastic, fabric, and carpeted surfaces.

With a metallic finish, a third component of reflection – metallic flake – is also present. Metallic flakes act like little mirrors mixed into the paint. If the flakes were all parallel to the surface, they would create a mirror-image reflection similar to the surface reflection. The flakes, however, are close to parallel and vary in orientation. Their reflection is thus spread around the specular angle, the width of spread depending on the distribution of the flake orientation. The total amount of reflection in this component depends on the number and size of the flakes. The metallic flake component, however, is not pure white like the surface reflection but partially colored by the pigment. The reflection pattern for a metallic paint, then, is the sum of the three components. Metallic finishes are important because they comprise about seventy percent of today's market.

Again, spheres illustrate the difference in appearance between the various finishes. The smooth surfaced spheres have sharp white highlights located at the specular angle. Surrounding the highlight, the metallic spheres also have a softly colored highlight, which diminishes away from the specular angle. The sphere with a larger coarser flake also shows a mottling pattern and sparkle, another effect which also complicates the reproduction of metallics. The smooth surfaced spheres are darker than the rough spheres away from the highlights. The effect of mottling and sparkle are also enhanced by a smooth surface.

In an automobile, curved surfaces allow different parts of the car to be observed simultaneously under different lighting and viewing conditions. For an ordinary solid-colored finish, approximating a matte surface, the color will appear to be uniform. With a clear coat applied to give a smooth finish, bright white highlights will be located on the surface at points viewed by the observer at the specular angle, and the color will be deep and saturated. With a metallic finish the sharp white highlights will be surrounded by areas of softer highlights, darkening other parts of the surface. The metallic component tends to contour the curves of a car with highlights, giving an appealing appearance.

Directional variations in reflected light are related to many appearance properties – highlights, reflections, soft metallic contours, and deep, saturated colors. To reproduce these appearance properties, the directional reflection pattern must be accurately reproduced. The first step is to measure reflectance as a function of angle. Although the ideal case would be to measure all angles of observation for all angles of illumination, this approach is not practical or necessary in manufacturing. A compromise is needed. There are really three separate reflection components that must be measured: the colored diffuse component, the surface highlights, and the metallic flake component (its size and width). Measuring these components gives information about the amount of pigment, the surface texture, and the size, orientation, and amount of metallic flake. The reflectance varies smoothly with angle and characterizing it should not require many measurements.

Interpreting a Scene by Eye

Looking at still life, we can recognize the three-dimensional shapes, the surface textures, and the materials by the way each object reflects light. Sharp, white highlights on the ceramic goose and glass cruet indicate a hard, smooth surface. The plant and the white vase have softer highlights characteristic of rough surfaces. The brass candlestick holder and copper pot have colored highlights characteristic of metallic surfaces. The irregularly shaped highlight of the cooper pot reveals its surface texture. Some surfaces accentuate the three-dimensional shapes of objects better than others. The gradual highlighting of a lemon and a white vase reveal their shape well. Soft contours of light and shadow contour the shape of the ceramic goose. The rough surface of the green canister, however, has no highlights and appears almost completely flat. There are other clues: The transparency of the glass is indicated by the distorted image of the objects behind it. The color of the liquid combines with the pattern of the material behind it. We can also see reflections in the white vase of the plaid material. An artist knows that, under different lighting conditions, objects can appear to be quite different. Diffuse lighting eliminates highlights and makes the objects seem flat. Backlighting or colored lighting can change the relative lightness of the objects. There is much information about the objects in any scene which can be measured and utilized to reproduce the object and its appearance.

Many of these effects are found in automotive finishes to some degree and enhance the appearance of cars. High-gloss finishes give the appearance of a hard, durable surface. Reflections of the surroundings give a more glamorous appearance. Metallic flakes in a finish soften the highlights and emphasize the three-dimensional shape of a car's contours. The patterning effect imparted by the flakes also adds complexity to the appearance. Tinted clears occasionally used as top coats, like colored liquid in a glass, combine with color from the base coat to produce novel effects. Interference colors, similar to those seen in oil slicks or bird feathers, are produced by adding coated transparent flakes to automotive finishes.

The problem of color reproduction in the automotive industry is different from that encountered by the artist. Artists select a specific scene with the illumination and view needed to create the desired effect. They paint in the highlights, shadows, and reflections, creating a static scene in two dimensions. In the automotive industry, on the other hand, the object produced must resemble the original from any view and in any scene or lighting condition. For a perfect reproduction, the automotive finish must have the geometrical and surface characteristics needed to create the desired appearance under all conditions.

The techniques available to achieve such faithful reproduction are limited in the automotive industry. While an artist can employ visual effects such as adjacent complementary colors to give the illusion of a sharp highlight, the painter of automobiles is limited by the medium. If a paint vehicle provides a rough surface texture, there is little that can be done to enhance specular reflection, or highlights, without changing the surface texture.

A professional artist knows by experience which pigments to use to make a given color and adjusts the amounts until the desired color is achieved. In industry we cannot hire an artist to paint each car. How, then, does one go about selecting the correct pigments and the required blend for each color of paint without an artist? Recall the formulation step in the manufacture of paints. It is done ahead of time by a specialist highly skilled in the color and chemistry of paints, using the most advanced computer tools. Formulation, when done properly, makes many manufacturing problems easy to control.

Formulation

To reproduce what an artist does in selecting pigments and finding a formula, we first need to describe the color to be created. For this task we need an instrument to measure the light reflected from a finish and convert it to numbers that characterize the color. Usually we must have a sample of the color before it can be formulated. Second, we need an accurate database of pigment characteristics. Like a pigment mixing chart, this database contains information about how the pigments interact with each other.

Accurate measurement is important because of the sensitivity of the eye to color differences. The eye will read a color in an artist's painting as false if its relationship to neighboring colors is false. Similarly, it will easily detect a small difference in color between two adjacent panels of a car. Also, a small error in measured reflectance can result in a large error in a computed formula. For example, with dark or saturated colors, an error of one-tenth of 1% in measured reflectance can produce a factor-of-2 error in the amount of one ingredient. An accurate color-measuring instrument is therefore needed, both to measure the sample to be matched and to create the pigment database.

The color-measuring instrument is analogous to the artist's eye. Just as the artist must be able to see the color to reproduce it on the palette, so the instrument must be able to measure the effects to be controlled. If angular reflectance variations in the finish are to be controlled, the instrument must have multiple measurement geometries.

At Du Pont we use a spectrophotometer, which measures reflected light as a function of wavelength. A computer then multiplies by the desired light source and tristimulus weighting functions X, Y, and Z, and then sums over the visible spectrum to compute the color. Another color-measuring instrument, the colorimeter, uses color filters to approximate the X, Y, Z weighting functions and takes one measurement for each filter, thus measuring the color directly. The spectrophotometer is more accurate than the colorimeter because it does not rely on color filters. It also gives us enough information to compute the color under any light source. With the reflectance curve we can also check the specific pigmentation. The color of the formula is more likely to match the standard under all lighting conditions, if the same pigmentation is used.

Once the computer contains a pigment database and a description of the desired color, the pigments are combined to match the color. Since the computer doesn't know which pigment combinations would be best, it tries all combinations, solving simultaneous equations to match the color. Those combinations that cannot make the color are discarded. For most desired colors there will be several combinations of pigments that will make the color, each with a different appearance. The formulator, using the computer, must choose between them.

