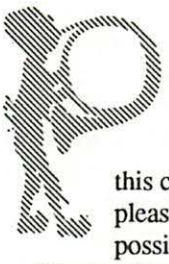
Inter-Society Color Council *News*

IN THIS ISSUE

Number 334 **November/December 1991**

CALLING ALL COLORFUL MUSICIANS!



An ISCC band is forming! If you play an instrument, please let me know. Depending on how many of us play and what styles, we might have an opportunity to play at the Princeton joint meeting with AIC next year. Who knows, this could become our most active interest group! please send me the following information as soon as possible:

Name, address, phone, fax, instrument, music styles, and music reading proficiency.

Thanks and I look forward to hearing from you.

Roy Berns
Munsell Color Science Laboratory
Center for Imaging Science, RIT
P.O. Box 9887, Rochester, NY 14623-0887
Phone 716 475 2230 / Fax 716 475 5988

Instrument: Guitar, Banjo
Style: swing, modern jazz, western swing, bluegrass
Reading: chord charts and jazz fake books

A PLEA TO ALL CONTRIBUTORS AND PROSPECTIVE CONTRIBUTORS TO THE ISCC NEWS

When submitting items for publication in the ISCC News—or when issuing reports to chairmen, it would be appreciated if you would please supply supporting, duplicate material *on disk* as well.

Disk formats are noted on the back page. If requested, we can and will return the disks to their owner.

Deadline to the editor is the first of each even numbered month, so please plan ahead.

Thank you for your consideration. *Editor*

Page 2 of ISCC News No.330 and Page 1 of the last issue of ISCC News featured articles on ISCC Member Anna Campbell Bliss and her mural, *Windows*. Here's more!

ANNA CAMPBELL BLISS MURAL FEATURED IN SCIENTIFIC AMERICAN

A two-page color photograph of the large mural *Windows* by Anna Campbell Bliss was featured on the first two pages of the lead article in the September, 1991, 190-page special issue of Scientific American. The article, titled Communications, Computers, and Networks, set the theme for the annual issue of that magazine, which traditionally features a single topic of major interest to the scientific world. The abstract of the article reads: "By fusing computing and communications technologies we can create an infrastructure that will profoundly reshape our economy and society." It was written by Michael L. Dertouzos, director of the MIT Laboratory for Computer Science.

The caption to the photograph of the Bliss mural reads: "*Windows*, an eight-by-30 foot mural made of enameled steel by Anna Campbell Bliss, explores the worlds opened by the innovative use of computers. The artist attempts to span time and place, showing how computers let us see phenomena from the microscopic to the macroscopic. The palette of colors...is typical of graphics programs. Representations of outer space are juxtaposed with images from pre-Columbian Peru as well as resent-day Salt Lake City. Bliss contrasts Chinese calligraphy with randomly generated alphanumeric printing, followed by an interpretation of computer memory.

"A 'fractalscape' evokes the future. The work is on display at the Data Center located at the Utah State Capitol."

The photograph is attributed to John Telford, University of Utah.

Anna Campbell Bliss has been an ISCC member for many years and was a Director from 1983 to 1986. Mrs. Bliss pursued dual studies in art and architecture, receiving a Bachelor of Arts degree from Wellesley College and a Master of Architecture degree from the Graduate School of Design at Harvard University. She continued at MIT and Minnesota and with computer studies at the University of Utah. Recent honors awarded her include the American Academy of Rome Fellowship, ASID Presidential Citation, and a Graham Foundation grant for color research and experimentation. Her works are exhibited in many museums, galleries, and industrial buildings.

Fred W. Billmeyer, Jr.

INTERR•I•TESTING CORNER

We welcome RIT as a regular contributor to the ISCC News. Ms Elizabeth Pirrotta of the Munsell Color Science Laboratory has promised to find interesting "tidbits" for our readers. Her first of many articles follows:

Rochester Institute of Technology has the only graduate level color science program in the country. The nucleus of this program is the Munsell Color Science Laboratory (MCSL), consisting of a collective of students, faculty and staff, rather than just a room full of instruments and computers. There are currently seven full time students and one visiting scholar associated with MCSL. While this may seem like a small, specialized group, the program encourages a wide variety of color science applications. The following is a brief introduction to these students and their particular interest.

Returning M.S. Students

Seth Ansell received his B.S. in Imaging Science from RIT with an emphasis on color and has previous experience as a professional photographer. AS a M.S. student, he has focused on imaging science in his course work. Presently, he is researching the evaluation of object texture using colorimetry for his thesis.

Ken Parton is an Imaging Science B.S. / M.S. candidate in MCSL. He is completing work on his thesis concerning the analytical modeling of ink-jet printers. He recently presented his research at IS&T's 7th International Congress on Advances in Non-Impact Printing. Upon completion of his work at RIT, he will be employed by Hewlett-Packard in the Corvallis division as a R&D engineer.

Elizabeth Pirrotta is in her second year at RIT. She received a B.S. in Color Science from Philadelphia College of Textiles and Science with an emphasis in physics and chemistry. As a student at RIT, her electives have been in optics and statistics. This year she will begin work on her thesis concerning mathematical and physcophysical testing of color appearance models.

Brian Rose has also received a B.S. in color science from Philadelphia College of Textiles and Science. His concentrations were in psychology and design, and his focus at RIT has been in computer graphics design. Currently, his thesis research involves creating an interactive computer graphics presentation to teach a color science foundation as it relates to the use of color in computer graphics programs.

New Students

Tim Kohler received his B.S. in Printing Technology from Western Washington University and also has an A.A.S. in Photography. Currently he is focusing on statistics and printing courses. He intends to do research concerning color pre-press proofing and

NEW MEMBERS

We are pleased to list the latest members to the ISCC. Their names will appear in the 1992 Membership Directory. Welcome!

Dr. David R. Cagna
7230 Wurzbach, #2406
San Antonio TX 78240
USA

Ms. Nancy J. Churchill
Williamsville Central Schools
8835 Goodrich Road
Clarence Center NY 14032
USA

Ms. Denise Cumming
Burlington Menswear
20th Floor
1345 Ave of Americas
New York NY 10105
USA

Ms. Janice Dries
Xerox Corp.
1350 Jefferson Road
Rochester NY 14623
USA

Ms. Ann G. Elwell
Interphase
380 Mt.Auburn Street
Watertown MA 02172
USA

Ms. Betty A. Grove
NEVAMAR Corp.
8339 Telegraph Road
Odenton MD 21113
USA

Ms. Susan H. Keesee
AATCC Technical Center
PO Box 12215
RTP NC 27709
USA

Mr. Timothy L. Kohler
RIT
513 Fairwood Circle
Rochester NY 14623
USA

Dr. Peter McGinley
Dulux Australia
PO Box 60
Clayton,Victoria 3168
Australia

Ms. Carol M. P-Stahl
PPG Industries,Inc./ Glass R&D Center
Guys Run Road
PO Box #11472
Harmarville PA 15238
USA

Mr. Richard G. Racheter
Internat.Academy of Merchandsg & Design Library
200 S. Hoover Blvd.
Tampa FL 33609
USA

Dr. Andrea Raggi
Istituto Di Merceologia
Universita' Degli Studi
Piazza Scaravilli 2
Bologna 40126
Italy

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image manipulation in color printing.

Nathan Moroney is another student who received a B.S. in Color Science from Philadelphia College of Textiles and Science. There he focused primarily in computer science. At RIT he is concentrating on statistics and digital image processing electives. His future research interests are in color computer imaging.

Other Students

Toru Hoshino is a visiting scholar from the Japan-based Konica Corporation and has his B.S. in Imaging Science from Chiba University in Chiba, Japan. He has been with MCSL since spring of 1991 and plans to stay for approximately two years. He will be conducting research in colorimetric compression and chromatic adaptation.

Amy North is in the final stages of completing her M.S. in Color Science and is now pursuing a Ph.D. in Imaging Science at RIT. Her M.S. thesis involved investigation of observer metamerism through measurements of color matching functions using a visual colorimeter she designed and implemented. She intends to continue her emphasis in color by working with the color appearance of images in different media.

CERTIFICATE NOTE

Some of you may have recently received blank ISCC membership certificates in the mail.

If you are current in your dues and wish to have your certificate signed and dated, please mail it to:

Mr. Hugh Fairman,
President ISCC
C/O Armorguard Products, Inc.
P.O. Box 215
Andover, NJ 07821

It will be signed, sealed and delivered to you, promptly!

OMISSIONS AND DELETIONS

There are several corrections to be noted from the last issue of ISCC News (333). Please correct as follows:

Page 7, third column should read: "...he pointed out that a review of published data shows considerable variability in color..."

Page 9, third column top should read: "*Colour Appearance and the Effect of Simultaneous Contrast*, S.A.R Scrivener"

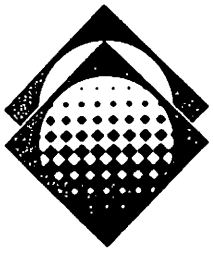
Page 12, E1356-90 should be Calorimeter. Flass should be Glass.

