

dfwg

Report

1/01

Deutsche farbwissenschaftliche Gesellschaft e.V.

Herausgegeben vom Vorstand der DfwG

Verantwortlich: Prof. Dr. Heinz Terstiege

AIC Color 01 Rochester

The 9th Congress of the International Colour Association

The logo for AIC 2001 features the letters 'aic' in a bold, lowercase, sans-serif font. The letters are filled with a pattern of horizontal lines that create a sense of depth and movement. Below the 'aic' text, the year '2001' is displayed in a large, bold, sans-serif font. The '2' and '1' are slightly larger than the '0's.

ROCHESTER, NY

Rochester Riverside Convention Center

June 24-29, 2001

*Deutsche farbwissenschaftliche Gesellschaft e.V.
im Deutschen Verband Farbe*



Geschäftsstelle:
Hardyweg 16, 14055 Berlin
Telefon: (030) 308 11512
Telefax: (030) 308 11513
e-mail: heinz.terstiege@t-online.de

Kto.-Nr.: 7234 430 00
Dresdener Bank Freiburg, Breisgau
BLZ 680 800 30

März 2001

Liebe Farbgemeinde,

Vom 24. zum 29. Juni findet im Rochester Riverside Convention Center, Rochester, NY, der internationale Farbkongress AIC 2001 statt. Die Konferenzsprache wird englisch sein. Für Deutsche ist kein Visum zur Teilnahme am Kongress nötig. Parallel zum Kongress wird vom 25. zum 26. Juni eine Ausstellung über die letzten Entwicklungen auf dem Gebiet der Farbtechnologie veranstaltet werden. Das AIC COLOR 01 Sekretariat wird von Ms. Cynthia Sturke, (Inter Society Color Council) 11491 Sunset Hills Rd., Reston, VA, 20190, USA, betreut werden. Für laufend aktualisierte Information steht die Webseite des ISCC zu Verfügung. Ein Zeitschema für den Kongressablauf ist im Report wiedergegeben. Für Frühbuchung bis zum 15. Mai sind die Tagungsgebühren für Teilnehmer 550,00 \$, für Studenten 200,00 \$ und für Begleitpersonen 200\$. Bei Einschreibung nach dem 15. Mai erhöhen sie sich diese für Teilnehmer auf 650,00

Für die CIE Division 1 wird eine Zusammenfassung des letzten Sitzungsberichtes von Teddington wiedergegeben. Der D1 Activity Report erscheint im nächsten Report. Bei der Öffnung der Webseiten der D1 und D2 über das NML ergeben sich z. Zt. Schwierigkeiten. Diese Seiten sind besser über die CIE (www.cie.co.at) zu erreichen.

Mit den besten Wünschen
Ihr Heinz Terstiege

DfwG-Nachrichten

Telefon: (030) 308 11512 Telefax: (030) 308 11513
E-mail: heinz.terstiege@t-online.de

DfwG-Jahrestagung 2001

Termin:

19. Oktober 2001

Ort:

*Märkische Fachhochschule
Hagen
Heidener Straße 182*



*Themen- und Referenten -
Vorschläge werden noch
entgegengenommen.*



**Institutsbesichtigung und Beisammensein
am 18. Oktober**

DfwG-Mitgliederentwicklung

Die DfwG begrüßt als neues Mitglied:

Herrn Walter Renzer, Nürnberg

Geburtstage I 01 / II 01

60 Jahre

Herr Dipl.-Ing. Eckhard Bendin * 10.05.41

65 Jahre

Herr Ing. Hans Ott * 10.03.36
 Herr Prof. Edgar Knoop * 22.03.36
 Herr Dr. Siegfried Kaufmann * 26.06.36

70 Jahre

Herr Rolf Herold * 07.04.31

80 Jahre

Herr Dr. Hans G. Völz * 18.03.21
 Herr Prof. Dr. H. Hauptmann * 20.06.21

In diesem Jahr wird wieder der DfwG Förderpreis für eine Arbeit aus dem Gebiet der Farbwissenschaften verliehen. Alle Mitglieder der DfwG sind berechtigt, eine eigene Arbeit einzureichen, oder Kandidaten für die Preisverleihung vorzuschlagen. Die Bestimmungen für die Verleihung des Förderpreises können in der Geschäftsstelle angefordert werden.

*Der farbige Umschlag wurde freundlicherweise von der Firma
 X-Rite übernommen.
 Herzlichen Dank*

aic 2001

ROCHESTER; NY 24. bis 29. Juni

Dear Colleagues,

On behalf of the AIC Color 01 Organizing Committee, it is our great pleasure to invite you to the 9th Congress of the International Colour Association to be held in Rochester, New York from June 24 to 29, 2001. The Congress has not been held in the United States since 1977 and we are now excited to have you back to our country so we can share some of our culture with you. Please consider accepting this invitation as either a participant or as a contributed papers author.

We are planning a Congress that promises to be a memorable experience for all those attending both in terms of stimulating technical interchange and social interaction. Our technical program will feature state-of-the-art papers covering all aspects of color to appeal to the interest of technologists, industrialists, engineers, designers, artists, and educators. The papers will focus on answering the following questions: What is color? What is color for? How does color work? How do we control color? and How do we teach color? There will be a Color Management Tutorial and Symposium. The social program features a delectable banquet with dancing, music and a luncheon excursion to the Genesee Country Museum. Evening activities are also planned for enjoyment to continue the day's exchange with your colleagues and friends.

We are honored to welcome you to Rochester, New York, *the World's Image Centre*. Color and images go hand in hand. We hope that the 9th Congress of the International Colour Association will be an experience of colorful images both inside and outside the lecture hall, that will last in your memory forever.

Paula J. Alessi, Senior Staff, Research Labs
Eastman Kodak Company
Chairman of AIC 01 Organizing Committee
AIC Vice President

Dear Colleagues,

On behalf of the Executive Board, the Board of Directors, the Member Bodies, and the Sustaining Members of the ISCC, invite and warmly welcome you to this, the 9th AIC Congress. We at the ISCC are honored to be able to host the Congress for the first time in over 20 years. Some of us remember the seminal ideas and opportunities created by the 3rd AIC Congress in Troy, NY in 1977. Due to the great Vision and efforts of the current Organizing Committee under Paula Alessi, the 9th Congress promises to be even better- in fact, I think it will be the most exciting, educational, and informative Color Congress ever.

The program plan reflects the broadest overview of color, from color science to art and design; yet the program features revolutionary, groundbreaking papers, presentations, and exhibits in each of these fields. We are looking forward to a colorful Congress and are delighted that you choose to be a part of this unique and exciting event. My words to you are those that I use as the ISCC President to its membership: „Become involved, make a difference, and have the time of your life. Best wishes.