Many factors must be considered in choosing between pigment combinations. Although the different combinations will all be nominally the same color, the quality of the color match may vary. Some formulas may change color under different illumination. Because of pigment chemistry or particle size, some formulas may have less gloss than others or different directional variations. The appearance of the metallic flakes may vary, either in sparkle or softness of metallic highlights.

Other factors unrelated to color must also be considered. Some of the pigments may be expensive because of ingredient or manufacturing cost, thus affecting the price and competitiveness of the product. Some pigments are transparent, and therefore much more pigment is required for complete coverage, or hiding, which also increases cost. Some combinations of pigments are chemically incompatible. Although the artist tries to control the pigment interaction to produce special effects, in industry such effects would not be repeatable. Incompatible pigment combinations are avoided. Durability may be a problem for some pigments or pigment combinations. Some formulas may be difficult to shade to the exact color desired. If the desired color is highly saturated, for example, and its prime colorant is not consistent, it may be difficult to achieve the exact hue without desaturating the color. The process is complicated, and we must rely on the formulator to select the best combination in light of all the variables.

We developed the Color Formulating Terminal, to assist the formulator in matching colors. To use the terminal a person measures the reflectance of a sample on an attached spectrophotometer, which stores the measured value as a function of wavelength and angle. The computer attempts to make a formula to match the color of the sample, with all possible combinations of all pigments, using the pigment characterization database. The results are shown simultaneously on a text and graphics screen.

As many as eight formulas may be generated for a given color. For each formula, the pigments and their percentages are shown, followed by the metamerism and cost of the formula. Metamerism is a measure of the degradation of the color match as the color of the light varies. The cost includes both manufacturing and ingredient cost. The graphics terminal gives information for two selected formulas. The reflectance curves, usually indicate whether or not the formula contains the correct pigments. Color differences between the standard and the formula are shown for one measurement angle.

Color patches simulate the actual color of the standard and the formula. Although they are not a perfect color replication, the color differences are accurate and can be used to evaluate the acceptability of the color match. The job of the formulator is to find the optimum formula – balancing color position, spectral curve, cost, and metamerism.

The terminal also has a manual mode for problem solving whereby the formulator can change pigments or adjust the amounts and see the effects immediately. This mode can be used to identify pigments in a formula; or the formulator can immediately identify the source of a problem, such as too dark or too yellow aluminum flake.

The formulating step is important in manufacturing because it simplifies the shading process in the plants. By selecting the correct pigments the formulator controls cost, durability, hiding power, metamerism, and appearance problems before production begins. Eliminating concern for variance in the color of the illuminant means that tristimulus rather than spectrophotometric data can be used, simplifying the manufacturing process.

Because the Color Formulating Terminal is designed to work with the formulator, it displays a wealth of data at one time in a compressed format, enabling the formulator to consider many parameters at once. This feature eliminates much tedious, repetitive trial-and-error spraying as the formulator tries to find the best compromise. The terminal is easy to use, reducing the training time required for new formulators and the need for large numbers of highly experienced color specialists.

Future Challenges

Lack of reproducibility in the spraying procedure complicates all phases of color reproduction. The measurement errors it creates masquerade as mixture errors and bring about unnecessary changes to the batch during formulation and shading. It also causes variations in the appearance of identical mixtures of paint when applied at different automotive sites. The ultimate measure of well-reproduced color is not an identical batch of paint, but rather an identically painted automobile. One method of creating identical final color at different locations is to adjust the pigment mixture to accommodate spraying differences. This solution, however, requires different sets of formulas, standards, and tolerances for each customer site. An alternative and equally difficult solution is to make spraying conditions identical at all locations.

Research is needed to relate spray variables such as humidity, temperature, flow rate, viscosity, external forces, pressure, and nozzle type to variables that affect appearance – surface texture, aluminum flake orientation, and aluminum flake and pigment distribution, and from there to appearance parameters. A good, practical mathematical model for spraying would enable us to predict the results of adjusting variables. Such a development would provide a higher level of control over spray variables equivalent to the control of pigment mixture variables provided by the Kebelka-Munk theory. Direct measurement, feedback, and control of spraying variables could provide considerable improvement in the consistency of color and appearance. Measurements of color as paint is being applied could also be used to control spraying on-line.

Appearance is another area that complicates color reproduction. Color measurements depend on appearance parameters, especially lighting and viewing directions, patterns, and textures. Color can be measured for all combinations of lighting and viewing angles, but little is known of how to relate these data to appearance. Finishes can be scanned microscopically to obtain a closeup image containing information on pattern and texture. Again, it is difficult to relate the quantity of data to the perceived pattern and its relationship to color. For color, we actually measure a continuous spectrum of reflectance as a function of wavelength. Using available theory developed by psychophysicists, we can extract three numbers to characterize the color from these data. Reduction in the quantity of data from a continuous function to three numbers simplifies color considerably. A similar theory, with a similar data reduction, is needed for appearance parameters. This ability would eventually allow us to specify appearance numerically and to set appearance standards and tolerances.

As computers and colorimeters become less expensive and more portable, styling, formulation, and shading will be moved out of the laboratory and into the field. Automotive stylists will be able to dial a desired color on a color simulator and receive a sample rapidly. Instrumental computer-controlled systems will help improve quality and efficiency through end-of-the-line inspection and repair. Customized colors will be less expensive and readily avialable. But to achieve these goals, instruments and computer systems must be carefully designed to be both easy to learn and easy to use.

The assembly line operator doesn't have the desire or time to understand color from the scientist's point of view. Because of the computer's need for definitive instructions, its communication through numbers, its inability to make value judgments, and its intolerance of mistakes, it is intrinsically difficult to use. If its tasks are not of significant value to the user, it often creates more work than it saves. This is especially true for complicated problems, like color, which require much interaction between the computer and the user. Only careful study will make possible a computer system oriented toward the customer's method of operation.

As mentioned earlier in this presentation, styling involves the creation of colors to match a concept or mental image. The idea may come from the customer, marketing, the fashion industry or the anticipated use of the vehicle. To date, in spite of our efforts to develop valuable instrumental computer tools, the stylist continues to use techniques similar to the artist's to reproduce color. Such tools can't be used because there is usually no sample of the desired color and appearance to measure. The stylist has no way to communicate the color so that the computer can formulate it.

Commercially available color simulators, which employ rotating panels to create colors, have many good features. They allow a user with little scientific understanding of color to create a color by adjustment of dials. They have controllable lighting, which can also illuminate a sample panel, so that simulated colors can be visually compared with existing finishes. And, they are easily interfaced to a computer and can communicate a color concept to it. However, the color simulators also have several limitations. They do not have variable directional illumination or the capability to simulate the surface and metallic flake highlighting properties of today's finishes. Because their panels rotate, they also cannot simulate metallic flake appearance or other patterns. They don't take into account chromatic adaptation, which can change the perception of the simulated color. Also, the perception of the color may change when seen on an actual automobile.

A simulator has been developed in the laboratory to display computer-enhanced video pictures. Such a simulator allows a stylist to create a desired color on an automobile, while viewing it in a variety of scenes and lighting situations. Highlighting, reflections, and patterns can all be simulated. More important, the viewer can evaluate the effectiveness of the color with the particular style of vehicle. Colors displayed on a video simulator, however, are difficult to compare to an existing paint panel. Chromatic adaptation is even more of a problem than with the rotating panel simulator, so it would be difficult to formulate the simulated colors. A new type of simulator, which could display appearance properties as well as color, and which could supply input to computerized formulation, would be a very valuable tool. Such a simulator would make it possible to use instrumental computerized color tools in styling.