The method E1356-90 should be not included in the 1991 Book of ASTM Standards relating to appearance, since the reference is Calorimeter, not Colorimeter.

Page 13 Third Column, half way down, our president is Hugh S. Fairman.

WILLIAMSBURG 1992

The Inter-Society Color Council (ISCC) and the Technical Association of the Graphic Arts (TAGA) will co-sponsor a conference on *Comparison of Colored Images Presented in Different Media that are Intended to Simulate Each Other or Another Image.*



The two and one half day conference, February 23-26, 1992, will address the problems associated with comparing and evaluating images that are intended to match or simulate another image when they are presented in different media. The program will consist of both invited and contributed papers and is intended to provide a forum to address and discuss critical issues associated with this topic.

Participants should be prepared to discuss the papers presented and the conference will be structured to encourage such participation. To aid in this interchange, attendance will be limited and will be available on a first come, first served basis. Registrants will receive pre-conference abstracts and are encouraged to be familiar with the pertinent literature.

Because many of the problems associated with the comparison of images in different media involve appearance concepts, the conference is dedicated to the Memory of Richard S. Hunter, pioneer in the measurement, instrumentation and technology of appearance.

Arrangements:

The conference will be held at the Woodlands in Colonial Williamsburg Virginia. A group booking has been arranged including a modified American plan and full facilities usage.

This includes room accommodation, breakfast, dinner and visiting privileges to Colonial Williamsburg. Daily accommodations fees are $76.50 per person for double occupancy and $101 for single occupancy. Reservations can be made by contacting Colonial Williamsburg directly at 800-HISTORY; ask for group reservations under ISCC-92A by January 15, 1992.

Program:

The technical program will consist of paper sessions on Monday morning and evening, Tuesday morning and afternoon and Wednesday morning. Monday afternoon is open to allow the attendees to enjoy the attractions of Colonial Williamsburg. A reception is scheduled for Sunday evening following registration.

The program will address such topics as:

Appearance modeling
White point and monitor calibration
Data transmission
Adaptation
Color transforms and look-up tables
Present techniques
Color independent measurement (are there any)
Transparance input; Reflection output
Tolerances for pictorial images
Dealing with media of different luminances ranges
Influence of surface properties of image interpretation

Registration:

The fee for the conference is $200 for participants and $30 for accompanying persons. This fee includes all social events. Registration will begin at 4:00 pm Sunday February 23, 1992 and will be followed by a reception at 5:00 pm.

Conference registration can be made through Mr. James Grady, arrangements chairman, by January 15, 1992. Checks should be made payable to Inter-Society Color Council. Refunds cannot be made after February 3, 1992. For additional registration information call Jim Grady at 313-585-7200.

For other information, contact Milton Pearson, conference chairman, RIT Research Corporation, 75 Highpower Rd., Rochester, NY 14623, phone 716-475-5290.

REPORT FROM INTEREST GROUPS I AND II

During the annual meeting held in New York, Interest Groups I and II combined to hold a joint meeting whose title was, *Color: What You See Is Not Always What You Get.*

This theme was selected as many designers and artists have a need to accurately reproduce color for advertising, archiving, and other applications. There are many new devices and technologies available to provide coloration opportunities such as still video, color electrophotography, ink jet, and thermal dye diffusion. Also computer graphics software packages are frequently used to create a desired design on a CRT. Sometimes when a printed color image is made it does not match the color as it was displayed on the CRT. In addition, traditional color reproduction with photography can offer a surprise when the color does not match that of the original, It is not always obvious how or why the color of the reproduction was altered when compared to the original.

Provoked by this theme, six authors presented papers representing diverse views of the problems and concepts of color reproduction. As the scope of participation in the interest groups continues to expand, we were pleased that each of the papers was contributed rather than invited, and that for a number of the authors this was their first association with the ISCC. We will continue to actively encourage an increasingly broad participation in the interest group sessions of future meetings, and invite those with ideas to share to plan to make presentations. We include here a brief review of the

contents of the papers.

Color Photography: A Mirror of the World, Paula Alessi, Eastman Kodak Co.

Color Photography is one means of capturing an original scene and saving it in the form of a reproduction. Many of us have used our cameras to record an important moment onto color film. sometimes we are surprised when we receive the photographic reproduction, whether it is a color print or a color slide, because it does not always match the colors as we remember them in the original scene. The factors that produce these results are varied and complex, but Paula used demonstrations of two issues to illustrate the point.

After describing the processes of image capture, chemical processing and final color reproduction for both slide and reflection print films, common differences between the spectral sensitivities of film layers and human vision sensors were shown. Often the red sensitive film layer exhibits sensitivity far past that of the eye. This result leads the heavenly blue morning glory to be reproduced as a pink or purple, and an azo dyed green garment can be reproduced as a brown. However, the solution of the problem is not just to make the film sensitivities match the eye's color mixture curves, since other factors are also important. For example, the image dyes of a film are not block dyes. Therefore, when creating a metameric match to an aim color, there is a limit to the dye gamut which can be achieved. the great success of modern color photography indicates that many of the problems can be well managed, but there are times when the "mirror" will not be perfect.

Color on the Desktop, Richard Herbert, Pantone, Inc.

Richard Herbert reminded us again of the present reality of desktop color digital design, image manipulation and printing. However, although the capability is available, the quality of the result can be in serious question unless knowledgeable action is taken in specifying and controlling basic elements of the reproduction process. To effectively conceptualize, specify and communicate color, the user must be able to control the color being displayed regardless of the medium in which it is being generated. The various types of media involved in computer desktop publishing include:

1. RGB monitors
2. Color thermal transfer printers
3. Laser image setters
4. Pre-press proofs
5. Process color or spot color printing.

It is impossible to generalize a calibration specification for RGB color monitors as the phosphors are different for each of the major brands. To define a color in terms of RGB therefore, constrains the accurate display to the monitor for which the calibration was made. To solve this problem it is necessary to use device-independent specifications, D50 and D65. Pantone custom matches its colors to each licensed a hard-copy output device through a lookup table created for each printer.

Preserving the Experience of Color, Uri Feldman, MIT Media Laboratory

Uri Feldman has adopted a point of view quite different from more standard objective colorimetric specification. In his presentation he described how to preserve the "experience" of color. Color experience, he proposed, is not about matching or replicating color, which in many cases is not possible when the output is a different medium from the original. Rather, color experience is about relating color to its visual context. The reproduction process then becomes one of maintaining the relationship between colors. Colors are related by their "color alignment" based on the distance between hues and by the amplification or luminance contrast . He proposed that preserving the experience of color becomes a matter of preserving the alignment between colors. Preliminary results of a forced-choice experiment demonstrate that such correspondence between alignment and experience exists.

After presenting this concept, the remainder of the presentation was devoted to descriptions and demonstrations of the "experience" of color and its correspondence with color alignment. In accordance with the formulation of color alignments, initially developed by Nathaniel Jacobson and Walter Bender, there is a wide range of experiential possibilities. In terms of this formulation, no alignment is better than another. Differences merely reflect the differing experience they create. For example, an energetic experience corresponds to a complementary or off-complementary alignment. A change in experience corresponds to a shift in alignment, and vice versa. Therefore, there is the possibility of choosing an experience desired and the realignment that will produce it. Several striking examples illustrated the issues. Also, color alignment allow for systematic specification of color relationships, and permit their preservation.

Color Reproduction: Good News and Bad News, Roy S. Berns and Brian J. Rose, Rochester Institute of Technology

In the human visual system, the eye contains three color receptors that are responsible for the capability of color vision. Trichromatic color reproduction depends on the image capturing device having sensitivities similar to those of the eye's sensors. This correspondence is rarely achieved, and as a result, color distortions occur. Beginning with this fundamental premise, Roy Berns illustrated his view of both the good news and the bad news of color reproduction. The good news is the great archiving of spatial information; the bad news is that color information is not well retained.

In addition to the analysis errors in recording color information, produced by recorder spectral responses not being the same as human visual system, there are also synthetic errors, produced by colors in the original being outside the gamut of the reproduction. Further complications arise with illuminants such as when we undertake to view in a slide projector with its tungsten lamp a photographic slide of an original scene which we viewed in daylight.

To illustrate the magnitude of some of the possible reproduction errors, Roy reproduced textile dyes, ink on paper and acrylic paint with photographic

Color: What You See Is Not Always What You Get (con't from page 5)

prints, photographic transparencies and offset printing. While some of the results were pleasing, many of the discrepancies were large and objectionable.