Jack A. Ladson
President, Inter-Society Color Council

- Date:** June 24-29, 2001
- Location:** Rochester Riverside Convention Center
Rochester, New York USA
- Language:** The working language of the Congress is English.
- Visa/Passport:** Participants who may need passports or visas to attend the Congress are asked to consult the Passports and Visa section on pages 11-12 for further details.
- Invitation Letter:** Participants may require official invitation letters from the Congress for either local grant applications or entry visas to the United States. Please write to the Secretariat, address below, should such a letter be needed. This invitation, however, does not imply commitment to the payment of any expenses.
- Exhibition:** An exhibition featuring the latest developments in Color Technology will be held June 25-26, 2001. Displays will include:
- Colorimetry tools and instruments
 - Image processing/software
 - Newest books and publications, color samples. etc.
- Fee:** \$750 prior to December 1,2000
\$1000 after December 1,2000
- Contact:** Mr. Kevin McGuire
Tailored Lighting, Inc.
1350 Buffalo Road, Ste 12
Rochester, NY 14624-1829 USA
E-mail aic2001@solux. Net
- Secretariat:** AIC Color 01 Secretariat
c/o Inter-Society Color Council Phone: 001 703 318-0263
Ms. Cynthia Sturke Fax: 001 703 318-0514
11491 Sunset Hills Rd. E-Mail: *iscc@compuserve. com*
Reston, VA 20190 USA
- Important Dates to Note:**
- | | |
|----------------|---------------------------------------|
| April 15, 2001 | Congress Program Available on Website |
| May 15, 2001 | Advance Registration for Congress Due |
| May 15, 2001 | Manuscripts for Proceedings Due |
| May 18, 2001 | Hotel Reservations Due |
| June 24, 2001 | AIC Color 01 Begins |
- Website:** www.iscc.org/aic2001 Please check the website for continuous updated information.

CONGRESS PROGRAM

OPENING CEREMONY SPEAKERS

Monday, June 25, 8.30 – 10.30 a.m.

James Stoffel, Vice President and Director of Kodak Research and Development
Hervé Gallaire, Senior Vice President, Xerox Research and Technology

It is appropriate that the first AIC Congress to be held in the United States since 1977 should be held in Rochester, New York, *the World's Image Centre*. Color has come a long way since then—it is digital and more pervasive in our everyday life, as color digital cameras, copiers and printers have made color more accessible in the home and office. Eastman Kodak Company and Xerox Corporation are two companies that have had a major influence on the growing use of color. Both of these companies originated in Rochester. It is with pleasure then that we are able to announce that the keynote speakers at AIC Color 01 will be *James Stoffel* Eastman Kodak Company and *Hervé Gallaire*, Xerox Corporation.

SYMPOSIA OF INVITED SPEAKERS

What is Color?

Monday, June 25, 4:00 - 6:00 p.m.

Coordinator: Paul Green-Armytage, Curtin Univ. School of Design, Western Australia
Moderator: Larry Hardin, Department of Philosophy, Syracuse University

The purpose of AIC congresses is to discuss all aspects of color. The starting point must be understanding what color is. *Larry Hardin*, will serve as catalyst a discussion about the nature of color by asking what color Vision does for the animal that has it. In what sense do different species have color vision? Instinctive response to certain wavelengths of light is very different from having a "color experience!" It is color experiences that are of chief concern to human beings. instinctive responses can be acted upon by natural selection. But since experiences are private, how could they ever have been subject to selective pressure? What, then, do color experiences do for the human animal?

A panel with representatives from a variety of disciplines in art and science will explore these and other questions more fully. Panelists will include *John Werner*, Ophthalmology Department, University of California; *Oswaldo da Pos*, Department of General Psychology, University of Padua, Italy; *Rolf Kuehni*, Consultant; and *Lois Swinoff*, Professor Emerita, University of California, Los Angeles. They will take a brief essay by Hardin as the starting point for their remarks, which will take the form of short papers and comments. Following that, there will be a general discussion. Copies of the essay and responses from panelists will be available before the congress for those who wish to come prepared to participate in the discussion.

What is Color For?

Tuesday, June 26, 4:00 - 6:00 p.m.

Coordinator: Meg Miele, Fashion Institute of Technology ISCC Interest Group III

Having understood what color is, we must then explore what color is for. *Margaret Walch*, Associate Director of the Color Association of the United States (CAUS), with her unique perspective and wealth of experience will introduce the topic and set the tone for this Symposium. Walch is a frequent lecturer on color and she is often quoted in the media.

Follow-up speakers will include individuals from an array of color applications, such as *Catherine Stein*, Director of the Color Council for the Home Furnishings Industries; and *Grete Smedal*, interior designer at the Centre for Form and Colour in the National Institute of Art and Design School in Bergen, Norway whose work on the role of color in environmental design is well known throughout the world. Other speakers will represent areas such as publishing, computer-aided-design (CAD), fashion design, cosmetics, art and website development.

How is CIE Helping Us Make Color Work?

Thursday, June 28, 1:00 – 3:40 p.m.

Coordinator: Allan Rodrigues, DuPont

The task of the colorist is to make color work. National color organizations initiate new methods in color technology, which are ultimately brought to CIE, which standardizes its application globally, allowing us to make color technology work. Most color needs are addressed by CIE Divisions 1 and 8. Our panelists will highlight what these Divisions are doing now and expect to provide in the future. They will also discuss in depth the work of Technical Committees whose work is near completion. Speakers will include *Todd Newman*, Canon R&D Center Americas, overviewing the activities 01 Division 8 (Image Technology); *Mark Fairchild*, Rochester Institute of Technology, on Colour Appearance Models; and *Ronnie Luo* University of Derby, on Industrial Colour Difference Equations; and *Francoise Viénot*, Lab. de Photobiology Museum, on the Fundamental Chromaticity Diagram with Physiologically Significant Axes.

How Should We Teach Color?

Thursday, June 28, 4:00 - 6:00 p.m.

AIC/ISCC Color Education Committee**Coordinators: Geoffrey Rogers, Fashion Institute of Technology; University de Granada**

Successful implementation of color requires proper education. This question of how we teach color encompasses a number of issues that will be addressed through presentations and a panel discussion. An issue of particular current interest involves the use of new technologies for color education. In particular, does the internet offer new strategies for the teaching of color? Other issues concern the pedagogy of color education. There are a variety of professional disciplines for which a "color education" is important - in science, engineering, architecture, design, graphic arts, and the fine arts. What sorts of curricula should be implemented for these different disciplines? What methods and teaching aids can be employed? Is there a universal base of color knowledge that is common to all? What are the needs of industry for "color educated" employees? How can these needs be met? Panelists will include *Berit Bergstrom*, Chair of the AIC Study Group on Color Education speaking on Creative Color Education and *Mike Brill*, Sarnoff Corporation, on Webliography.

The Why's and How's of Color Management: A Tutorial: Monday, June 25, 1:00 - 3:00 p.m.**Coordinator: Robert Buckley, Xerox Corporation**

This tutorial is primarily aimed at artists, designers and others working in color who may not now be using color management, but who want to know what it could mean to them and how it can affect what they do. Color management applies when color is used in a digital system with devices and media of differing color capabilities. The tutorial will describe the situations in which color management is practiced, the approaches to achieving it, its benefits and limitations, and how to go about using and benefiting from it. It will bring together perspectives from both the art and design as well as the color technology worlds.