As color-control techniques are improved, the ability to manufacture more complex finishes will also increase. Modern cars have adjacent components of materials with inherently different appearances and surface textures such as metal, plastic, vinyl, leather, fabric, and carpet. Customer demand for sophisticated appearance will require a high-quality color match among these materials, both inside and outside the car. In the future, the complexity of finishes and the quality of color matches will steadily improve. Also, as we gain greater skill in manufacturing complex finishes, we'll be able to create totally new appearances. Imagine reproducing a natural phenomenon on cars – a sunset or a rainbow of colors. Or imagine creating a natural appearance – such as the patterns of marble or the directional color variations of silk. Such a challenge may not be too long in coming.

WORKSHOP ON UNIFORM OSA COLOR SCALES

The workshop entitled "Update on Uniform OSA Color Scales" was really more of an introduction to the OSA Color Scales using new models and samples than an update. New charts exemplifying the color scales were prepared by Svend Ransing of Copenhagen, Denmark. Several models, including a three-dimensional plastic model, were prepared by Joy Turner Luke and the staff of Studio 231.

The workshop, which was presented by W. N. Hale, was opened with the statement, ". . this is the most uniformly spaced color order system in the world." The body of the workshop focused on justifying the opening statement using the charts and models.

A brief history of the work of the OSA committee on uniform color scales was given to provide an overview of the reasons for the creation of the OSA color scales. Mr. Hale indicated that the current exemplification of the OSA scales is a set of 558 painted papers prepared by Hugh Davidson and is available from OSA headquarters in Washington, D.C. In this collection the (j,g) intervals are 2 units and the L intervals are 1 unit. The charts prepared by Mr. Ransing are spaced with intervals of one half the size of current OSA charts.

The uniqueness of the spacing of the OSA system was illustrated by Mr. Hale using the three dimensional model. He pointed out that the unique sampling of the OSA system has 85 cleavage planes not available in other color order systems. He also indicated that the charts in the room prepared by Mr. Ransing provide 2240 color chips and that Mr. Ransing has formulas for 3900 (L,j,g) specifications. This represents the largest single collection of examples of any color order system in the world. This exhibits a spacing as small as 0.3 OSA units or about 0.9 CIELAB color difference units.

Dr. F. W. Billmeyer, Jr. reviewed some recent research that has identified some local non-uniformities in the OSA spacing. It was emphasized that these non-uniformities are not correctable since they are very close to the limits of visual performance and in no way contradicts the opening statement.

It was pointed out that the OSA headquarters still has a few hundred sets of the original collection prepared by Mr. Davidson. However, they are currently being improperly stored in plastic folders that are contaminating the samples. Anyone purchasing a set should immediately remove the chips from the plastic sheeting and place the chips in an archival quality container.

The rest of the workshop time was used to allow the participants to closely examine the charts and models. This was certainly appropriate as a color order system must be seen to be appreciated.

Danny C. Rich

COLOR RESEARCH AND APPLICATION

Articles in Summer, 1986, Issue

This issue begins with a series of three articles on *Colour and Appearance in Nature* by John Hutchings. In Part I he begins by asking the question: Why are the leaves green? The answer is provided in terms of the physics and optics of the process of photosynthesis. He shows how adaptation to the environment has led plants to utilize available energy efficiently. In Part II, he considers the colors in flowering plants and animals (other than human), postulating the major reasons for their development. In Part III, he extends the discussion to the natural and deliberate colors of people.

Those of us involved with the coloring of materials are always interested in how well the techniques we use apply to other kinds of materials – we can often learn from the experiences of others. It is nice, therefore, to find from William M. Johnston, William J. O'Brien, and Tseng-Ying Tien how well the Kubelka-Munk theory so widely used in textiles, paints, and plastics works for dental porcelains. Read their two articles, *The Determination of Optical Absorption and Scattering in Translucent Porcelain* and *Concentration Additivity of Kubelka-Munk Optical Coefficients of Porcelain Mixtures.*

Interest in color order systems remains high in the color community. *The Story of the DIN Color System,* by Manfred Richter and Klaus Witt, appears to be the first major English-language article on this system since 1953. In the meantime the DIN system, the German standard color system, has increased greatly in prestige and importance. This article contains a definitive discussion of its structure and properties.

The relation of any color order system to the CIE system is always a topic of interest. In their article *Transformation of NCS Data into CIELAB Colour Space,* Gunilla Derefeldt and Christer Sahlin find that the transformation in relations named are not simple.

Over the years several articles and notes have appeared discussing the effects of concentration errors on color in a variety of systems. (As a coauthor of the first of these, long before this journal, I well remember the disbelief that arose when "the experts" read our limited but startling results.) Now David H. Alman has studied *Computer Simulation of the Error Sensitivity of Colorant Mixtures,* and tells just how wrong you can afford to be before getting into serious trouble.

In a largely qualitative discussion, which we hope he will find the time to back up with research details, Anders Hard, in his Color Forum contribution *Distinctness of Border: An Alternative Concept for a Uniform Color Space,* suggests a new criterion for the judgement of the equality of colors, and he speculates on the basic nature of color difference in the light of its use.

With the increased interest in the use of colored displays, as well as signal lights, has come concern about how the eye sees small areas of various colors, not only when looking directly at them, but also "out of the corner of the eye" or when vision is blurred. In the article *Successive Heterochromatic Brightness Matches for a LED Display,* Lucia R. Ronchi addresses some of the problems involved using the well-established technique of brightness matching of differently colored (heterochromatic) fields seen in succession rather than simultaneously.

W. A. Thornton makes two contributions to this issue. In his Color Forum *Note on Visual Responses: System vs. Retinal,* he clarifies a distinction that has bothered some of us who have been reading his publications, namely the difference between the responses to light of the cones in the retina of the eye and the quite different overall responses of the entire human visual system through the brain to what we call perception. Then, in his article *Evidence for the Three Spectral Responses of the Normal Human Visual System,* he concentrates on the latter, using a well-characterized set of metameric sample pairs to deduce the likely peak wavelengths of these three overall responses. They are indeed different from the peak wavelengths of the cone pigment responses.

Fred W. Billmeyer, Jr.

AIC Symposium Papers

The Proceedings of the 1986 Interim Meeting of the International Color on Color in *Computer Generated Displays* were all printed before the meeting Association (AIC) in a supplement to Volume 11 of COLOR.

A copy was presented at the meeting to each registrant and each subscriber to *Color Research and Application* received one in the mail. Anyone desiring a copy can order one from John Wiley & Sons, 605 Third Avenue, New York, NY 10158. The price is $15.95 postpaid in USA. For other countries please add $2.00 for postage. Back volumes of COLOR can also be obtained from Wiley at $70 per volume.

MATTIELLO MEMORIAL LECTURE

At the 63rd Annual Meeting of the Federation of Societies for Coatings Technology in St. Louis, Missouri, October 9, 1985, our illustrious ISCC member, Ruth Johnston-Feller, Mellon Institute, Carnegie-Mellon University, had the privilege of presenting the 1985 Mattiello Lecture. She prepared a most interesting and informative lecture entitled *Reflections on the Phenomenon of Fading.* Your Editor did not have the privilege of hearing the presentation, but it can now be read by everyone interested in fading. See Journal of Coatings Technology, v 58, n 736, May 1986, p 32-50. Although the dissertation is quite technical, both artist and scientist should find it quite interesting.