An Investigation Into Current and Optimum Methods of Color Reproduction in the Graphic Arts, Edward Pariser, R.R. Donnelley and Sons Company

Ed Pariser performed an experiment to determine the optimum method of reproducing the colors in a photographic color transparency that are outside of the gamut of the printing process. The currently employed techniques of reproducing a transparency on a four color process were modeled in CIELAB color space. These models were used to study the present practice of handling out of gamut colors and tone reproduction, which is producing acceptable results in the marketplace. This study showed that the prepress CMYK color correction tables that were empirically derived give tone reproduction of the neutral scale that is linear in L*, and give color reproduction tat is a non-uniform compression of C* and L*.

Published literature for handling out-of-gamut colors on a CRT indicates that clipping the pixels back to the surface of the output gamut was preferred over compression of either C* or C*/L*. In a similar study reported here, but now for a direct digital color proofing device, six methods of gamut clipping and compression were compared. Six different input images were evaluated in a paired comparison experiment. Included in the gamut compressing techniques were clipping C* at constant L* and hue angle, and compression of both L* and C* similar to the employed in Donnelley prepress centers. The results of this study indicate that the preferred methods of color gamut reduction for reflective hard copy were similar to those found for CRTs, and also noted that the preferred method could be image dependent.

Color Tolerancing of Images, Mike Stokes, Rochester Inst. of Technology

The object of Mike Stokes' work was to measure the perceptibility and acceptability tolerances for color images. Six pictorial scenes of wide ranging content were displayed on a high resolution color monitor where judges evaluated paired comparisons. The images were digitally manipulated in CIELAB dimensions by using ten mathematic functions. Psychophysically derived tolerances determined by probit analysis were compared to the results of CIELAB and CMC, and MCSL color difference equations.

The high degree of fit of data analysis by the digital models suggest that the experimental environment was sound. However, Mike concludes that none of the three color difference formulae accurately predict the visual observations of the images, and the scene dependence was very modest, certainly less than in other experiments. The detailed tolerance curves will be presented in a forthcoming publication.

Norm Burningham

REPORT FROM INTEREST GROUP III–ART, DESIGN & PSYCHOLOGY

Magenta Yglesias, ASID, Chairman

Special Interest Group III met Sunday afternoon May 5, 1991 at our annual meeting in New York City.

Wade Thompson, Professor Art and Design at Southwest Missouri State University in Springfield, Missouri, presented a slide/lecture reporting his recent visit to the National College of Art and Design (konstfackskolan) in Stockholm, Sweden. Mr. Thompson examined the Painting and Environment program, which is a five year program of study, preparing students for career as fine artists able to apply their skills in creating environmental installations and commissions. The faculty structure is very different from the structure that exists in the United States in that the professors have a limited length of time in their positions at the Konstfackskolan before returning to their full time careers as working artists. Mr. Thompson remarked on the varied and comprehensive programs presented in all media; textiles, ceramics, sculpture in every material, drawing, painting; fully preparing the student to create complete ambiance in art.

Included in the slide review were stunning examples of the magnificent Stockholm underground railway system. Sweden's long winters and sometimes dreary climate demands enclosed spaces of excellent visual and physical experience. The faculty and students of Konstfackskolan have developed a course of study designed to beautifully fill these requirements.

Jean Bourges of Bourges Color International presented a progress report of her book *Bourges 20 Keys*. Bourges is a name that is well known by graphic artists. The original ink-color sheets, introduced in 1949, became the accepted coloring material for the designer. Miss Bourges informed the group that a patent has recently been granted to this comprehensive and updated color system, re-enforcing the *20 Keys* for today's relevance and taking it into the 21st century.

Miss Bourges presented "galleys" of her book for critique by the audience. The *Bourges 20 Keys* are colors arranged in a master chart that covers the spectrum and offers simple and valid methods to work with color. The descriptive text will extend the visual presentation of color and direct creation of color schemes; establishing color complements; tints and shades of the hues; dulling and brightening particular hues or combinations for a desired particular color effect.

Mary Ann Danin of the Department of Art at California State University, Northridge presented a slide/lecture addressing "Spatial Hue Discrimination".

Miss Danin's study sought to decide at what distance hue helps define our perception of space. To verify the

existence of the advancing and receding of warm and cool colors; to find whether factors of age, background, sex and visual experience are determinants. Or, are visual preferences associated with outdoor recreational activities, driving a car, watching television, bobbies requiring close work, etc. important. Miss Danin also investigated the effect color blindness had upon the viewer's perception of depth when hue is the only cue.

The method of investigation was to use human subjects and actual enclosed space instead of a computer simulation. A 50 foot tunnel was designed as a testing environment, without first and second order spatial cues. Sight lines (perspective) were nonexistent and the light was indirect. Cues relating to size and shape were controlled by the use of amorphous irregular shapes that were varied. Color and hue were the only spatial cues.

A densitometer was used to measure the value of each hue to assure absolute uniformity. They correspond to the CIE/ Munsell scales. Gray is Number 5 on the Munsell scale with a reading of .6 on the densitometer, red and blue correspond with exactly the same readings on both scales.

Mark Brown, assistant, built a tunnel 50 feet long and 8 feet in diameter. A series of targets, each group including a red, a blue, and a gray were placed at each of three intervals, 21 feet, 35 feet and 45 feet. The tester raised one target at a time from its prone position on the floor to an upright position in random order. The subject moved an overhead gray target, attempting to position the top gray target directly above the bottom one.

The first group of subjects showed very interesting results. At 25 feet there is clear evidence that all subjects placed the red target from one foot to several feet in front of the blue and gray targets. This was expected. However, at 35 feet and 45 feet, spatial discrimination definitely drops off when related to warm and cool hues. Most subjects were less certain about the placement of the upper target. It is assumed that spatial discrimination related to hue drops off significantly beyond 25 feet.

REPORT FROM PROJECT COMMITTEE #45: PSYCHOLOGICAL RESPONSE TO COLOR

George Brainard, Ph.D. and Magenta Yglesias, ASID, Chairmen

The Project Committee #45 convened on Monday afternoon, May 6, 1991 to review our Scope and Objectives. N.B. There is a need to classify and define how color influences human physiology, psychology, and behavior in order to improve use of color in the human environment; to develop appropriate terminology and definitions for describing the effect of color on human physiology, psychology and behavior; to conduct experiments to generate data necessary to define human physiological response to color; to conduct experiments to study the effects of color on human psychology and behavior; and to design and conduct an empirical study which will yield repeatable data on the biological response of normal humans to color.

In the course of developing the above Scope and Objectives, the committee has established a network of members with keen interest in this study, and also conducted a comprehensive literature search with a resulting bibliography, and a history of previous work on the subject within the ISCC.

Dr. Brainard presented an illustrated report of how the study was conducted and the basic results of the finished study. It was decided by the Committee that we had achieved our goals and that the project was of outstanding interest and merit. The Co-Chair have elected to place this report before the ISCC in a separate document in the near future.

New projects developed from this meeting; i.e., a printed report of the literature and information collected to date, and a written history of the ISCC's work in Human Response to Color. The Co-Chair are encouraged by the response and request the Committee's patience in the follow-up on the formation of these new projects.

The Colour Group of Great Britain Announces:

2ND BARTLESON SYMPOSIUM

The Second Bartleson Symposium will be devoted to "Spatial Inductions and Colour Constancy" and will be held on January 8, 1992 at the Royal Institution, Albermarle Street, London. The program will include the following papers:

Professor R. Hunt "Bartleson on colour constancy"
Dr. Anya Hurlbert "Computational models of colour constancy: predictions and tests" (Bartleson Prize Lecture)
Dr. P. Whittle "Some new measurements of contrast colours"
Miss Alex Shepherd "Should chromatic induction be considered as an error of the visual system's attempt to achieve colour constancy?"
Professor D. Foster "Robust colour constancy"
Mr. M. Bains and Dr. J.E. Saunders "A quantitative approach to colour constancy: I—Individual differences"
Professor J. L. Barbur, Dr. P.M. Forsyth and C. Williams "A quantitative approach to colour constancy: II—Mechanisms and models"

For registration and further details, contact Dr. J. Taylor, Honorary Secretary, The Colour Group, The National Physical Laboratory, Queens Road, Teddington Middy TW11 0LW United Kingdom

AIC ANNOUNCES **COLOUR 93**

The 7th Congress of the International Colour Association - Colour 93 - will be held at the Technical University of Budapest June 14-18, 1993.

AIC

The Congress is being organized by the Hungarian National Colour Committee at the request of the AIC Executive Committee and in accordance with the decision of the AIC general meeting.

Conference subjects:

Coloured vision and the appearance of colours, adaptation of colours, colour contrast, irradiation, invariance of colours, colour memory.

Colorimetry, colour standardization, colour difference, fluorescence, colorimeters.

Colour order systems, analysis of historical and contemporary colour systems, transformation between colour systems, printed and electronic collections.

Research into colour dynamics, colour preference, colour association, colour physiology, colour psychology, theories in colour harmony, colour and function, colour and lighting, colour and space.

Application of colours in industry, colour reproduction, colour matching, colour TV, questions of colour identity of printed samples.