The State of the Art and Future of Color Management Tuesday, June 26, 1:00 - 3:00 p.m.

Coordinator: Robert Buckley, Xerox Corporation

Color management came of age in the 1990s. There are now industry consortia dedicated to its standardization and promotion, and there are applications that make it readily available both on the desktop and in high-end color. This Symposium provides the opportunity to see the progress made in color management over a decade of development and evolution and to find out where it's going. It will begin with an overview of the state-of-the-art in color management and then go on to discuss the new techniques and approaches that are emerging for color management, and to explore new applications in domains such as internet imaging, web color, digital cameras and digital cinema.

Imaging Techniques of Spectral Estimation Tuesday, June 26, 8:30 - 10:30 a.m.

Moderator: Roy Berns, Rochester Institute of Technology

In recent years, instruments are being built which estimate spectra rather than directly measuring spectra (as done in conventional spectrophotometry using a dispersing element such as a diffraction grating). The simplest estimation technique is to subsample the spectrum and interpolate the missing data. Another technique exploits knowledge about the coloration system. Imagine a coloration system composed of three colorants. If we know the relationship between colorant amounts and spectra, e.g., Kubelka-Munk or Beer's law, three radiometric measurements, whether broadband tristimulus values or narrow-band individual wavelengths, can be used to estimate the spectra. For coloration systems that use more than three colorants or for colored objects of unknown composition, statistical approaches are used such as eigenvector analysis. A set of radiometric, that is, multi-spectral measurements, usually more than three but less than ten, is related to the scalars of each eigenvector.

These and other techniques are being used in LED-type color-measuring instruments and in digital imaging to create spectral images. This symposium will review these estimation techniques and present current imaging-based research in spectral estimation. *Roy Berns* will review these techniques and moderate. Panelists will include *Bernhard Hill*, Aachen University of Technology, Germany and *Yoichi Miyake*, Chiba University, Japan.

The Artist and Digital Media Tuesday, June 28, 6:30 - 10:30 a.m.

Moderator: Wade Thompson, Ass. Head, Art and Design, SW. Missouri State University

The accelerating rate of technological change has presented artists directly involved with color new challenges, which have in turn, initiated the development of innovative methodologies and creative strategies within the studio. While increased efficiency may result from the new technologies, ever present is the challenge to preserve and foster each creative person's individuality and uniqueness within the application of new media. Artists now have the ability to display millions of color choices within the realm of the computer screen and look to new technologies to assist in effectively formulating and translating initial concepts into the final art form. With so many new options available, the importance of effective communication between the artist/colorist and the technologist is at its highest level. Artists can no longer work in the isolation of the past and this heightened interaction with technologists and scientists underlies the importance of this developing dialog.

This Symposium will explore the impact of digital technology within the pursuit of artistic excellence. We will present current research and creative activities from recognized practicing artists and researchers and will encourage interaction between the speakers and participants. Panelists will present a review of their current creative work prior to the discussion period. The Symposium will then proceed into a panel discussion of issues related to the use of digital media for contemporary artists.

Color Issues for Digital Archives

Thursday, June 28, 8:30-10:30 a.m.

Moderator: Franziska Frey, Image Permanence Institute, Rochester Inst. of Technology

Museums, archives, libraries, and commercial stock houses all around the world are busy converting their holdings into digital form. A wide variety of materials, including photographs, documents, and paintings are and will be available for various uses through digital image data bases. Digitizing artwork for high-quality puts high demands on the imaging system and the human operators involved in the task. Do the produced images comply with the current state of the art of color imaging technology, or are the archives filled with legacy images that will not fulfill the promise of repurposing? This Session, keynoted by *David Saunders*, National Gallery, London, will give an overview of the state-of-the-art of imaging in the museum and archive world and incorporate a show and tell from various institutions. The session goal is to show ways to better communication and understanding between the content holders, academia, and industry, in order to achieve a seamless, transparent work flow of images across platforms, devices and time.

The Future Role of Color in the Three Dimensional World Friday, June 29, 8:30 - 10:30 a.m.**Moderator: Shashi Caan, Design Director, Skidmore Owings & Merrill Architects**

An end is a beginning. It is time to look at the past and to plan for the future. In the last two centuries we have begun to understand the phenomenal interaction of color in the two dimensional plane. Individuals such as Goethe and Albers have demonstrated some of the rudimentary and profound interactions of color which affect us and our world constantly.

With the growing complexity of our world, with economies changing from local to global, with technologies requiring the development of new languages to allow us to communicate, new demands are placed on art, architecture and design. The environments that are to be created require greater sensory support for the individual. This may be called the new humanism in design.

Within the context of this new humanism, the role of color is ever more important. For the designer to effectively manipulate the three dimensional world with color, a basic understanding of the language for color phenomena that we experience needs to be explored. The goal of this symposium is for the art and design component of the symposium to open a dialogue on this basic language, experience and perception of the interaction of color in the three dimensional world. Speakers will consist of outstanding artists, architects and designers.

The Future of Color

Friday, June 29, 2:00 - 3:30 p.m.

Coordinator: Jack Ladson, Estée Lauder

We live in a world in which styles and technologies are nearly the same from place to place, but change daily. This changing global culture is unprecedented, and reinforced by emerging new technologies that affect us all. This symposium will examine new technologies, how they will affect the selection and promulgation of color in the near future, and their impact upon us. We will examine this topic from many perspectives-technological, business and commercial. Most importantly, as we understand how our world is emerging, we can position ourselves strategically for tomorrow. This symposium promises to be an aspect of the congress that you will not want to miss. Our goal is to peek into the future, challenging participants to develop new ideas to bring to the next AIC Quadrennial Congress.

Payment Schedule and Information:

Registration Options	Advance Registration paid by May 15, 2001	On-Site Registration Paid after May 15, 20001	Daily Registration
Participant Registration	\$550,00	\$650,00	- \$175,00
Student* Registration	\$200,00	\$200,00	No Daily Rate Offered
Companion Program	\$200,00	\$200,00	No Daily Rate Offered

Registration Fee Includes:

For participants and students.

- Admission to all Congress Sessions.
- Welcome Reception and dinner. *Advance reservation is necessary*
- Daily breakfasts and lunches.
- Program and Book of Abstracts.
- Proceedings to be mailed at a later date.
- *Students must have full-time status to receive discounted rate.

For Companion Program:

- Welcome Reception and dinner. *Advance reservation is necessary*
- Daily breakfasts and lunches.
- Transportation and entrance fees to Landmark Society Historic House Tour, Winery Tour and Tasting, and George Eastman House and International Museum of Photography and Film Tour. *Advance reservation is necessary*

Accepted Forms of Payment

- All payment must be in the form of **US Dollars**.
- Acceptable forms of payment are: personal, company, or certified check drawn on a US Bank, money order, travellers checks, or credit cards. Accepted credit cards include: Mastercard, Visa, Discover, and American Express.