The author describes a technique for quantifying the degree of fading of colored material after exposure to light or other deleterious condition. By obtaining spectrophotometric data and utilizing color-matching equations, the amount of pigment that remains after exposure can be evaluated by computing the pigment concentration necessary to match the faded specimen. The technique is illustrated with data obtained on alizarin red, one of the most important pigments used by artists and artisans. This pigment is also a convenient one with which to work because measurable fading can be obtained in a reasonable period of time. Other colorants were found to fade in similar fashion.

The printed lecture contains 31 figures, eight in color. Fig. 29 is a series of six color photographs of a portrait painted on Mylar. Five concentrations of alizarin-lake glazes were used in painting the modeling of the sleeves. The painting was backed with white and mounted on the drum of a Fade-ometer. The colored illustration shows the unexposed painting and then the condition after different periods of exposure from 106 to 350 hours. The total exposure is reported to be roughly equivalent to 100 years on a museum wall well illuminated by diffuse daylight.

The author concludes, "The techniques described should be extremely helpful in establishing realistic warranties on appearance aspects of coatings in physical terms. They could, in the future, decrease both the time and numbers of panels submitted for exposure evaluations and, one may hope, eliminate a lot of the subjectiveness concerning the stability of pigmented systems." If you find this brief review interesting, you may wish to read the entire 19-page article.

For those unacquainted with this Federation Lecture Series, it may be appropriate to recount here that the Joseph J. Matteillo Memorial Lecture was established in 1949, one year after his untimely death at the age of 48. Mattiello was deeply involved in the technical activities of the company for which he worked, the New York Production Club, and the Federation. He had just completed the fifth volume of a comprehensive treatise on Protective and Decorative Coatings and had begun work on a sixth volume that was never completed. It was decided that it would be appropriate to perpetuate his memory and the technical work he liked to do by creating a Memorial Lectureship. At each Annual Meeting of the Federation, a technical expert of national stature is invited to present a comprehensive lecture on his specialty.

NEW ISCC MEMBERS

28 Application for Individual Membership Approved at Board of Directors Meeting. June 15, 1986

Mr. Benjamin D. Atkinson
16 Clinton Street
Cornwall, NY 12518

Mr. Atkinson is Product Manager, Color Systems, for Macbeth. His color interests include: instrumentation, color control and computerized color match prediction. He is a member of AATCC and the Society of Dyers and Colourists.

Mr. Terry E. Barton
J.P. Stevens and Co., Inc.
Taylors Plant #2
P.O. Box 7
Taylors, SC 29687

Mr. Barton's work involves Quality Control, establishing color tolerances for automotive carpet and QC of dye solutions for the laboratory. His interests include computer measurement, relating visual color difference to instrumental differences, and educating plant personnel in color measurement.

Miss Cheryl E. Beard
120 Kalmia Circle
Aiken, SC 29801

Miss Beard is a colorist for Graniteville, Co. Her work involves color control of textiles. She is just entering the field and is particularly interested in implementation of color systems. She is a member of AATCC.

Mr. William A. Binder
117 Longshore Avenue
Yardley, PA 19067

Mr. Binder is presently employed by Applied Color Systems in the Product Development Group, responsible for program specifications. His particular color interests are: problems related to ink industry, new methodology for color formulation and correction, and effects of gloss on instrumental color evaluation.

Mr. J. Thomas Brownrigg
South Acton Street
Carlisle, MA 01741

Mr. Brownrigg is a Principle Scientist with Colorgen, Inc. His responsibilities include instrumental test procedures, standards and R&D activities. He is interested in spectrophotometric accuracy and precision, translucent materials, instrumental color matching and correlation with visual matches.

Mr. James T. DeGroff
Colortec Associates
P.O. Box 636
Oldwick, NJ 08858

Mr. DeGroff has had over twenty years experience in the industrial use of color. Presently, his work involves QC systems and color matching. He also provides consulting and training services. His particular color interests include color matching, color measurement, color CRT rendering, color vision and perception.

Mr. David Dickson
BASF Fibers Corporation
P.O. Drawer 3025
Anderson, SC 29621

Mr. Dickson serves as a researcher at BASF Fibers in color science. His work is on melt coloration of fibers and fiber blends. He is a member of ACS.

Mrs. Valerie Jean Feltmann
401 Treefield
Fenton, MO 63026

Mrs. Feltmann is the Senior Colorant Formulator/Color Lab Supervisor for Carboline Co., manufacturers of industrial coatings. Her concerns are: pigments and their dispersions in a wide range of coatings; color matching; pigment strength and hue change; and tint paste dispensing systems.

Mrs. Margaret Fikioris
Winterthur Museum
Winterthur, DE 19735

Mrs. Fikioris is a conservator for Winterthur Museum. Her work is related to the care and preservation of historic textiles. Color interests include historic dyes, fading, reproduction of furnishing fabrics from the 17th - 19th centuries.

Mr. Allan E. Gore
11 Charles Circle
Mechanicsburg, PA 17055

Mr. Gore works in product development of textiles for C.H. Masland and Sons. His color interests include color development on textiles, and instrumentation. He is a member of the DCC and AATCC.

Mr. Stephen Hafer
P.O. Box 583
Canton, CT 06019

Mr. Hafer develops laboratory methods for analysis of color in gem materials. His color interests include: color perception and measurement in gemstones; relationship between instrumental data and perceived color of a gem; and measurement of gemstone color using the CIE L*a*b* color order system.

Mr. Jeffrey D. Lewis
Plasticolors Inc.
P.O. Box 816
Ashtabula, OH 44004

Mr. Lewis' work involves matching, QC and measurement of plastic material as Color Lab Manager for Plasticolors Inc.

Professor Harold Linton
25645 Circle Drive
Southfield, MI 48075

Professor Linton is Director of Freshman Design Studies in the School of Architecture, Lawrence Institute of Technology. One of his particular interests is the role of color in 3-Dimensional design applications (i.e., Architecture, Interior Design). He has recently published a book on this subject.

Mr. Charles E. Lippincott
C. Withington Co., Inc.
16 Pelham Place
Pelham Manor, NY 10803

Mr. Lippincott's work is related to coatings and plastic materials, and involves color problems in pigment supplies to industry and developing pigments for new applications.

Ms. Anne M. Malinasky
General Motors Corporation
C.P.C. Hdqtrs., Rm. 108-25
30001 Van Dyke
Warren, MI 48090

Ms. Malinasky is concerned with color quality control of textiles for automotive seat and door body application. She develops color masters on textile materials for these items, and is interested in establishing shade tolerances with a spectrophotometer. Member of AATCC and DCC.

Mr. Richard B. Maring
Megatronics
4095 Chicago Drive
Grandville, MI 49418

Mr. Maring is President of Megatronics, Inc. The company markets a color quality control system that utilizes color machine vision technology. His present color interest is the accurate electronic measurement of color, through the use of machine vision. Member of ASTM.

Mrs. Beth C. Ramsey
PPG Industries, Inc.
Glass Research and Development Center
P.O. Box 11472
Pittsburgh, PA 15238

Mrs. Ramsey is a recent addition to the Spectrophotometry Lab, where she works on color and color difference problems for glass and its related coatings. Her particular color interests include the evaluation of clear, tinted and reflective glasses, and color, color differences for experimental studies and plant production.