Colour design; colour formation of institutions for different functions, townscape, monuments, industrial and individual objects; colours in arts. Computer aided colour design. Basic, intermediate and advanced education of colours. Graduate and postgraduate training. Teaching aid.

Contributed Papers:

May deal with an aspect of the science, art and technology of colour. They must be submitted to the Chairman (see below) with 3 copies of an extended abstract of not more than 2 A4 pages (Including figures) by August 1992.

The abstract, which will be published in the Proceedings, must be patterned following the guides which will be provided to each contributor.

Papers will be accepted in English, French or German. The preferred language is English.

The International Papers Committee will decide on the final selection of the papers. Authors will be informed of acceptance of their contribution by November 1, 1992.

Lectures:

Internationally recognized experts on the most important subjects have been invited to deliver lectures of 40 minutes duration. In two parallel sessions there will be about 70-80 contributed papers of 20 minutes each.

Posters will be displayed over an area of about 200 square meters. Ample time will be guaranteed for the oral explanation and discussion of posters.

6 fifty minute forums will be held to discuss the current problems of each subject group.

Exhibitions:

The subjects of the AIC work-groups, such as colour systems, the fields of colour design and education will be displayed at study exhibitions.

It will be possible to exhibit instruments, paints, colour design equipment and books for commercial purposes.

It is hoped that other exhibitions will be held in conjunction with colours, e.g. art and architecture. As well, preliminary plans are in place to hold other conferences, such as CIE Division 1 and Division 2, International Fashion Show, International Conference on Ecology and International Conference of Colour Designers.

The Official language of the Conference is English, and no translation service is planned.

A number of social programs are planned in and around Budapest. Budapest is the political, cultural, industrial and educational capital of Hungary, with over 2 million inhabitants. Within its' area of 326 square kilometers, are the river Danube, wooded hills and a pleasant combination of "old and new".

For further information on exhibitions, papers, etc., please contact:

General Chairman, Prof. Antal Nemcsics.
Co-chairman, Dr. Janos Schanda
Congress Office
Technical University of Budapest
Conference Office, Building Z, Room 101/b
H-1521 Budapest, Muegyetem, rkp. 3-9.
Telephone and FAX number is: (36-1) 185-2218

Deadline for forms submission is March 15, 1992

More information on the social programs, accommodations, general registration and more will be forthcoming.

REPORT ON THE 22ND SESSION OF THE CIE

Melbourne, Australia
July 2 - 11, 1991

I arrived in Melbourne by way of Sydney to attend the AIC interim conference, Colour and Light '91. There were many interesting papers and members of the Colour Society of Australia were very involved. Once the CIE conference began, I was immersed in activities of Division 1 on vision and color and Division 2 on measurement of light and radiation activities. (This report will be limited to my experiences within these two divisions.) W. Blevin (Commonwealth Scientific and Industrial Research Organisation, Australia) presented the first invited paper about the history and the future of photometry and radiometry. He began with Euclid and his erroneous belief that vision went outward to interact with objects; it was not a detector that responded to incident flux. Blevin described the history of photometry and radiometry touching on the important developments such as the Stefan-Boltzmann Law, Planck's Law, thermoelectric radiometers, and blackbody sources. He stated that the future revolved around spectral measurements and that at present the measurement community has yet to achieve acceptable precision and accuracy. Certainly the National Institute of Standards and Technology (NIST) has adopted the philosophy of spectral based measurements. The measurement community is looking forward to improvement in total uncertainty. The U.S. Council for Optical Radiation Measurements (CORM) recognizes this as a national priority.

Following the morning invited paper, a presented paper session followed where three divisions had concurrent sessions. At the Division 2 session, A. Parr (NIST, USA) discussed the new international temperature scale. During the United States National Committee of the CIE annual meeting, there was some concern that this would affect Planck's second radiation constant and as a consequence, alter the correlated color temperature of CIE illuminant A. It turned out that the second constant will not be changed; therefore, illuminant A will continue to have a correlated color temperature of 2856 K. There was some discussion about the definition of a standard illuminant. Given that illuminant A is defined by its spectral power distribution and not as a Planckian radiator of a specific color temperature, a change in the second constant was irrelevant relative to the spectral definition of illuminant A.

The second paper was presented by R. Stolyarevskaya (Research Institute for Optical and Physical Measurements, USSR). She discussed new lamps for irradiance measurements

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The March/April issue of ISCC News this year contained an article by our President Elect referring to a booklet by Dr. W. D. Wright. The response was so good we are pleased to re-run that article, for those of you who might have missed it.

TWELVE "COLUMNS" ABOUT COLOUR: A COLLECTION OF DR. W.D. WRIGHT'S PUBLICATIONS

How many of you remember that delightful series entitled TALKING ABOUT COLOUR that Dr. Wright wrote for the Color Research and Application journal between 1986 and 1989? Dr. Wright has arranged with publishers John Wiley and Sons, Inc., for the private reprinting of the twelve-article collection that comprised the TALKING ABOUT COLOUR series. The result is a booklet entitled "Twelve 'Columns' About Colour", which represents a memorial to Dr. Wright's wife, Dorothy, whom he lost in March of 1990. Since the original articles did not have individual titles, Dr. Wright accepted the personal challenge to dub the following titles:

The leaders we have lost
Colour: Art and Science
Lively times with computer graphics
A plea to Edwin Land
Colour harmony for the red-green blind
Colorimetrists not wanted!
A color palette in the brain?
"Vision is awe inspiring"
How to cope with a colour defect
Hummingbirds and slugs
More coloured illustrations, please
My Chinese "grand-student"!

This booklet is truly a treasure to be enjoyed by all those interested in color. Dr. Wright would like to share its sentimental value with fellow ISCC members. If you wish to have a personal copy of this booklet to add to your color science literature collection, please send your name and address to:

Paula J. Alessi
Eastman Kodak Company
1700 Dewey Avenue
Rochester, New York 14650-1925

Arrangements will be made to have the booklet mailed to your address. There are only a limited number of these booklets available, so act now and don't miss this wonderful opportunity to embellish your personal color science literature collection.

Paula J. Alessi

CIE 22nd Session (con't from page 9)

and the development of a liquid filter to yield detectors with photopic responsivities. Liquid filters in the 1990's struck me as rather odd. I thought I went back in time to the 1920's when Davis and Gibson developed sources B and C. It certainly went against the statements of Dr. Blevin where the future belongs to spectral measurements.

After a quick coffee break held in the middle of Illuminex, a lighting exhibition and extravaganza, concurrent presented poster sessions followed. Unfortunately, the format for these sessions was such that five eight-minute papers were hastily presented and in most instances, insufficient time remained for meaningful discussion. On the first day, I attended the Division 2 session. I enjoyed them all: J. Gardner, Radiometric/photometric standards, (Commonwealth Scientific and Industrial Research Organisation, Australia); T. Goodman, The establishment of a new national scale of spectral total flux (National Physical Laboratory, United Kingdom); J. Bastie, Luminous flux measurement with a goniophotometer; study of the time effects on data collection (INM/CNAM, France); and Y. Ohno, One step self-calibration method using white light for high-accuracy photometric standards (Matsushita Electric, Japan).

Following lunch there was an hour and fifteen minutes for the poster display where participants could view the poster papers and discuss the papers with the authors. This session followed lunch each day. I found these sessions very useful giving me a chance to discuss the papers in greater depth than the presented poster sessions.

The day concluded with a workshop. The workshop on colorimetry and photometry of electronic visual displays chaired by Jay Rennilson. It began with a papers session consisting of four speakers, all of whom were presenting posters or poster papers during the session. J. Verrill (National Physical Laboratory, United Kingdom) described their recent development of a CRT colorimetric characterization service where they will measure the chromaticities and luminance of a display using a scanning spectroradiometer that measures in synchronization with the refresh rate of the video generator. Various properties of the spectroradiometer were discussed in order to accurately measure the phosphor chromaticities. The presentation concluded by a discussion about the use of a colorimeter as a transfer device to insure that the display would have the same chromaticities and luminance at the customer's laboratory compared to NPL's facility. This was necessary because of magnetic field differences between the two laboratories. In my opinion, this practice could give erroneous results because the video generator used at NPL will likely have different voltages for its black and white levels than the customer's video generator although both conform to standard voltage tolerances. In my experience, different manufacturers of computer graphics board each will have a different transfer function between digital counts and voltage. For this reason, colorimetric characterization is performed for a display and computer combination. It is possible to use the spectroradiometric measurements to calibrate the colorimeter to improve its accuracy in measuring phosphor chromaticities.