Confirmation of Advance Registration

Confirmation letters will be sent to registrants after February 2001. This confirmation letter must be presented at the Registration Desk at the Congress.

On-Site Registration

An on-site Congress Registration Desk will be open at the Rochester Riverside Convention Center on Sunday, June 24, from 8:00 a.m.- 5:00 p.m. It is strongly recommended however, that participants pre-register by mail as this will greatly facilitate registration procedures on-site. For the duration of the Congress, the Registration Desk will be open daily from 8:00 a.m.- 1:00 p.m. Please note that the Secretariat will not accept advance registration applications after **May 15, 2001**.

Cancellation and Refund Policy

In the case of a cancellation, please notify the Secretariat, page 2, in writing as soon as possible. Refunds requested before **May 15, 2001** will be honored, but an administrative charge of \$50 will be retained. Due to the nature of the Congress, there are significant up-front costs which are not refundable. Therefore, no refund will be possible after **May 15, 2001**.

ISCC Awards Luncheon**Sunday, June 24, Noon - 1:30 p.m..**

The Annual ISCC Awards Luncheon will be held at the Rochester Riverside Convention Center, consisting of a short business meeting reviewing the affairs and status of the Inter-Society Color Council (ISCC). Most importantly, the ISC will present the Nickerson Service Award and the God-love Award, and will induct members into Honorary Membership status. This is an opportunity to renew acquaintances with your colleagues and be a part of history as some of them are honored.

Fee: \$25,00 Advance reservations are necessary

**George Eastman House Sunday,
and International Museum of Photography & Film****Sunday, June 24, 2:00 - 5:00 p.m.**

Located on historic East Avenue in Rochester, the 12.5-acre museum site was the urban estate of George Eastman founder of Eastman Kodak Company. The Museum includes Mr. Eastman's restored house and gardens, and displays the art, technology, and impact of photography and motion pictures over 150 years.

Transportation: Buses will pick-up at 2:00 p.m. at the Convention Center and depart from the Eastman House at 5:00 p.m.

Fee: \$8,00 (transportation is included) Advance reservations are necessary.

Welcome Reception**Sunday, June 24, 6:00 - 9:00 p.m.**

Rochester Institute of Technology's Center for Imaging Science and Munsell Color Sciences Laboratory will host the AIC Congress Welcome Reception. There will be open laboratories, tours, demonstrations, music, drinks, and a buffet dinner. Please plan to visit RIT's unique suburban campus and enjoy a colorful evening to set the stage for an exciting Congress.

Transportation: Buses will pick-up at the Convention Center at 5:15, 5:45, and 6:15 p.m. and depart from RIT at 8:30 and 9:00 p.m.

Fee: included with Congress Registration. Advance reservations are requested.

Excursion**Wednesday, June 27, 10:30 a.m. - 4:30 p.m.**

After the General Assembly the afternoon is reserved for the Congress excursion. No lectures will be scheduled during this time. Just 20 miles away from Rochester, the Genesee Country Village and Museum maintains the third-largest collection of historic buildings in the nation. Each of the 57 19th-century buildings has been moved to the site, restored to original condition, and furnished with period antiques. As you stroll through the buildings, "villagers" in period dress tell you about 1800s Genesee River Valley life. Live demonstrations of crafts and tasks of the 19th century take place every day.

Transportation: Buses will pick-up at 10:30 a.m. at this Convention Center and depart Genesee Country Village at 4:00 p.m.

Fee: \$40,00 (transportation and lunch are included) Advance reservations are necessary

Banquet**Thursday, June 28, 6:00 - 11:00 p.m.**

The Rochester Riverside Convention Center banquet will feature cocktails and a delicious sit down dinner. Entertainment will be provided by *Nik and the Nice Guys*, a band with national acclaim throughout the US. They will play swing, country, rock, and a variety of different types of music for your dancing pleasure. Additionally, the highly prestigious Judd Award will be presented. The award is presented biannually and was established in 1975 in memory of the outstanding color scientist, Deane B. Judd to recognize work of international importance in the fields of color perception, color measurement, or color technology. Casual or formal dress is acceptable.

Fee: \$80,00 Advance reservations are necessary.

OPTIONAL EVENING EVENTS (*Times are approximate.)

Sporting Event

Monday, June 25, 7:00 - 10:00 p.m.*

Enjoy a game at Frontier Field with either the Rochester Red Wings baseball team or Rochester Rhinos soccer team. The Frontier Field game schedule is not currently available, but a game will be scheduled for either Monday or Wednesday evening during the Congress for your enjoyment.

Transportation: Buses will pick-up at the Convention Center at 7:00 p.m., depart after the game.

Fee: \$18,00 (transportation and ticket fees are included) Advance reservations are requested

Memorial Art Gallery of the University of Rochester

Tuesday, June 25, 7:00 - 9:00 p.m.*

A visit to the Memorial Art Gallery is a Journey through more than 5,000 years of art history. From the relics of antiquity to works in the of contemporary movements, the Gallery offers a panorama of the world's art.

Transportation: Buses will pick-up at the Convention Center at 7:00 p.m. and depart at 9:00 p.m.

Fee: \$8,00 (transportation + entrance fees are included) Advance reservations are necessary

COMPANION PROGRAM (*Times are approximate)

Historic Pittsfort Village Erie Canal and Shopping

Monday June 25, 10:00 a.m. - 2.00 p.m.

Spend the morning walking along the historic Erie Canal, viewing the 19th century architecture, and browsing the village shops

Transportation: Buses will pick-up at the Convention Center at 10 :00 a.m. and depart Pittsfort Village at 2:00 p.m. Time will be allotted for lunch

Fee: \$8,00 Advance reservations are necessary if NOT registered in the Companion Program.

Landmark Society Historic House Tour

Tuesday, June 26, 9:00 a.m. - Noon*

Rochester's downtown now embraces the early 21st century, but blended in among the new is prominent and solid evidence of Rochester's history Enjoy an architectural tour of downtown Rochester with the Landmark Society of Western New York.

Transportation: Buses will pick-up at the Convention Center at 9:00 a.m. and depart Landmark Society at 11:45 a.m..

Fee: \$25, 00 Advance reservations are necessary NOT registered in the Companion Program.

Winery Tour and Tasting

Thursday, June 28, 1:30 - 5:00 p.m.

At Rochesters Casa Larga Vineyards, see old world wine-making from graft to glass! The guided tour begin in the vineyard, where you will learn how our grapes are. grown, harvested, and pressed. Then follow the wine-making process through fermentation, oak cask ageing, and bottling cellars. Complete your tour with the basis of wine tasting

Transportation: Buses will pick-up at the Convention Center at 10:30 a.m. and depart Casa Larga at 4:00 p.m..

Fee: \$16,00 Advance reservations are necessary.

George Eastman House, and International Museum of Photography and Film

Friday, June 29, 1:30 - 5:00 p.m.