Mr. Robert L. Serenka
Reichert-Jung, Inc.
A Cambridge Instrument Company
P.O. Box 123
Buffalo, NY 14240

Mr. Serenka provides diagnostic and research services for ophthalmic instruments. His color-related experience includes densitometry, colorimetry, spectrophotometry and standardized Xerox Corporation color measurements and evaluation. His color interests are color vision and human response to color.

Mrs. Maruta Skelton
Winterthur Museum
Scientific Research Section
Winterthur, DE 19735

Mrs. Skelton provides analytical and research services for paint, textile and ceramic products. Her work includes the analysis of pigments on 18th century painted silks, and colorants in glass. Color interests are pigment composition, application techniques, permanence, degradation mechanisms and color interaction. Member of American Physical Society.

Mr. George V. Skowronski
113 Sugar Tree Lane
Neenah, WI 54956

Mr. Skowronski is with the James River Corporation. His work involves colorants and research on paper; specifically, the coloration of consumer tissue products. He is a member of TAPPI.

Mr. Kenn Smith
78 Ball Pond Road
New Fairfield, CT 06812

Mr. Smith provides styling and marketing services for surfacing materials – plastic laminates. His particular color interests are the psychological impact of color, color trends, and the marketing of color to the architectural community. He previously served as chairman of the ASID delegation to ISCC.

Mr. Russ Steimle
520 Washington Avenue
Holland, MI 49423

Mr. Steimle is a color technologist for the Dyestuffs and Pigments Group, BASF Corporation. His work services both the research and production of dyes and pigments used in printing inks, coatings and plastics. Color interests are color differences, and color matching by spectrophotometric methods. Member of ACS.

Mr. James Murray Stewart, Jr.
LOF Glass
1701 East Broadway
Toledo, OH 43605

Mr. Stewart is involved in production QC and research on glass for architectural and automotive products, serving as Supervisor, Spectrophotometric Lab. His particular interests in color are finding optimum color monitoring procedures for research and plant use in filmed flat glass production. Member of ASTM and IES.

Dr. Nathan Stolow
The Colonial Williamsburg Foundation
P.O. Box 194
Williamsburg, VA 23187

Dr. Stolow serves as Foundation Conservator for the Colonial Williamsburg Foundation. His color interests are in painting and photography. Current color concerns are: the assessment of color changes in works of art as a result of ageing, extrinsic and intrinsic factors; and methods of documentation of color over periods of time. He is a Fellow of: American Institute of Conservation; International Institute for Conservation; and, Canadian Association of Museums.

Ms. Susan Swierczynski
4525 Devereaux Street
Philadelphia, PA 19135

Ms. Swierczynski provides research services for coatings. She is involved in color matching. Her color interests include a variety of industrial applications.

Mr. Wade S. Thompson
2361 South Fort Avenue
Springfield, MI 65807

As Associate Professor of Art and Design, Southwest Missouri State University, Mr. Thompson provides instruction and research on painting.

His color interests include color theory and its practical implementation in applied design fields and the fine arts, and color and illusion from a painter's viewpoint while working with transparent acrylic mediums.

Mr. Ernest Wertheim
2145 Nineteenth Avenue, #2
San Francisco, CA 94116

Mr. Werthiem works in landscape architecture as an instructor and planning consultant. He is interested in the use of color in the landscape and in architecture, and seeks a better understanding of the use of color for this purpose and in the design of garden centers.

Mr. Raymond A. Young
Department of Forestry
University of Wisconsin
1630 Linden Drive
Madison, WI 53706

Mr. Young provides teaching and research services in textiles and paper at the University of Wisconsin. His course instruction and dye classification research involve color. Current interest is computer demonstration of color and color systems. Is a member of ACS and TAPPI.

HELP REQUESTED

Munsell Lab Seeks Professor

Rochester Institute of Technology is seeking candidates to fill the Richard S. Hunter Endowed Professorship in Color Science, Appearance, and Technology.

The successful candidate will direct the full activities of the Munsell Color Science Laboratory as well as chair the Department of Color Science within the College of Graphic Arts and Photography. These directed activities fall under four objectives: 1) applied research and development in color science; 2) undergraduate and graduate education including a M.S. degree in color science, appearance, and technology; 3) standardization of optical radiation measurements, particularly in those areas where material standards are either nonexistent or difficult to obtain; and 4) close liaison with industry including subscription services and continuing-education courses and seminars in applied color technology.

Color science is an interdisciplinary field comprised of physicists, chemists, psychologists, physiologists, and others. Applicants must have a doctorate in one of these fields, preferably in a physical science. He or she must have a proven record of research and development in applied color science and expertise in colorimetry and optical radiation measurements. The salary and level of rank are commensurate with qualifications. Intersted individuals should send their inquiries to:

Chairmen, R.S. Hunter Professorship, Search Committee,
College of Graphic Arts and Photography
Rochester Institute of Technology, P.O. Box 9887,
Rochester, NY 14623-0887
Affirmative Action/Equal Opportunity Employer

SURVEY ON COLOR IN FOLKLORE

A Survey has been launched on Colour in Folklore, Belief, Tradition, and Legend by the Folklore Society based at University College, London, and The Colour Group (GB).

Colour in folklore is a subject that has received very little attention. There are superstitions associated with various lucky or unlucky colours, and colours that are peculiar to various traditional activities and a wide variety of other beliefs and practices. For example, throughout Britain, the wearing of green is considered unlucky. Many brides insist on wearing white and something blue. Buddhist monks must wear orange. Western clergymen usually wear black or grey. Many nurses believe that if red and white flowers are put into the same vase, especially in a hospital, a death will follow. Colour forms an essential part of many charms and cures. There are also legends concerning specific colours; in Wales for example, a white dove flying over Lake Dulwyn in North Wales is said to be the soul of a beautiful woman on her way to Hell.

The folklore of colour is a subject about which many of us know something.

Readers of ISCC News from all countries are urged to contribute to this survey to help make it international in scope.

Please send documented information to John Hutchings, The Pyghtle, Milton Ernest, Bedford MK44 IRF, England.

All letters will be acknowledged.

COLOR HARMONY MANUAL, ANYONE?

Walter Granville has had a request from overseas for a copy of the third edition of the Color Harmony Manual. Does anyone have one that he would be willing to contribute or to sell? As most of us know this fine manual developed by Granville some years ago before he retired from Container Corporation of America has not been available for purchase for some years. When the supply was exhausted the Corporation decided not to do another edition. If you have a Color Harmony Manual with which you would be willing to part to place it in a library in Europe, or if you know of someone who might be willing, contact Granville by letter or by phone. His address is 312 Elm Court, Libertyville, IL 60048, telephone 312-362-4646.

PRODUCTS AND SERVICES

Products

Filter Colorimeter – A new filter-type tristimulus colorimeter with 45/0 geometry for reflectance measurement is supplied with a separate measuring head or with head built into the micro-computer console. In the latter format, the illuminant can be switched from CIE C to A for evaluation of color difference with change in illuminant. A measuring head with circumferential illumination can also be provided. A transmission attachment is available for use with transparent specimens. The instrument, known as Colorimeter 526, is made in Westfalia, Germany, by Erichsen GmbH & Co. For more information write in North America to Erichsen Instruments, 1350 Home Avenue, Akron, Ohio 44310 or call 216-653-3644.