The next talk was by R. Berns (Rochester Institute of Technology, USA) where he described the colorimetric characterization techniques used at the RIT Munsell Color Science Laboratory. They use an analytical model where digital counts are related to monitor tristimulus values with gamma, gain, and offset model parameters. Monitor tristimulus values are related to CIE tristimulus by the usual linear transformation matrix. Characterization accuracy was close to display and measurement uncertainty with five gray-scale measurements and individual measurements of each phosphor type. M. Luo (LUTCHI Research Centre, United Kingdom) presented their method of colorimetric characterization. Rather than a model, a look-up-table was used to characterize the transfer function between digital counts and monitor tristimulus values. They found this approach better than the models they tested. Unfortunately, they did not test the model described by Berns. They compared the display accuracy of several monitors of the same manufacturer. However, it wasn't clear that they all had the identical setup before their comparison. Luo concluded with several interesting images showing a variety of human interface color palettes using Munsell, NCS, and CIELAB.

The last talk was given by S. Kokoschka (Technical University of Karlsruhe, Germany). They performed a visual experiment to judge large color differences in order to assess the accuracy of CIELUV. They found, in similar fashion to most color difference experiments using surface colors, that uniformity was improved by compressing the calculated color difference at a rate proportional to the chroma of the standard. Following the presentations, a discussion followed where metrology and display setup were the main issues.

The workshop was concluded with an open TC 2-26 meeting chaired by R. Berns. He reviewed the scope and objectives of the committee and showed data comparing spectroradiometer and colorimeter accuracy in measuring the chromaticities of CRT phosphors. Two important points were made during the meeting: 1) a guide written by TC 2-16, Characterization of the Performance of Tristimulus Colorimeters, is desperately needed and 2) chromatic transfer standards to verify the accuracy of colorimeters and spectroradiometers are also needed.

Thursday began with the invited paper by D. Krizek (USDA Climate Stress Laboratory, USA) on lighting requirements for space travel. NASA and USDA are sponsoring many experiments to evaluate the quality and quantity of illumination necessary to grow food optimally where there are space limitations. I found the talk interesting; it was a topic new to me. This talk appealed to many people with

a lively question and answer session.

I attended the Division 3 presented paper session where C. Benton (University of California at Berkeley, USA) presented how an office building was designed to maximize the amount of natural daylight, minimize energy consumption, and maintain minimum illuminance requirements. A. Slater (Building Research Establishment, United Kingdom) followed with an experiment where observers judged the acceptability of different illuminance levels between work stations (desks, not CRT displays).

The Division 1 presented poster session had five papers. T. Seim (University of Oslo, Norway) presented an interesting paper where image blurring was simulated using a CRT display and etched glass in order to improve the visibility of signage for elderly observers. G. Yang (Tongji University, PRC) described the effects of luminance patterns on visual capabilities. M. Sivik (University of Michigan, USA) discussed an experiment measuring discomfort glare. R. Luo (LUTCHI Research Centre, United Kingdom) gave an abbreviated repeat of the paper he presented in the CRT workshop. P. Dehoff (Zumtobel Leuchten, Austria) concluded the session with a paper describing the use of computer graphics for lighting and environmental design. He found that the dramatic difference between the range of real scene luminances and CRT luminances are not well accounted for by a linear mapping; a logarithmic compression was required. He attempted to account for interreflections between objects and shadows to improve the realism. To me, the paper pointed out the problems of not doing a careful literature search before proceeding with an experiment. Many of the problems Dehoff described and his solutions have all been addressed in the photographic sciences and in remote sensing quite some time ago. Several of the papers presented at this session were disappointing. Clearly, they did not represent state-of-the-art.

The last day of the conference began with the invited paper by Y. Nayatani (Osaka Electro-Communication University, Japan). He reviewed the study and measurement of chromatic adaptation and color appearance. The paper was very well done. He explained differences between brightness, lightness, whiteness, and blackness; and chroma, saturation, and colorfulness. The classic experiments by Stevens, Hurvich and Jameson, and Hunt were described and their importance in terms of modeling how the visual system perceives the color appearance of object colors. The accompanying proceedings article will be very useful. This subject area has a tremendous literary history. Nayatani's paper provided an excellent resource of this history; 51 references are cited.

A Division 1 presented paper session followed where the CIE president, H. Bodmann (Technical University of Karlsruhe, Germany) presented the results of an experiment where contrast thresholds were measured at transient adaptation. He found that the visual system adapts faster with an increase in luminance than a decrease and that the peripheral regions adapt faster than the fovea. These results may be important to the work of TC 1-27 Specification of Colour Appearance for Reflective Media and Self-Luminous Display Comparisons where experimental designs are being recommended for studying color appearance under different luminance levels and different chromaticities for the adapting fields. H. Yaguchi (Chiba University, Japan) discussed the variation in inter-observer heterochromatic brightness matching results. Using principal component analysis he found that two eigenvectors accounted for most of the variance. These eigenvectors could be related to the two opponent channels. It was interesting to see techniques used to define CIE daylight applied to other areas of interest within the CIE.

The Division 1 presented poster session opened with W. Adrian (University of Waterloo, Canada) who presented a paper on transient adaption process, a model to predict its effects on vision. The paper was presented in a manner that defied comprehension. L. Mori (Suga Weathering Technology Foundation, Japan) described a very comprehensive visual experiment testing the CIE proposed chromatic adaptation formula. The experiment was conducted by a research committee within the Color Science Association of Japan. Haploscopic matching was performed using Munsell samples. The effects of adapting chromaticity and illuminance

US NATIONAL COMMITTEE OF THE CIE (USNC/CIE)

The USNC/CIE members have elected the following officers for the term 1991 to 1995:

Klaus Mielenz as President, Alan Lewis as Vice President, Jack Hsia as Secretary, and Herbert Odle as Treasurer. Thomas Lemons has been elected Executive Committee member at large for the term 1991 to 1994.

The CIE Executive Committee announces the following officers elected for the next quadrennium:

Aldworth (GB) president; Lofberg (SE), vice president-technical; Julian (AU), vice president-publications; Chahparunians (SU), Narisada (JP), and Kaufman, vice presidents without portfolio; Scott (GB), treasurer, and Bastie (FR), secretary. The division directors appointed for the next quadrennium are: Division 1 - Ikeda (JP), Division 2 -Hengstberger (SA), Division 3 - Chauvel (FR), Division 4 - Holmes (GB), Division 5 -van Bommell (NL), Division 6 - Sliney (US), Division 7 Seidl (DE).

CIE 22nd Session (con't from page 11)

were studied. The committee is recommending adoption of the CIE method based on their experimental results. In my opinion, the results were inconclusive. In particular, the observers did not perceive the Helson-Judd effect for white light illumination. I look forward to a more comprehensive article describing this important experiment. R. Berns (Rochester Institute of Technology, USA) presented the results of ongoing color-difference research where automotive coatings were evaluated by a large number of observers. The resulting database has been used to evaluate the underlying differences and similarities between this dataset and the CMC and BFD datasets. J. Roufs (Institute for Perception Research) presented recent developments in the measurement and prediction of brightness-luminance relationships. The research was reminiscent of the Bartleson and Brenemen research of the 1950's and 1960's. T. Takeuchi (Matsushita Electric Industrial Company, Japan) concluded the session describing a new measuring device that measures brightness of an object in relation to the object's surrounding luminance. An example was given where a person with the same measured luminance will be perceived as dark or bright depending on whether the surround has a higher or lower luminance. The instrument apparently measures several scene elements to correctly calculate the perceived brightness of the person in these complex lighting situations.

The technical sessions concluded with a workshop about new photometric systems based on heterochromatic brightness matching at photopic, mesopic, and scotopic levels of illumination. The session was chaired by M. Ikeda (Kyoto University, Japan), Division 1 chairman, and K. Sagawa (Industrial Products Research Institute, Japan). All the leading experts in the field in attendance presented recent visual results. There were short talks by Sagawa, Yaguchi, Nakano (Tokyo Institute, Japan), Kokoschka, and Howard (University of Dayton Research Institute, USA). Many of these scientists were testing their models with a common data base of visual experiments. I found the workshop very informative and intriguing. Our laboratory has recently become interested in heterochromatic lightness matching under photopic vision. This session was one of the conference highlights.

Following the conference, there was a weekend of CIE planned sightseeing and technical committee meetings. On Monday, division meetings began. At the opening session, it was announced that the 23rd Session will be held in New Delhi, India. Also, the following persons were elected as division directors: Division 1: M. Ikeda, Japan Division 2: F. Hengstberger, South Africa, Division 3: P. Chauvel, France, Division 4: R. Holmes, Great Britain, Division 5: W. van Bommel, Netherlands, Division 6: D. Sliney, United States, and Division 7: M. Seidl, Germany.