Located on historic East Avenue in Rochester; The 12,5-acre museum site was the urban estate of George Eastman, founder of Eastman Kodak Company. The Museum includes Mr Eastman's restored house and gardens and displays the art technology, and impact of photography and motion pictures over 150 years.

Transportation: Buses will pick-up at the Convention Center at 1:30 p.m. and depart the Museum at 5:00 p.m..

Fee: \$8,00 Advance reservations are necessary

These tours have limited space therefore, we would appreciate confirmation of your attendance at the time of registration. If cancellations are necessary for any of these tours, please inform the secretariat, page 2, as soon as possible or at the registration Desk upon your arrival

OPTIONAL PRE AND POST CONGRESS TOURS

Niagara Falls Day Tour

Saturday, June 30, 9:00 a.m. - 8:00 p.m.

Your day begins with an exciting Imax theatre production, "Niagara: Miracles, Myths, and Magic" followed by a behind the Falls boat ride on the *The Maid of the Mist* (raincoats are provided!), free time at the popular Casino Niagara, and a scenic cruise on Lake Ontario.

Transportation: Buses will pick-up at the Convention Center at 9:00 a.m. and return at 8:00 p.m. Time will be allotted for dinner

Fee: \$65,00 (transportation and lunch are included)

Corning Museum of Glass and Finger Lakes Winery Tour

Saturday, June 30, 9:00 a.m. - 8:00 p.m.

Your day begins riding along one of the beautiful Finger Lakes with a stop for a tour, wine tasting, and lunch at a local historic winery Your day continues with a guided tour of the famous Corning Museum of Glass including a spectacular hot glass show. After shopping along historic Market Street, a buffet dinner will be provided.

Transportation: Buses will pick-up at the Convention Center at 9:00 a.m. and return at 8:00 p.m. Time will be allotted for dinner

Fee: \$65,00 (transportation, lunch and dinner are included)

TRAVEL INFORMATION

Appointed Official AIC COLOR 01 Travel Agency

We are pleased that registrants will only need to communicate with one travel agent for both airfare and hotel. DePrez Travel has been appointed the official AIC Color 01 Travel Agency. Please feel free to contact them for any questions or concerns regarding your visit to Rochester, NY.

DePrez Travel Bureau
145 Rue DeVille
Rochester, NY 14618 U.S.A.

Tel: 001 716-442-8900
Fax: 001 716-422-8921

E-Mail: depreztravel@wspan.com Website: www.ci.rochester.ny.us

Deadline: Hotel reservation requests must be received by the Greater Rochester Visitor's Association Housing Desk at DePrez Travel in writing no later than **May 18, 2001**. If you have not done so by this date, your request will be processed on an availability basis.

Domestic Travel

Discounted airfare is available exclusively through DePrez Travel. You may request air discounts via phone, fax, or e-mail. Refer to the „International Colour Association" when requesting rates and schedules.

International Travel

Discounted airfare is available with United Airlines, Continental Airlines, Northwest Airlines and their global partners. Participants may contact DePrez Travel or the airline direct to obtain rates and schedules. When contacting the airline directly, please refer to the following discount reference numbers:

United Airlines:	To Be Announced - Contact: DePrez Travel
Continental Airlines:	ZCW5
Northwest Airlines:	RBABU

Rochester

Rochester is located on the southern shore of Lake Ontario in Western New York. Its metropolitan area extends southward from the lake about 25 miles on both sides of the Genesee River. Rochester is known as *the World's Image Centre*, due to its unique imaging history; it's impressive educational opportunities in the imaging sciences; and its vast number of businesses engaged in some aspect of imaging technology, services, or products. Three internationally famous corporations also had their start in this image-making City: Bausch & Lomb, Eastman Kodak and The Document Company, Xerox. Please visit the Rochester home page at: www.visitrochester.com

Access to Rochester

The Greater Rochester International Airport is located within 20 minutes of the city center and the Rochester Riverside Convention Center. The Convention Center can be reached from the airport via 390 North to 490 East. Follow signs to Downtown, exit Inner Loop East (Exit 13) and exit at St. Paul Street. Turn right onto St. Paul Street. Go through 4 traffic lights, crossing over Main Street. The South Avenue Parking Garage is on the left. The Convention Center is connected to the Garage. Many area maps can easily be accessed by clicking the *maps* button of website: www.visitrochester.com.

Public Transportation

The Regional Transit System (RTS) buses serve the Rochester area, 1-800-288-3777. Taxi cabs can be found waiting for passengers at the airport, bus station, and train terminal.

Climate and Clothing

In late June, the temperature in Rochester averages between 13 °C and 26 °C with occasional rainfall.

CO-LOCATED MEETINGS

CIE Division 1: Vision and Colour Meeting

Friday and Saturday, June 22 - 23

CIE Division 1 will hold their Technical Committee and main meetings at the Hyatt Regency Rochester Hotel. A banquet style lunch will be available on both days, but participants must pay for their lunch. Hotel rooms have been reserved at all three AIC 01 Congress hotels for the nights of June 21st and June 22nd. If you plan on attending the CIE Division 1 meeting, please check the appropriate box on the AIC registration form

Inter-Society Color Council (ISCC) Project Committee Meetings

PC-51 Guide to Material Standards, Chair: A. Springsteen

PC-52 Comparative List of Color Terms II, Chair: E. Carter

PC-53 Annotated "Webliography" of Color, Chair: M. Brill

Chair: Paula Alessi,
paula.alessi@kodak.com
Exhibitions Chair: Kevin McGuire,
aic2001@soluxtdi.net
Finance Chair: Geoff Woolfe,
geoff.woolfe@kodak.com
Fundraising Chair: Roy Berns,
berns@cis.rit.edu
Publications Chair: Bob Chung
rycppr@rit.edu

Publicity Chair: Dave Wyble,
wyble@cis.rit.edu
Poster Chair: Karen Braun,
kbraun@crt.xerox.com
Social Program Chair: Cathy Daniels Cerosaletti,
cathleen.cerosaletti@kodak.com
ISCC Liaison: Robert Buckley,
rbuckley@crt.xerox.com

Scientific Program Committee

Chairperson: Allan Rodrigues (DuPont Performance Coatings, USA)
allan.b.rodrigues@usa.dupont.com
Ex-officio: Paula Alessi (Kodak, USA)

Roy Berns, Rochester Institute of Technology, USA
 Robert Buckley, Xerox Corporation, USA
 Shashi Caan, Skidmore Owings & Merrill Architects, USA
 Bob Chung, Rochester Institute of Technology, USA
 Mark Fairchild, Rochester Institute of Technology, USA
 Paul Green-Armytage, Gurtin University School of Design, Australia
 Richard Harold, BYK-Gardner, USA
 Robert Hirschler, SENAI/GETIOT, Brazil
 Nancy Kwaliek, University of Texas at Austin, USA
 Georgia Kalivas, Fashion Institute of Technology, USA
 Jack Ladson, Estée Lauder, USA
 Joy Turner Luke, Artist, USA
 Ronnier Luo, University of Derby, UK
 Manuel Melgosa, University of Granada, Spain
 Leo Oberascher, Institut für Angewandte Ökologische Psychologie, Austria
 Meg Miele, Fashion Institute of Technology, USA
 Joel Porkorny, University of Chicago, USA
 Danny Rich, Sun Chemical Research, USA
 Alan Robertson, National Research Council, Canada
 Geoffrey Rogers, Fashion Institute of Technology, USA
 Grete Smedal, National Institute of Art and Design in Bergen, Norway
 Heinz Terstiege, DfWg, Germany
 Wade Thompson, Southwest Missouri State University, USA
 Geoff Woolfe, Eastman Kodak Company, USA
 Hirohisa Yaguchi, Chiba University, Japan
 Magenta Yglesias, Consultant, USA