Spectrocolorimeter – A holographic grating is used in a new spectrocolorimeter to obtain spectral data at 5 nm intervals from 375 to 730 nm with a sphere coated with polytetrafluorethylene (PTFE). The instrument measures reflectance or transmittance with small or large viewing area, computes colorimetric data for as many as nine illuminants and reads out in any of 22 color scales and indices. Designated the Ultrascan™ spectrocolorimeter, the manufacturer states that the instrument has unprecedented precision and accuracy. For additional information contact Beth Krauser, Hunterlab, 11495 Sunset Hills Road, Reston, Virginia 22090-5280 or call 703-471-6870.

Seminar on Colorimetry, NRC Canada

A seminar on colorimetry will be held at the National Research Council in Ottawa on 5-7 November 1986. The seminar is one of a series sponsored by the Division of Physics, National Research Council, on the measurement of basic physical quantities. Speakers will be W.B. Cowan (NRC), A.A. Gaertner (NRC), A.R. Robertson (NRC), C. Ware (University of New Brunswick) and J. Zwinkels (NRC). Subjects to be covered include basic principles of colour vision and colorimetry, the CIE system, spectrophotometry, spectroradiometry, photo-electric colorimetry, colour difference measurement, colour-order systems and gloss. There will be a visit to the laboratories of the Photometry and Radiometry Section of NRC and it is planned also to have an exhibition of commercial colorimeters and spectrophotometers. There will be ample time for interaction between attendees, the staff of the Photometry and Radiometry Section of NRC, and the instrument exhibitors.

This and other seminars in the series are designed mainly, though not exclusively, for an industrial audience and are intended to provide an updating of information and a broadening of knowledge of measurement techniques in Canadian Industry. Attendees should have a technical background but not necessarily any previous knowledge of colorimetry.

The number of participants will be limited and preregistration will be necessary. A registration fee of CDN $135.00 will be charged which will cover all lectures, a copy of the lecture summaries, a tour of the Photometry and Radiometry Section laboratories, coffee, three lunches and one dinner (on November 5).

Further information on the program may be obtained from Dr. Alan R. Robertson, Division of Physics, National Research Council, Ottawa, Ontario K1A OR6 (Telephone: (613) 993-9347). Registration forms and other information may be obtained from Mrs. Gloria Dumoulin at (613) 993-2504.

MISCELLANEOUS NEWS

Color Order Systems

In 1977, the International Colour Association (AIC) appointed a Study Group, chaired by Gunter Wyszecki, to study color order systems, historic and modern, as a source of basic reference. Members of the Study Group were from various color organizations and AIC member societies throughout the world. From 1983 to 1986 the chairman was Fred W. Billmeyer, Jr. He has now been replaced by C. James Bartleson. Billmeyer did a fine job of assembling data from Study Group members, undertaking extensive research on his own, and eventually, in 1986, compiling an exhaustive 400-item annotated bibliography that ran to 67 pages. An AIC Technical Report, "Survey of Color Order Systems," will be published in Color Research and Application in 1987.

The Bibliography has been distributed by Committee E-12 on Appearance of the American Society for Testing and Materials, identified as the AIC Annotated Bibliography on Color Order Systems. It has been sent to AIC members in 24 countries for their further distribution. It is probably the first comprehensive literature review of the subject.

In the first classification of the Bibliography, devoted to ATLASES, there are 37 references to systems that are in the Faber Birren Color Collection at the Art and Architecture Library of Yale University, New Haven, Connecticut. Probably no other single source has such a complete selection. Included are such rare items as "An Exposition of English Insects" by Moses Harris (1776) one of the first attempts at color identification from a balanced spectrum and including descriptive names in English and French; Werner's "Nomenclature of Colours" (1814), with color plates and names of special interest to scientists; Chevreul's "Des Couleurs et de leurs applications aux arts industriels a l'aide des cercles chromatiques," with extensive color plates arranged in methodical order (1864); Robert Ridgway's "A Nomenclature of Colors for Naturalists," a rare work of colors hand-applied to charts and published in 1886, some 26 years before his well known work of 1912; and Charles Lecouture's, "Repertoire chromatique" (1890) with color plates exhibiting 1300 optical mixtures.

The Faber Birren Collection of Books on Color at Yale deserves further mention. The original library, assembled by

Birren over a period of several decades, was given to Yale in 1972. An endowment fund was set up at the time and has since been increased. Two exhibits of rare items from the collection were displayed in the Yale Sterling Memorial Library in 1974 and 1982, and on this later occasion a complete bibliography was printed. (A revised bibliography of recent acquisitions is being compiled.)

In 1978 Research Publications of Woodbridge, Connecticut, released a microfilm series of over 500 titles (many in color) from the Yale library. This included a number of rare works from the renowned color collection of the Royal College of Art in London.

As it stands today, the Faber Birren Color Collection at Yale is an outstanding one. As to its representation of Color Order Systems, it is thought to be without equal in America or abroad. Preparation of an annotated bibliography is being considered.

A copy can be obtained by writing to W. N. Hale, Chairman, ASTM E-12, 1505 Phoenix Road, Phoenix, MD 21131. Enclose a 9 x 12 in. self-addressed envelope with US domestic first-class postage for 4 ounces ($0.73).

Faber Birren

COLOR AWARD FOR ART

In 1981 Faber Birren set up an endowment fund to award creative color expression in the general field of art: painting, design, graphics, textiles, sculpture, ceramics. This has now progressed through the years and has grown in reputation nationally. The program is being supervised by the Stamford Art Association of Stamford, Connecticut, Birren's home town. For the Sixth Annual 1986 Award the top prize will be $1,000, with four additional awards of $250 each offered by the Association.

Any artist is eligible to enter the competition. Submissions of art must be in the form of 35mm color slides and should be sent by August 22, 1986. For further information write Stamford Art Association, 39 Franklin Street, Stamford, CT 06901. Juror for the award this year will be Barbara Haskell, Curator, Paintings and Sculpture, Whitney Museum of American Art, New York.

COLOR IN PACKAGING

Last year The New York Times carried an article on August 20, 1985, by Pamela G. Hollie describing litigation over whether BASF Wyandotte Corporation and Fred Meyer Inc. could sell their anti-freeze in yellow one-gallon containers. The Union Carbide Corporation markets Prestone II antifreeze in a yellow container and sued to prevent the competition from using the same color for their products. In this case Union Carbide lost the case, but the article goes on to give other examples of the importance of color in merchandising:

"Certain colors send specific messages to consumers. In the soft drink industry, red means cola. Green means lemon-lime. Blue means low calorie. In the cigarette industry, red means full flavor. Green means menthol. In household products, green is pine scent. And, it would be hard to sell any dishwashing liquid in a yellow container if it did not have something to do with citrus.

The meaning and use of colors change. For years, white and black were considered elegant colors. But then supermarkets began using white for their generic, low priced store brands. White lost its packaging cachet. On the other hand, black, which went through a period when consumer companies shunned it, has made a comeback since Sunkist's success with its predominately black frozen-orange-juice can.

This year, the Package Designers Council gave half its top 14 gold award prizes in June to black packages."

In some of the examples of products associated with a specific color cited in the Times article, companies use color simply as a reference to something appealing in nature. Green for limes or for pines, yellow for lemons. But some examples are one step removed from the association. For menthol the company wants to project the image of coolness and green has two references to cool, trees again plus the fact that greens and blues are considered cool, retreating colors. Does red mean cola because the companies want an image of vigor and youth, and red seems strong?