I attended Division 1 and 2 sessions. Each TC was reviewed. In Division 2, several of the TC's were alarmingly inactive. Due to a conflict in my schedule (a Division 1 TC meeting), I did not hear the outcome of this problem. This problem seems related to the communication problems between the CIE council, division directors, and TC chairmen. In Division 1 within the color subdivision, three new TC's were formed. The first will write a technical report describing the chromatic adaptation transformation previously proposed for field trial (CIE Journal, 1986). Because the CIE journal was not widely disseminated, a technical report describing the accomplishments of TC 1-06 Chromatic Adaptation seems appropriate. This TC will be chaired by

NEWS FROM MEMBER BODIES

SOCIETY FOR INFORMATION DISPLAY (SID)

Final Call For Papers

SID The Society for Information Symposium, Seminar and Exhibition (SID'92) is being held at the Hynes Convention Center, Boston, Massachusetts, May 17-22, 1992. This is the final call for papers. Broad areas of the Topical Sessions include Large-Area Displays, LC Technology, Non-Emissive Displays, Emissive Displays, Display Systems, CRT Displays, Display Manufacturing, Display Measurement, Printing, Image Processing, Applied Vision, and Human Factors.

Three sessions that would be of particular interest to ISCC members are Device Calibration for Color WYSIWYG, chaired by Danny Rich of Datacolor International, Color Reproduction, chaired by Gary SK. Starkweather of Apple Computer, and Color Coding and Color Perception Chaired by James Larimer of NASA Ames and Louis D. Silverstein of VCD Sciences.

Authors should submit your double-spaced typewritten abstract and technical summary on one side of 8.5 by 11-inch of A4-sized pages using the following format: page 1 paper title and abstract (35-50 words). Pages 2-7 maximum technical summary covering objective and background, results, impact, references, prior publications. There are a limited number of travel grants up to $1000 each for student authors of accepted papers. The deadline for receipt is November 15, 1991. Send one reproducible copy of the abstract and technical summary to: Terri Lichtenstein (SID '92) Asst. Conference Coordinator, Palisades Institute for Research Services, 201 Varick St., Suite 1140, New York, New York 10014, (212) 620-3375 or FAX (212) 620-3379.

GEMOLOGICAL INSTITUTE OF AMERICA (GIA)

GIA News from the GIA includes an announcement of classes and seminars through 1992, establishment of a new facility in Vicenza, new books available in the GIA library.

Week-long classes are scheduled for Eastern U. S. cities through out 1992. The classes have no prerequisites. They include topics such as GIA's Diamond Grading System to evaluate color, clarity, and cut, basic instrumentation and testing procedures for identifying natural, synthetic, imitation, and treated stones, evaluation of color, clarity, and cut of colored gemstones, etc. For more information, call (800) 421-7250, ext. 227 or write the GIA Registrar, Dept PR01, P. O. Box 2110, Santa Monica, CA 90407-2110, FAX (213) 828-6589.

In August 1991, GIA announced its intention to open a facility in Vicenza, Italy to serve the European gem and jewelry trade. The facility is expected to be operational as early as 1992. GIA has named Mr. & Mrs. Frederick Stocco of Venice as on-site managers of the new facility.

A first edition and two new editions of standard gemological texts are now available from the FIA Bookstore. Gemology, by Peter G. Read, is a follow-up to the authors Beginner's Guide to Gemology. A general reference on the latest techniques and instrumentation used to identify natural and synthetic gem materials, it is designed as a study supplement for students of the Gemological Association of Great Britain. Similarly titled Gemology, by Cornelius S. Hurlbut, Jr. and Robert C. Cammeriling, is the revised second edition of the classic resource, updated to include new material on imitation gems, gemstone enhancements, newly identified gem materials and advances in equipment. Gem Testing, the late Basil Anderson's practical manual for jewelers, has been revised by E.A. Jobbins for a 10th edition that describes many new synthetics and has a special concentration on the heat treatment of sapphires and rubies. to order these books or request a free catalog of all titles in stock, write the GIA Bookstore, Dept. PR04, P. O. Box 2052, Santa Monica, California 90406-2052, or call (800) 421-7250 ext. 703.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

The AATCC sponsored several color-related activities this fall. The International Conference and Exhibition in Charlotte, North Carolina featured a session of technical papers on color science topics. The session consisted of the following papers "Review and Comparison of Color Vision Screening Tests for Normal Observers", by Louis A. Graham, Lou Graham & Associates; "Color Consistency and Practical Aspects of Shade Sorting using CCC" by Dan R. Teel, Tanner Co.; "Continuous Color Monitoring and Control" by Robert Willis, Shelyn, and "Color Communication in the 90's" by R. McDonald, J&P Coates Ltd.

AATCC Workshop on Color Measurement Principles and the Textile Industry was scheduled for October 24-25, 1991 in Research Triangle Park, North Carolina.

Finally Research Committee RA36 will meet on Tuesday November 19, 1991 at the Doral Inn in New York City. The agenda will include recent letter ballot of the new Nine-Step Chromatic Transference Scale, revisions to Method 153, and other topics.

RENEWAL OF A PREVIOUS MEMBER BODY

We would like to take this brief opportunity to welcome back to ISCC, The Society of Plastics Engineers, *Color and Appearance Division.*

WECOME BACK! We've missed you!

Y. Nayatani. The second TC will study indices for evaluating color rendering properties of light sources based on a color appearance model. In some ways, this is a continuation of TC 1-13 Color Appearance Analysis. Attendees felt it would be more effective to start "fresh." This TC will be chaired by W. Walter (GTE Electrical Products, USA). The final new TC will investigate the performance of models on their ability to predict the color appearance of surface colors in simple and complex scenes under various illumination conditions. This is the next step following TC 1-06 and is also a continuation of TC 1-13 but not limited to color rendering. This TC will be chaired by M. Fairchild (Rochester Institute of Technology, USA).

In conclusion, the CIE conference overall was a success. I had many interesting discussions, learned new things, heard some excellent papers, and renewed friendships.

Roy S. Berns

Acknowledgments:

Partial travel support to attend the CIE 22nd Session was generously provided by the United States National Committee of the CIE (USNC). Their support is greatly appreciated. This report is an abbreviated version of a report prepared for the USNC.

THE SOCIETY FOR IMAGING SCIENCE & TECHNOLOGY (IS&T)

IS&T is an international non-profit society whose goal is to keep members aware of the latest scientific and technological developments in the field of imaging through conferences, journals and other publications. IS&T focuses on imaging in all its aspects, with particular emphasis on silver halide, non-impact printing, electronic imaging, photofinishing, image preservation, pre-press technologies and hybrid imaging systems.

The Society currently has 2500 members in 27 countries. It has 14 chapters. It publishes the Journal of Imaging Science and the Journal of Imaging Technology. From four to six conferences are conducted each year on selected topics involving imaging technology.

Following Print '91 September 11 - 13, 1991, IS&T conducted its Second Symposium on Electronic Prepress Technology and Color Proofing. This year's theme was "Imaging in a Global Environment." A total of 90 papers, covering topics ranging from electronic pagination systems to environmental challenges were presented. In addition there were five tutorials and 15 poster presentations. The keynote address was given by W. Ed Tyler, group president of the Documentation Service Group at R. R. Donnelley & sons.

"Imaging '92" will be held at the Meadowlands Sheraton Hotel, East Rutherford, New Jersey, on May 10-15, 1992. The central theme of this conference will be Emerging Technologies for the year 2000. Emphasizing this theme the key representatives of various segments of the imaging industry will explain first-hand what they foresee as their imaging needs, extrapolated to the year 2000 and the technological developments needed to fill them. A limited number of table top exhibits will be included. For further information on exhibiting contact Exhibit Chair Ms. Julie Tamura, Esselte Letraset, 40 Eisenhower Drive, Paramus, NJ 07653, (201) 845-6100, FAX (201) 845-4708.

GATF

ISCC Member Body GATF Offers New Five Day Color Process Control Workshop

Process Control for Consistent Color Quality is a newly revamped five-day workshop from the Graphic Arts Technical Foundation (GATF). The first program is scheduled for February 17-21, 1992.

The addition of statistical process control presentations by Professor John Compton, director of the Laboratory for Quality and Productivity in the Graphic Arts at Rochester Institute of Technology, is just one of many new features.

Among the other special features are hands-on laboratory sessions on using automated instruments interfaced to personal computers, color measurement stations, and scanning densitometers; raw materials testing; color theory; and scanning and proofing.

"The program will present the best steps to establish better control and predictability of printing processes and use of measurement techniques for process control," said Richard D. Warner, Director of GATF research.

For more information contact:

GATF
4615 Forbes Ave.
Pittsburgh, PA 15213
Telephone 412-621-6941

TECHNICAL ASSOCIATION OF THE GRAPHIC ARTS (TAGA)

The Technical Association of the Graphic Arts (TAGA), founded in 1948, is an association dedicated to research in science and technology in graphic arts. TAGA joined ISCC & has been a member-body since 1951.

The mission of TAGA is to provide a world-wide forum for sharing and disseminating theoretical, functional, and practical information on emerging technologies for graphic arts print production and related processes. Other than sponsoring conferences, publishing proceedings, TAGA is instrumental in sponsoring student activities such as student chapters on campus and graduate fellowships.