AIC Member Organizations

Grupo Argentino del Color, **Argentina**
 Colour Society of Australia, **Australia**
 Österr. Verband für Elektrotechnik, **Austria**
 Asociación Boliviana del Color, **Bolivia**
 Associação Brasileira da Cor, **Brazil**
 Colour Group of Bulgaria, **Bulgaria**
 Color Association of China, **China**
 Centre Français de la Couleur, **France**
 Deutscher Verband Farbe, **Germany**
 The Colour Group, **Great Britain**
 Hungarian Nat. Colour Committee, **Hungary**
 The Colour Group of India, **India**
 Associazione Ottica Italiana, **Italy**

Color Science Association of Japan, **Japan**
 Korean Society of Color Studies, **Korea**
 Nederl. Ver. v. Kleurenstudie, **The Netherlands**
 Norsk Farveforum, **Norway**
 Central Office of Measures, **Poland**
 Slovenian Colourists Association, **Slovenia**
 South African Colour Science Ass. **RSA**
 Comité Español del Color, **Spain**
 Stiftelsen Svenskt Färgcentrum, **Sweden**
 Pro Colore, **Switzerland**
 The Color Group Of Thailand, **Thailand**
 Inter-Society Color Council. **USA**



DIVISION 1: VISION AND COLOUR

Director: Dr Ken Sagawa

Im Folgenden werden die auf der Tagung der Division 1 in Teddington am 7. April 2000 vorgetragenen Berichte der Technischen Komitees aus der Gruppe Farbe (Associate Director: Dr. Pointer) wiedergegeben

TC1-27. Specification of Colour Appearance for Reflective Media and Self-Luminous Display Comparison (P Alessi)

Phase one of the three final experiments has been completed. This phase featured 8" x 10" prints viewed in a room illuminated with CIE D50 simulator at a viewing distance of 21" and softcopy 8" x 10" matching images on a CRT set to a 9300K white point, also viewed at a distance of 21". The luminance level for both hardcopy and softcopy white point was 70cd/m².

The hardcopy prints and a large colour patch set were scanned and a model was derived from the colour patch set to reliably convert from scanner code value to XYZ. This model was used to convert scanned print data to XYZ. Then softcopy matching images were created to the print XYZ-data on a pixel - by - pixel basis. The following uniform colour space, chromatic adaptation transforms and colour appearance models were used for making the matching softcopy images: CIELAB, von Kries, Bradford (D computed), Bradford (D set = 1,0), Nayatani *97, Hunt *96 (assuming average surround), CIECAM97s (assuming average surround), LLAB (assuming dim surround) and RLAB (assuming dim surround). The surround choices came from the results of a pilot study. The prints were gamut-compressed so that no softcopy matching image for any of the models contained pixels outside of the video gamut. Finally the prints were made less sharp in an attempt to match the perceived sharpness of the softcopy matching images.

A psychophysical experiment was run featuring the memory-matching technique across media. A forced choice paired comparison experiment was run where 30 observers saw 36 pairs (i.e. all possible pair combinations of 9 models) of softcopy matching images for each of four scenes (Barn, Golfer, Musicians, and U-chart). Each observer adapted to the print for at least 60 seconds. (The prints had a 1/4" white border and then they were mounted on an 18% gray board). The room lights were turned off and the observer adapted to an 18% gray on the CRT for 60 seconds. Then the pairs were presented. (The CRT images were just like the prints in that they were surrounded by a 1/4" white border and then a larger gray border that filled out the CRT raster.) The observer was asked to pick which member of the pair best matched the print they just saw. Observers were allowed to look back at the print at any time recognizing that they would have to go through the adaptation periods again. If an observer did not request to look back at the print by pair 12 or pair 24, they were asked to do so. The following model ranking results were obtained from a Duncan test of statistical significance:

Barn:

CIELAB <Nay*97 <RLAB <von Kries = LLAB <Brad(D=1) <Hunt*96 <CIECAM97s <Brad

Golfer:

CIELAB <RLAB <Nay*97 <von Kries < LLAB < Hunt*96 < Brad(D-1) < CIECAM97s = Brad

Musicians:

Nay*97 < RLAB <CIELAB <LLAB <von Kries <Brad(D=1.0) < Hunt*96 < CIECAM97s <Brad

U-chart:

Nay*97 <CIELAB <RLAB <LLAB <Hunt*96 < von Kries = Brad(D=1) <CIECAM97s <Brad

These model ranking results were substantiated by other tests of statistical significance like the Bradley-Terry method and the Scheffer method.

It is clear that for all four scenes, the top two models were Bradford and CIECAM97s. In fact, Bradford was the top model for all scenes, except golfer, where it came out equal to CIECAM97s. These are not surprising results. The media differed only in chromaticity (i.e. print white point at simulated CIE D50 and CRT white point at 9300K and both at 70cd/m²) so one might expect that a chromatic adaptation transform like Bradford would be all that is necessary to achieve equal colour appearance across media. It is worth noting that CIECAM97s uses the Bradford chromatic adaptation mode 1, which is probably why it also scored high. It is also worth noting that both versions of the Bradford model always outscored the von Kries chromatic adaptation model. Also Bradford with D computed always outscored Bradford with D set to 1,0. The poorest performing models were CIE LAB, Nayatani*97 and RLAB(dim surround).

The next step is to use the same experimental approach on the second set of viewing conditions, which features the print white point at simulated CIE D50 and 600cd/m² with the CRT white point at 9300K and 70cd/m². Based on the results from the first set of viewing conditions reported above, it is proposed to drop CIELAB, Nayatani*97 and Bradford (D=1,0). Also CIECAM97s2 will be used instead of CIECAM97s and the new Nayatani et al. model known as CIECAT94LAB. Thus the model list would be the following: von Kries, Bradford, Hunt*96, RLAB, LLAB, CIECAM97s2, CIECAT94LAB. A new set of scenes will be used to overcome some problems with the previous set. Another pilot experiment will have to be performed to determine the proper surround conditions for Hunt*96, RLAB, LLAB, and CIECAM97s2.