Blue to indicate low calorie is a weaker signal and is directly product and culturally related. Its effectiveness depends on the customer having seen many products in blue containers advertised as low calorie.

The black and white examples relate to style and fashion. Someone created packaging that stood out from competing products in just the right way and then it became a style. These color signals change rapidly. They are most effective until they become commonplace. In this sense they are the opposite of the other examples, which depend on familiarity for effectiveness. The prople who create styles seem to be rarer than those who can effectively use color signals drawn from a common cultural heritage.

Joy Turner Luke

MONET'S COLOR VISION PROBLEMS

In a short item on page 27 in the August 1986 copy of *Artist* magazine Don Satalic reports on the findings of an opthalmologist, Dr. James Ravin, who has been studying how Claude Monet's paintings may have been affected by his failing eyesight. Dr. Ravin's work was published in the *Journal of the American Medical Association* but no issue was specified.

Claude Monet is one of the founders of the French Impressionist School of painters. Many of his later paintings are landscapes painted in the beautiful garden that he planted and which is still preserved in Givenchy, France. His huge late paintings are often of the reflections in the pond in his garden and are famous for their color.

"Cataracts began to rob Monet's vision while he was still in his 60's. Paintings of that period show a blurring of distant objects. Over the next ten years, his cataracts slowly worsened. With time, Monet's loose, impressionsistic style – a diffusion of form and color – become even more blurred, more indistinct.

Eventually, his palette was affected: Blues disappeared in favor of reds and yellows. Toward the end, Monet was even forced to label his tubes of paint so he could distinguish one color from another. Finally, in 1922, Monet was pronounced blind, and had to undergo cataract surgery.

After two operations, Monet – like a man kept in a dark room and then suddenly exposed to the light – was virtually blinded by color, colors he had not seen for years. After eye surgery, Monet exclaimed, "I see blue!"

But that was the only color he saw. In 1924, Monet complained to his physician: "I no longer see red or yellow. This annoys me terribly because I know these colors exist." Although Monet continued to paint, he was depressed and discouraged by the results. "It's filthy, it's disgusting," protested Monet, "I see nothing but blue."

During this troubled time, Monet may have destroyed many of the 'blue Period' canvases because he considered them inferior. According to Ravin, Monet eventually overcame his color difficulties by using specially tinted glasses, and lived on to complete a major series of paintings for the French government."

This is an interesting report. Perhaps ISCC members who have had cataract operations can comment on whether it fits their experience. Down through the years there have been a number of hypotheses built on speculated vision problems to explain what some people have considered distortions in a painter's work. In most cases the 'distortions' are probably due to style and the attempt to communicate an emotional content, but it makes for interesting conjecture.

Joy Turner Luke

CHOOSING HOUSE PAINT COLORS

An interesting article on the above subject by Carole Engle, illustrated in color, appeared this spring in Southern Living (March, 1986, page 125-127) entitled: "Exterior Paint: Make the Most of Color Choices." The author contends that "Color can shape, blend, and accentuate your homr's best features and hide its flaws." She feels that "Perhaps nothing contributes as much to a house's good looks as the exterior paint, even if that only means trimwork, shutters, and doors." She goes on to say that "choosing the best colors can sometimes be a problem." She quotes architect J. Terry Cox, AIA, as saying, "We used Williamsburg-type colors – subtle, grayed tones – as a jumping-off point and added some variations along the way." Designer Jim Clamp, ASID, of Greenville, South Carolina is quoted as saying, "If you do not have anything that merits emphasizing, don't use a fancy color scheme." Engle points out that "Most successful color schemes use only two or three different colors." Architect Cox contends that a three-part color scheme is just about the limit – siding one color, trim another color, shutters and door a third color. Architect Clarke Plaxco observes that grayed-out but rich colors seem more appropriate for traditional houses. He says, "The primary colors or clear colors do well on more contemporary architecture." Plaxco advises putting together samples of flooring, brick, and all paint colors you might want to use before making a final decision. Some paint combinations just don't go with certain roof colors or shades of brick.

The article is well illustrated with reproductions of thirteen color photographs, five of entire house fronts and eight of different entrance treatments. The illustrations graphically portray the effect of different colors and the change in emphasis associated with the color treatment of different parts of the house.

PERSONAL COLOR ANALYSIS

A Hanes Hosiery news release of March 11 introduced the Hanes Color Consultant," a personal color analysis, that, according to the release has become "one of the hottest fashion trends in the nation." They state that offering a personal prescription for colors based on an individual's skin tone will revolutionize the fashion industry and thus greatly influence consumer buying habits.

The "Consultant" is not just a person but includes the use of a specially designed colorimeter developed by Bhromatics International with the assistance of the Stanford Research Institute in Palo Alto, California. The News Release states that "this technology, combined with the expertise of Dr. Fred Billmeyer, Jr., Color Scientist and Professor Emeritus at Rennselaer Polytechnic Institute in Troy, New York, has created a unique scientific approach to personal color analysis, offering unparalleled advantages in terms of precision and reliability.

The actual color analysis uses a light sensor to obtain a skin tone reading, which is analyzed by the computer to identify the consumer's unique color dynamics. The Hanes Color Consultant will then provide a pocket-sized Color Guide and a personalized computer printout listing recommended wardrobe colors and Hanes® pantyhose shades that complement those wardrobe colors. In addition, the Hanes Color Consultant has a second program identifying Hanes pantyhose shades that complement a specific outfit selected by the consumer.

This dramatic innovation in fashion technology will be tested with selected retailers during the 1986 season. The

Hanes Color Consultant, located in the store's hosiery department, will be offered as a complimentary service from Hanes and the store.

SILICON EYE

In the Washington Post for Sunday, April 20, 1986, page F1, staff writer Michael Schrage reports on an exciting development – a first real cut at mimicking the biology of the living eye on a sliver of silicon. Carver Mead of California Institute of Technology at Pasadena states that these "analog" nerve networks using Very Large Scale Integrated (VLSI) circuit designs will do for neurobiology what gene splicing did for genetics.

Advances in VLSI microchip fabrication enables a designer to put more than a million transistors on a chip – more than ten times the number that could be placed there less than five years ago. Mead points out that most of our information processing is unconcious. We are not aware of seeing something. We just see it. Our mind chooses consiously to act on preprocessed information.

Mead's silicon eye can see every curl, twist and rotation of a twirling pinwheel – a feat that is beyond the vision systems of the most sophisticated machines available today.

PANTONE COLOR INSTITUTE

In March your Editor received a form letter announcing the establishment of the Pantone Color Institute, 6324 Variel Suite 319, Woodland Hills, CA 91367. The purpose of the Institute is to explore and communicate the influence of color in our lives because color is such an important factor in consumer choices. With the letter was a copy of "Color News," Volume 1, No. 1, Spring 1986, four pages. The first issue of the News contains twelve short items on a variety of subjects. The Institute Chairman Lawrence Herbert, included a note to introduce the Executive Director, Latrice Eiseman, who incidentally attended the 1986 Williamsburg Conference. Pantone Color News will be issued quarterly. If you wish to be on the mailing list, send a request to the Institute at the above address.

ANNOUNCEMENT

Williamsburg Conference, February 8-11, 1987

ISCC is sponsoring a conference on appearance evaluation to stimulate research and exchange information on appearance. A two and half day program of invited and contributed papers is planned. Contributed papers will consist of thirty minute presentations. A conference proceedings consisting of summaries of the papers will be available at the conference.