The TAGA membership currently exceeds 1,200 with about 750 from the USA and 250 being from outside the USA. The rest are made up of student members and senior/retired members. In addition, there are over 30 corporate members who support TAGA goals and objectives. The majority of members are graphic arts research scientists, technical support personnel, production professionals, and quality control personnel.

This year's TAGA annual Technical Conference was held in Rochester, New York from May 5-8, 1991. Over 250 graphic arts professionals hear formal presentations, attended tutorials and workshops, and discussed issues and trends with peers from around the world.

ISCC and TAGA will co-sponsor a conference on "Comparison of Color Images Presented in Different Media" February 23-26, 1992 in Williamsburg, VA. According to Milton Pearson, Conference Chairman, there will be a

INTER-SOCIETY COLOR COUNCIL APPLICATION FOR INDIVIDUAL MEMBERSHIP

Name _____ Date _____

❒ Dr. ❒ Mr. ❒ Ms.

Company/Affiliation _____

Street _____

City, State, Zip _____

Telephone (____) _____ ❒ Home

Fax (____) _____ ❒ Business

_____

Signature

My chief interests in color are:

❒ education ❒ art

❒ industry ❒ science

_____

Name other interests

My work relates to the following products and services:

_____

_____

_____

My present and past business, professional or educational connections with color are: _____

_____

_____

_____

My particular interests in color are: _____

_____

_____

_____

I belong to the following national organizations or associations: _____

_____

_____

_____

I learned about ISCC from: ❒ ISCC Newsletter ❒ Other source: _____

Please tell us the individual or organization that interested you in ISCC

ISCC dues are shown on the reverse side. Applications for membership dated prior to July 1 should be accompanied by full annual dues; those dated July 1 and later should be accompanied by 50% of annual dues. You have the option of subscribing to Color Research & Application at special membership rates. If you wish to do so, please add $60.00 (US) or $90.00 (overseas) to the amount of your check.

This application and remittance should be sent to

Ms. Ann C. Laidlaw, Membership Committee, c/o SheLyn, Inc., 1108 Grecade Street, Greensboro, NC 27408

Telephone: (919) 274-1963

EXCERPT FROM THE BY-LAWS OF THE INTER-SOCIETY COLOR COUNCIL, INC.

Constitution, Article II — Aims and Purposes

The Council shall operate solely and exclusively as a non-profit organization with the aims and purposes:

A. To stimulate and coordinate the work being done by the various members leading to the description and specification of color by these members.
B. To promote the practical application of this work to the color problems arising in science, art, and industry, for the benefit of the public at large.
C. To promote communications between technically oriented specialists in color and creative workers in art, design, and education, so as to facilitate more effective use of color by the public through dissemination of information about color in both scientific and artistic applications.
D. To promote educational activities and the interchange of ideas on the subject of color and appearance among its members and the public generally.
E. To cooperate with other organizations, both public and private, to accomplish these objectives for the direct and indirect enjoyment and benefit of the public at large.

Council Activities

The ISCC is the principal professional society on the field of color in the United States, encompassing the arts, sciences and industry, pursuant to the Aims and Purposes described above. Other national organizations with an interest in color are Member-Bodies of the Council and appoint delegations to participate in the Council's work. Individual members are the largest single group. The Annual Meeting, usually held in April, includes meetings of the Project Committees and sessions of four Interest Group: Measurement & Colorimetry; Vision & Color Appearance: Art, Design & Psychology; and Color Education. There is also a main program devoted to a specific aspect of color plus a Poster Paper session. Joint programs with one of the Council's Member-Bodies are interesting and educational.

In most years there is a separate topical Williamsburg Conference, often in February, where a single color subject is explored in depth with participants from all over the world providing state-of-the art information. Attendance at these conferences is usually smaller than at Annual Meetings, reflecting their topical nature and permitting interaction between speakers and participants.

The ISCC is the U.S. Member of the Association Internationale de la Coulour (AIC), which holds general meetings quadrennially and topical meetings annually. Color Research & Application, published bimonthly in English, is the principal international journal in this field; it is endorsed by ISCC. It reports recent research and opinions of colorists, review books and reports on national and international color meetings. Membership in ISCC permits subscription at more than a 50% discount.
The ISCC News, a bimonthly newsletter, reports the color activities of the Council, its members, Member-Bodies and international color organizations. Members receive the ISCC News at no cost. Member-Bodies and Sustaining Members receive 10 copies of the ISCC News.

Categories of Membership	Annual Dues
Individual Member. Any person interested in color and desirous of participating in the activities of the Council.	$25.00
Student Member. Full time students.	$10.00
Member-Body. Any non-profit national organization interested in color and desirous of participating in the activities of the Council.	$100.00
Sustaining Member. Any organization not eligible as a Member-Body, or any individual, interested in color and wishing to support the work of the Council. Receives 10 copies of ISCC News.	$250.00
Retired. Treasurer must be notified, in writing, of retirement before dues have been billed.	$10.00
Library Subscriptions. Receives all ISCC mailings, including ISCC News.	$40.00
Overseas Member. A surcharge of $15 is added to $25 dues to cover additional mailing costs.	$40.00

COLOR RESEARCH AND APPLICATION

In This Issue, December 1991

One hundred years ago, Hermann von Helmholtz published the first of two papers on the line element for color discrimination. The second followed the next year. These were his last contributions to visual science. In the centennial year of that work and on the occasion of the reception of the Deane B. Judd AIC Award, J.J. Vos and P.L. Walraven go "Back to Helmholtz." In this article they examine Helmholtz's ideas on higher color metrics, how much of his theory still stands and what has been added, and what were the consequences for color vision theory in general.

This issue contains a three articles relating to instrumentation for colorimetry. Each deals with a different topic: random errors, design of diffuse illuminators, and types of sources for color measuring instruments. In the first article "Propagation of Random Errors in Spectrophotometric Colorimetry", Mark D. Fairchild and Lisa Reniff review the propagation of errors in spectrophotometric colorimetry and provide examples of the level of uncertainty in typical colorimetric measurements due to random errors introduced by standards and calibration.

The second article seeks to help all those diligent colorists who search for the proper source, angle of illumination, and surrounding conditions so that their judgments may represent the appearance and color of the specimen rather than the variations in the light source. In "Efficient Uniform Illuminators Using Diffusing Optics" William H. Venable provides a systematic, practical approach to designing devices which supply predictable uniform illumination to support accurate measurement or visual evaluation of appearance.

The third article on instrumentation, a companion to Venable's article on designing illuminators, compares a diffusing optics source and a lamp imaging source. In "The Efficiency and Uniformity Comparisons Between a Diffusing Optics Source and A Lamp Imaging Source", John Spadaro estimates the relative efficiencies of the sources, the sources of error, and the color difference between the combinations of areas for both sources.

Lightness has long been accepted as an important parameter for judging related colors, those colors seen in the context of other colors or a background. Lightness is supposed to be a function of the luminance of the object in question and the corresponding measure of the reference white. However it has long been known that equi-luminance lights of different chromaticities appear different in brightness, the Helmholtz-Kohlrausch effect. Since L* depends only on luminance factor, it is not a good correlate for the lightness attribute when comparing colors of different hue and chroma. Mark D. Fairchild and Elizabeth Pirrotta suggest a metric of perceived lightness of object colors, L**, in "Predicting the Lightness of Chromatic Object Colors Using CIELAB". L** predicts perceived lightness to within the inter-observer variability and provides a simple, practical measure of the lightness attribute.

In the too rarely appearing column, Industrial Notes, JOY TURNER LUKE describes and reviews the Munsell Book of Color, Nearly Neutrals Collection. In order to give some perspective on the collection she compares it to the Colorcurve Gray & Pastel Atlas. This issue concludes with the first annual index. We hope that the readers find the annual index an improvement over the five year indices which were published in the last issue of volumes 5, 10 and 15.

TAGA

full program with invited and contributed papers to address such topics as color space transformations, ambient conditions, viewing geometry, surface properties, and adaptation. A program brochure with registration form will be mailed to ISCC and TAGA memberships sometime in October.

The next year's TAGA conference will be in Vancouver, British Columbia on April 5-8, 1992. For more information contact the TAGA office at (716) 272-0557.

CALENDAR

Please send information on Member Body and other organization meetings involving color with dates, places, and information source to:

Harry K. Hammond, III
BYK-Gardner, Inc.
2435 Linden Lane
Silver Spring, MD 20910
(301) 495-7150 FAX (301) 585-4067

1992

ASTM COMMITTEE D-1 ON PAINT, Jan. 19—22
Embassy Suites Hotel, Ft. Lauderdale South, Florida. Information: Scott Orthey, (215) 299-5507.

ASTM COMMITTEE E-12 ON APPEARANCE, Jan. 20-23
Embassy Suites Hotel, Ft. Lauderdale South, Florida. Information: Bode Buckley, (215) 299-5599.

ADVANCES IN COLOR VISION, Jan. 30-Feb. 1
Optical Society of America Topical Meeting on Advances in Color Vision, Irvine, California. Information: (202) 462-6272.