TC1-38: Compatibility of Tabular Data for Computational Purposes (C McCamy)

The third draft of a CIE Technical Report Recommended Practice for Tabulating Spectral Data for Use in Colour Computations was prepared and distributed for comment. Dr. Séve of France agreed in general with proposals and provided editorial comments and a careful mathematical analysis. A fourth draft is being written to take these contributions into account. The committee has given a great amount of attention to methods of interpolation. It appears that we are reaching consensus in that regard. One objective of the technical committee is to recommend the spectral interval between tabulated values. The recommendations were virtually unchanged from the first to the second and from the second to the third draft and in the latest round, only minor editorial clarification and nothing substantive was suggested. The proposed wording of this fourth draft is as follows:

It is recommended that spectral data for use in colorimetry be standardised at 5 nm intervals.

It is recommended that the definitive values of colorimetric quantities be these based on computations at 1 nm intervals with values of the colorimetric functions and standard illuminants being interpolated at 1 nm intervals, by the recommended method, and values of the spectral modulation of objects or spectral power of lights being measured at 1 nm intervals. Given a recommended method of interpolation, colorimetric functions and standard illuminants need not be published at 1 nm intervals.

In the past year TC1 48 has had to consider the issue of spectral intervals. Dr. Schanda, Chairman, has obtained broad participation and members have contributed a great deal. Whereas TC 1-38 addressed spectral intervals in the abstract. TC14.8 had to address specific cases in the revision of Publication 15. With specific cases, they were able to compute errors associated with different approaches. In formulating the recommendations of TC 1-38 for future applications, we shall take full advantage of the results of computations, the experience brought to bear, and the insights gained by the well-organized and vigorous debate in TC1 48.

TC1-43: Rod Intrusion in Metameric Colour Matches (R Berns)

This was established in response to Thornton's work. Since the chairman does not wish to continue with his work because it is impossible to come to consensus, associate director proposed it be closed now. It was approved unanimously.

TC1-44: Practical Daylight Sources for Colorimetry (R Hirschler)

No report received

TC1-47: Hue and Lightness Correction to Industrial Colour Difference Evaluation (D. Alman)

This committee met at NPL. Subcommittees of TC147 reported proposed corrections to the CIE94 industrial colour-difference evaluation model for hue angle dependence of hue difference, lightness dependence of lightness difference, interaction of hue difference and chroma difference for blue colours and chromatic non-uniformity of neutral colours. The proposed corrections have been extensively tested with several visual colour-difference data sets. The working programme of TC 1-47 will now move from the investigation to the report phase and recommend a new colour-difference formula.

TC1-48: Revision of CIE Document 15.2 Colorimetry (J Schanda)

Work is well in hand and, following a meeting of the TC at NPL a final draft will be produced. It has been decided that it will be recommended that colorimetry be performed using 1 nm data as provided by the CIE/ISO standards. Recommended methods will be given to enable data to be interpolated to 1 nm and also to enable calculations to be performed using other wavelength intervals. Correlated colour temperature will be defined using a mathematical function in such a way that the results will be the same as those obtained by the present model. A new series of lamp spectral power distributions will be provided, in addition to some of those already in Document 15.2.

TC1-52: Chromatic Adaptation Transform (R Luo)

This TC met at NPL and it has been agreed that a technical report will be produced describing available methods for predicting corresponding colours. It is not possible to recommend a single method at this time

TC1-53: A Standard Method of Assessing the Quality of Daylight Simulators (C McCamy)

Draft 3 of a proposed CIE standard method of assessing daylight simulators was submitted to a letter ballot of the members of the technical committee on November 13, 1999. The draft received full approval, but with numerous comments. All of the recommended changes were incorporated in the 4th draft, dated January 9, 2000. There were numerous changes in terminology. A copy of the draft was sent to Dr. Pointer, because of his involvement with terminology. There were so many changes, some a little beyond editorial in nature, that it was considered appropriate to give the members an opportunity to approve the draft or make further comments. Responses were requested before the end of March. Because of the extensive involvement of fluorescence in the method, it is important to co-ordinate this effort with TC2-25. Its chairman, Dr. Joanne Zwinkels, is a member of TC 1-53. There has been only one response as of this date, with full approval and no comment. As soon as the remaining responses have been received, the Division will be apprised of the status of the work.

TC1-55: Uniform Colour Space for Industrial Colour Difference Evaluation (J Nobbs)

This TC met informally at NPL and has formulated a working programme that will investigate various approaches to solving the problem.

TC1-56: Improved Colour Matching Functions (M Brill)

The present report is to inaugurate the work of the new CIE Technical Committee TC1-56. Over the past month the Committee has discussed the document by email, so the report is the output of a virtual meeting that replaces the originally scheduled face-to-face meeting at NPL. Although some members are interested in exploring particular questions in more detail than indicated here, this report comprises a consensus of the work plan. The following is the detailed report from the chairman.

1. Introduction

TC1-56 has the charter to examine the fundamentals of colorimetry in view of some recent, empirically based questions. Even now, this effort is perceived as very important for the future of colorimetry. A precondition to the terms of reference is to set to rest a problem noted by W. A. Thornton (Toward a more accurate and extensible colorimetry, Parts I-III, Color Research and Application. Vol. 17,79-122; 162-186, 240-262, 1992). Thornton found experimentally that colour-matching functions for a single observer do not transform appropriately to predict colour matches by the same observer using another set of primaries. Additional experimental evidence will be sought that bears on this question of transformability. Although extending a little beyond the terms of reference, it may be useful to discuss how (if at all) a new set of colour-matching functions should be retrofit to existing colour difference and colour appearance models.

Some of the issues to be addressed by the present committee were discussed at a symposium sponsored by the CIE in June, 1993 on Improved Colorimetry (Proceedings are in CIE publication x007). Although a review article on these matters may not exist, several researchers at that Symposium pointed to failures of colourmatch additivity (due to rod intrusion, due to photo-pigment depletion, etc.), and failure of the CIE colour-matching functions (either 2-degree or 10 degree variety) to capture the entire population of human observer's colour matches. The question remains open as to whether these failures create important impediments to practical applications of the colour-matching functions (e.g., inter-device matching that involves colour matching of lights with large spectral mismatches). Thornton may be unique in offering evidence of very large and fundamental failures of the existing colour-matching formalism.

For the next four years, TC1-56 will look at these issues with due deliberation. In the eight years since Thornton's original paper, the crucial experiments have not been repeated. A major objective of TC 1-56 is to rectify this omission. Any technical decisions based on the one negative result must await corroboration, especially in view of the success of the CIE system in certain venues.

2. Beginnings of a Work Plan.

Based on the above background and terms of reference, here is a possible work plan for TC1-56. The work plan encompasses experiments, data analysis, and recommendations concerning several questions. The questions, outlined below, might well be addressed in parallel by interested subcommittees of TC1-56.