The program committee solicits papers on all aspects of geometric appearance evaluation, that is perceived appearance attributes caused by variation in the spatial and directional distributions of light. Papers may present models theories, instrumental methods, research methods of applications of appearance evaluation. Some example topic areas include:

Gloss, Distinctiness of Image, Haze, Transparency-Translucency, Retroreflection, Reference Standards, Metallic Flake Finishes, Pearlescence, Goniophotometry, Texture, Defect Detection, Appearance Reproduction, Visual Scales.

Abstracts were to have been submitted to the program committee by August 1, 1986, with authors notified of acceptance by September 1. Summaries of papers (up to four pages) will be required and must be received by November 15.

Authors, affiliations, principal author's address and daytime telephone number, title and abstract should be typed on one page. Submissions and requests for additional information should be sent to the Program Chairman, Dr. David H. Alman, E. I. Du Pont Company, P.O. Box 2802, Troy, MI 48007, Tel. (313) 583-8241.

PERSONALS

Popson to Receive TAPPI Award

Stephen J. (Jerry) Popson, President of Technidyne Corporation has been selected to receive the 1986 Process and Product Quality Control Division Leadership and Service Award of the Technical Association of the Pulp and Paper Industry (TAPPI). He will receive the award for the extraordinary contributions he has made toward educating TAPPI members about optical properties and for helping make TAPPI's optical test methods the accepted procedures throughout the industry.

Popson has chaired the Process and Product Quality Control Division's Optical Properties Committee for the past ten years. In that position, he has played a key role in developing and improving those test methods that measure the optical properties of pulp, paper and paper products. He has also developed and taught a number of seminars on optical properties. His efforts in both these areas have contributed significantly toward educating TAPPI members about this field of technology.

Mr. Popson joined TAPPI in 1965. He is also an active member of the American Society for Testing and Materials (ASTM), the Commission Internationale De L'Eclairage, and the Inter-Society Color Council (ISCC). He is also USA Expert in Optical Properties for the International Organization for Standardization (ISO), and a registered Professional Engineer in the state of Kentucky.

Mr. Popson, who has published several papers, has been President of Technidyne Corporation, Louisville, KY, since 1974. He received his B.E.E. and M.E. degrees from the University of Louisville, Louisville, KY.

OBITUARY

Yale Forman (1921-1986)

Lou Graham, ISCC President 1982-1984, recently brought to the attention of the *News* the fact that Yale Forman died in New York on June 20, 1986, after a short illness. Forman was a member of ISCC and served on the Publications Committee from 1978 to 1984. At the 50th Anniversary Luncheon Meeting in New York in 1981, Forman and his wife Frances gave an interesting presentation based on their earlier trip to China.

ISCC regrets the passing of Yale Forman and offers its condolences to his wife, Frances, daughter Kathy, and colleagues at Yale Forman Designs.

Forman was very active in the Color Marketing Group (CMG). The material that follows is from a letter dated June 30, 1986, from CMG President Sharon deLeon to CMG members.

Forman was a unique person – extremely capable as a designer and colorist, a true leader in the field. He also possessed tremendous vision. Speaking at a memorial service, Ken Charbonneau fondly remembered one of Forman's special talents. "I remember serving with Yale on one of the Color Directions Committees. He was enamored with the color 'boysenberry.' Many of us were skeptical – after all, weren't the browns and earthtones the current thing? But Forman persisted, and when we look back, we see that 'boysenberry' was the influence that led us into today's mauve and rose families."

Throughout his career, Forman was devoted to color, not only as a science and marketing tool, but as an art. In October, 1970, Forman spoke at the CMG meeting in Boston. The following excerpts give some insight into his character.

"I believe there is a tendency for us to be so deeply immersed in the day-to-day workings of turning out color lines, meeting market and customer deadlines that we do not readily see beyond our role in the market place – that we lose sight of our social role – the role that the creative developer and projector of color and design has always played in human history and must continue to play if the world is to be livable.

"And let us realize proudly that what is a first awakening to so many people is what we in our profession of color have always been doing – helping to make a world which not only satisfies man's physical needs, but which is also habitable and beautiful."

EDITOR'S CORNER

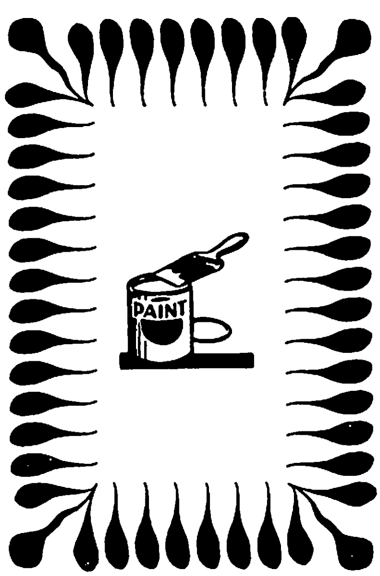
At the Board of Directors Meeting in Toronto, Peter Kaiser was named Chairman of the Search Committee to find an Editor to relieve your Interim Editor at the end of the year he volunteered to serve. In typical Kaiser fashion he went to work on the task immediately. He asked himself, what do we want in an editor? He then proceeded to list the following:

1. Someone committed to ISCC
2. Someone with a good command of English
3. A good leader
4. Someone good at cajoling others to contribute news
5. A person that is not only willing, but has the time to do a good job.

The basis of his proposed solution is to have an Editor-in Chief and one or more Associate Editors, or better still a battery of Reporters who will gather news and provide it to the Editorial Staff on a regular basis and in a timely fashion. He knows whereof he speaks, having served as Editor of the Canadian Newsletter.

Harry K. Hammond III
Interim Editor

PS: Does anyone have any news about color that he would be willing to contribute?



CALENDAR

1986

IES ANNUAL CONFERENCE
Marriott Copley Place Hotel, Boston, MA, August 17-21

ISO/TC 187, COLOUR NOTATIONS
"Stadsmissionen" House, Stockholm, Sweden, September 2-4

INTERNATIONAL CONGRESS OF PHOTOGRAPHIC SCIENCE (ICPS)
"Progress in Basic Principles of Imaging Systems." University of Cologne, Germany, September 10-17

INTERNATIONAL CONFERENCE
"Advances in Standards and Methodology in Spectrophotometry," Oxford University, Oxford, England September 14-17

SYMPOSIUM ON COLOUR IMAGING SYSTEMS
The Royal Photographic Society, Clare College, Cambridge, England, September 22-25

INTERNATIONAL DISPLAY RESEARCH CONFERENCE
Tokyo, Japan, Society for Information Display, September 30 - October 2

U.S. NATIONAL COMMITTEE, CIE
Town and Country Hotel, San Diego, CA, October 26-28

FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY
64th Annual Meeting and 51st Paint Industries Show, World Congress Center, Atlanta, GA, November 5-7

1987

ISCC WILLIAMSBURG CONFERENCE
"Geometric Aspects of Appearance," The Lodge, Colonial Williamsburg, VA, February 8-11

ISCC ANNUAL MEETING
"Industrial Problems in Color Science", The Barclay Hotel, 18th & Rittenhouse Square, Philadelphia, PA 19103, April 5-7

CIE, 21st SESSION
San Giorgio Maggiore, Venice, Italy, June 17-25

FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY
65th Annual Meeting and 52nd Paint Industries' Show, Convention Center, Dallas TX, October 5-7

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