SPSE/SPIE SYMPOSIUM, Feb. 9-14
Electronic Imaging: Science and Technology, The San Jose Convention Center, San Jose, California. Information: Khe Nguyen, (408) 954-5486.

IS&T ANNUAL MEETING, Feb. 10-15
Society for Imaging Science and Technology, 45th Annual Conference, East Rutherford, New Jersey. Information: (703) 642-9090.

AATCC WINTER MEETING, Feb. 11-13
American Association of Textile Chemists and Colorists, Hilton at University Place, Charlotte, North Carolina. Information: Jerry Tew, (919) 549-8141.

ISCC - WILLIAMSBURG CONFERENCE, Feb. 23-26
"Comparison of Color Images Presented in Different Media" cosponsored with TAGA, Colonial Williamsburg, Virginia. Information: Milton Pearson, (716) 475-5290.

ASPRS/ACSM Annual Meeting & Convention, Feb. 29-Mar. 5
American Society of Photogrametry and Remote Sensing Annual Meeting, Albuquerque Convention Center, Albuquerque, New Mexico. Information: Denise Cranwell (301) 493-0200.

ASTM COMMITTEE D-20 ON PLASTICS, Mar. 8-12
Ashville, North Carolina. Information: Katharine Schaff, (215) 299-5529.

TAGA ANNUAL CONFERENCE, Apr. 5-8
Technical Association of the Graphic Arts Annual Technical Conference, Westin Bay Shore Hotel, Vancouver, British Columbia. Information: Karen Lawrence (716) 272-0557.

ISO MEETING, Apr. 6-11
International Standards Organization Meeting, Paris France. Information: Bill Martin, (919) 549-8141.

COLOR MEASUREMENT FOR THE TEXTILE INDUSTRY, Apr. 28-29
Clemson University, Professional Development, Color Measurement for the Textile Industry, Hyatt Regency, Greenville, South Carolina. Information: Kay James, (803) 656-2200.

IS&T IMAGING '92, May 10-15
The Society for Imaging Science & Technology 45th Annual Conference, The Meadowlands Sheraton, East Rutherford, New Jersey. Information: (703) 642-9090.

AATCC SPRING MEETING, May 19-20
American Association of Textile Chemists and Colorists, AATCC Technical Center, Research Triangle Park, North Carolina. Information: Jerry Tew, (919) 549-8141.

SID '92, May 17-22
Society for Information Display International Symposium Seminar and Exhibition, Haynes Convention Center, Boston, Massachusetts. Information: Paul M. Alt, (914) 945-2437.

CORM ANNUAL MEETING, May 19-20
NIST, Gaithersburg, Maryland. Information: Albert Parr, (301)-975-3739.

ASTM COMMITTEE D-1 ON PAINT, Jun. 21-24
Marriott, Minneapolis, Minnesota. Information: Scott Orthey, (215) 299-5507.

INTERNATIONAL GEMOLOGICAL SYMPOSIUM, Jun. 20-24
Century Plaza Hotel, Los Angeles, California. Information: (800) 421-7250, ext. 211.

ISCC - ANNUAL MEETING, Jun. 21-24
Nassau Inn, Princeton, New Jersey. Information: Dr. Allan B. J. Rodrigues, (313) 583-8245.

AIC INTERIM SYMPOSIUM, Jun. 23-24
Computer Colorant Formulation, Nassau Inn, Princeton, New Jersey. Information: Dr. Allan B. J. Rodrigues, (313) 583-8245.

ASTM COMMITTEE E-12 ON APPEARANCE, Jun. 24-26
Nassau Inn, Princeton, New Jersey. Information: Bode Buckley (215) 299-5599.

IESNA ANNUAL CONFERENCE, Aug. 2-6
Illuminating Engineering Society of North America, 86th Annual Conference, San Diego, California. Information: Valerie Landers, (212) 705-7269.

XVII ISPRS CONGRESS, Aug. 4-13
17th International Society of Photogrametry and Remote Sensing Congress in conjunction with 27th International Geographic Congress and 1992 Global Change Conference, Washington Convention Center, Washington, District of Columbia. Information: Judy Peesel (301) 493-0290.

WWDU '92, Sep. 1-4
Third International Scientific Conference - Work With Display Units, International Conference Center, Berlin, Germany. Information: Dr. Ahmet Cakir, ERGONOMIC Institute Ltd., Soldauer Platz 3, D-1000 Berlin 19, German Federal Republic. Deadline for submission of abstract is December 15, 1991. Information: Tel: +49 30 302 10 50 Fax: +49 30 301 98 40

OSA - ANNUAL MEETING, Sep. 20-25
Optical Society of America Annual Meeting, Albuquerque, New Mexico. Information: Optical Society, (202) 223-8130.

IMAGING THE FUTURE, Sep. 21-25
The Royal Photographic Society Science Committee Symposium on Imaging the Future, University of Cambridge, EnglandInformation: Dr. M. R. Pointer, Kodak Ltd., Research Div. W-93, Harrow, Middlesex, HA1 4TY, England, tel. 44-81-427-4380 or FAX 44-81-863-4798.

AATCC - CONFERENCE AND EXHIBITION, Oct. 4-7
American Association of Textile Chemists and Colorists, Hyatt Regency, Atlanta, Georgia. Information: AATCC, (919) 549-8141.

USNC/CIE ANNUAL MEETING, Oct. 11-13
The United States National Committee of the CIE Annual Meeting, Embassy Suites Resort, Scottsdale, Arizona. Information: Dr. Ian Lewis (602) 991-9260, FAX (602) 991-0375.

FSCT, Oct. 21-23
Federation of Societies for Coatings Technology, 70th Annual Meeting and 57th Paint Industries Show, McCormick Place, Chicago, Illinois. Information: (215) 545-1507.

GIS/LIS Conference, Nov. 6-12
Geographic Information Systems and Land Information Systems Conference sponsored by the American Society of Photogrametry and Remote Sensing and several other organizations, San Jose Convention Center, San Jose, California. Information: Denise Cranwell, (301) 493-0200.

IS&T E/W SYMPOSIUM III, Nov. 8-13
The Society for Imaging Science & Technology, Maui Westin Hotel, Maui, Hawaii. Information: (703) 642-9090.

ASTM COMMITTEE D-20 ON PLASTICS, Nov. 15-19
Miami, Florida. Information: Katharine Schaff, (215) 299-5529.

OPTICON, Nov. 15-20
Optical Society of America OPTICON '92, Boston, Massachusetts.Information: Optical Society, (202) 223-8130.

AATCC FALL MEETING, Nov. 17-19
American Association of Textile Chemists and Colorists, The Doral Inn, Hew York City, New York. Information: Jerry Tew, (919) 549-8141.

1993

ASTM COMMITTEE D-20 ON PLASTICS, Mar. 1-4
Atlanta, Georgia. Information: Katharine Schaff, (215) 299-5529.

LUX EUROPA 1993, Apr. 4-7
Chartered Institution of Building Services Engineers, Edinburgh, Scotland. Information CIBSE, Delta House, 222 Balham High Rd., London SW12 9BS.

AIC-Colour 93, Jun.14-18
The 7th Congress of the International Colour Association, Technical University of Budapest, Budapest, Hungary. Information: Prof. Antal Nemcsics, Technical University of Budapest, Conference Office, Building Z, Room 101/b, H-1521 Budapest, Muegyetem rkp. 3-9 Hungary, phone and fax (36-1) 185-2218.

IESNA ANNUAL CONFERENCE, Aug. 8-12
Illuminating Engineering Society of North America, 87th Annual Conference, Houston, Texas. Information: Valerie Landers, (212) 705-7269.

AATCC - CONFERENCE AND EXHIBITION, Oct. 3-6
American Association of Textile Chemists and Colorists, Montreal, Quebec, Canada. Information: AATCC, (919) 549-8141.

ASTM COMMITTEE D-20 ON PLASTICS, Nov. 15-18
Fort Worth, Texas. Information: Katharine Schaff, (215) 299-5529.

NEWSLETTER EDITOR

Michael A. Hammel

Send photo material (black and white if possible) to:

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If at all possible, please send all other materials ON DISKETTE as follows:

MSDOS–ASCII, Q&A, Word Star, Word Perfect (5.25"–1.2 Meg, or 360K) (3.5"–1.44 Meg, or 730K).

Macintosh–Word, Macwrite, MS Works (3.5"–1.44 Meg, 800K, or 400K)

For hard copy transmission, FAX to (716) 425-2411.

Or send to: Dr. Ellen Carter • 2509 N. Utah St. • Arlington, VA 22207

Please note: the deadline for submission of material is the 1st of even numbered months.

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American Chemical Society (ACS)
American College of Prosthodontists (ACP)
American Psychological Association (APA)
American Society for Testing and Materials (ASTM)
American Society of Interior Designers (ASID)
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