2.1. For a single human observer, are colour-matching specifications amenable to transformation of primaries? This question is of critical importance, because transformation of primaries is tantamount to two applications of Grassmann's additivity law. (Find the Set-2 match of each primary in Set 1, replace each Set-1 primary with its Set-2 match, and thereby predict the matches made with Set 2 in a new experiment.) Hence Grassmann additivity fails if transformability fails

Accordingly, a laboratory is needed to conduct the following experimental program:

a. Acquire a proven apparatus for measuring colour matches, including a spectroradiometer to measure the lights participating in the matches, a monochromator that can traverse the visible spectrum and produce reliable colour-matching functions at 10 nm intervals, a bipartite 10-degree field (binocularly viewed) in which to display (at high photopic light levels) the two halves of the match. The radiometer should be calibrated to a suitable standard lamp. To be sure of the retinal illumination one may use special apparatus to measure pupil diameter, or light levels may be high enough to use an artificial pupil.

b. Screen from 6 to 10 subjects using Ishihara and Farnsworth tests for normal colour perception. At least two of the subjects should be less than 30 years old, at least two should be between 30 and 50 years old, and at least two should be over 50 years old.

c. Select two sets of wavelengths for the primary-light sets. To replicate Thornton's experiment, the wavelengths 452, 533, and 607 nm might comprise Set-1, and the wavelengths 497, 579, and 653 nm might comprise Set-2. (A third set, at wavelengths 477, 558, and 638 nm, might be used if time permits.) The primary sets must be very different from each other in their selected wavelengths.

d. Perform maximum-saturation matches to develop colour-matching functions (cmfs) for each observer and for each primary set. If time permits, perform the corresponding Maxwell colour matches.

e. Repeat Step d enough times on each subject to obtain a statistically significant estimate of intra-observer variability. Then, average the results within each given subject/primary-set to obtain colour-matching functions.

f. For each subject, perform a transformation from Set-1 cmf to predicted functions from Set-2 primaries. Compare these predicted functions to the Set-2 functions obtained directly by experiment.

NOTE: It may be sufficient for the transformability experiment to measure the colour-matching functions at only a few wavelengths besides those of the primaries.

A background theoretical task might be to perfect the data analysis and computation of colour-matching functions, so as to avoid the problems noted by Thornton.

2.2. What set of colour-matching functions best represents (up to linear transformation) the population of colour-normal human observers? Several sub-issues need to be settled:

a. Should observer data be averaged prior to transformation to a desired basis set, or afterwards?

b. What data sets should be examined? (Examples are the Stiles-Burch set used by TC1-36 and available in Wyszecki and Stiles, *Color Science*, the results from Thomson's laboratory, and others such as emerge from the facility performing phase 2.1 of the effort.)

c. Which, if any of the Standard Observers are sufficiently close to the data to be chosen as the "best"? Example Observers are the CIE 10-degree and 2-degree Standard Observers, and the Judd-modified Standard Observers.

d. What should be the recommended "best set" of colour-matching functions?

e. How should observer variability be characterised by the CIE?

f. What are the ramifications of observer variability in practical colour technology?

To resolve these issues, the experience of the committee members and published experiments may go a long way. However, new observer-variability studies may be suggested as the program proceeds, as field trials for the various suggested Standard Observers.

2.3. How shall quantities that have been derived from colour-matching functions in the past be modified in the event of new colour-matching functions? This question may not be answerable definitively within the scope of the committee but should be discussed in order to provide a suggested recommendation to the CIE.

3. Next Steps.

At least one laboratory must sign up for the Experiment in Section 2.1. That laboratory must have the equivalent of a high-precision visual colorimeter. Comments and volunteers are solicited. As motivation, it should be kept in mind that numerous queries from other standards bodies and industry have already been directed at TC1-56 even before its work is started. The world is waiting for an answer from us.

To participate in discussions, please email the email of the Chair of the committee, Mike Brill, at mbrill@sarnoff.com.

R1-11 Cognitive Aspects of Colour (G. Derefeldt)

The manuscript for this report has been prepared and was given to the Division Editor at the meeting at NPL. Table of contents of the report were reported. It was suggested to form a Study Group on this subject.

R1-15 Lighting Terminology (M Pointer)

The final versions of the International Lighting Vocabulary were submitted to the CIE Central Bureau at the end of August 1999 and have now been balloted by national committees. Many comments have been received and these will now be addressed.

R1-18 The Use of Colour Identification under Various Illuminance Levels (T Ishida)

A survey of the related studies was reported in Warsaw and this work is continuing.

R1-24 Colour Appearance Models (M Fairchild)

There has been some recent research activity in the area of colour appearance models to be reported to the CIE. However, all of the important issues raised are currently being addressed by CIE technical committees, thus there is no need to form another committee at this time. This reporter-ship will continue to monitor activity and welcomes input. The following is the detailed report from the reporter.

Revision of CIECAM97s

Three general suggestions have been made for improvement of CIECAM97s. Two are relatively minor formal revisions that were discussed within TC8-01 and reported by Li et al. (7th IS&T Color Imaging Conference and forthcoming in Color Research & Application) that correct practical issues with the lightness scale and surround compensations. The third is a new formulation of the chromatic adaptation transform to eliminate the nonlinearity that causes complications when inverting CIECAM97s. Finlayson and Susstrunk will describe this work at the Derby conference in April. Complimentary work is also ongoing at RIT. It is expected that CIE TC8-01 will consider these revisions and make recommendations.

Chromatic Adaptation Transform

TC1-52 is completing more tests of chromatic adaptation transforms and thus far the data support the formulation in CIECAM97s. This is a nice confirmation of CIECAM97s.

Other

A variety of other papers testing colour appearance models and applications have been published. Much has been learned to date. Thus far, no results have suggested that CIECAM97s is not at

least among the best models evaluated. This is consistent with the testing available in 1997 when the model was formulated. This research will be summarised in a more formal report form R1-24 at a future date.

R1-25: Liaison with ISO/TC: 35 Paint and Varnishes Colorimetry (K Witt)

The new chairman of ISO/TC 35 Paint and Varnishes is Dr. G. Etzrodt from BASF, Ludwigshafen and the new secretary is Mr. B Reinmüller from DIN. Both were informed about the problems with copyright of CIE publications used in ISO standards. The Reporter had a first very co-operative meeting with them on March 8; 2000 in Berlin at DIN. They discussed the status of the series of colorimetric standards ISO 7724, and what could be done to improve the link to CIE. The following procedure was proposed:

- a. ISO shall be asked to agree on the introduction of CIE/ISO standards.
- b. The responsibility of CIE is to formulate colorimetric standards deduced from Publication 15.3. The drafting procedure should include ISO/TC 35 activities as well as those of other relevant ISO Committees
- c. ISO desire to reduce the number of standards could lead to a reformulation of the ISO 7724/1-3 series.
- d. CIE should formulate a first draft of a CIE/ISO 7724 standard "colorimetry" as a collation of the three parts directly deduced from Publication 15.3. K. Witt accepted to try a first draft based on the existing data files of the ISO 7724 series by May 11.
- e. The standard shall meet the needs of the colorant industries.
- f. Colorimetric tables should be omitted in favour of those in the original CIE publication.
- g. Dr. Etzrodt shall put the new activity on the agenda of the forthcoming ISO/TC 35 meeting June 2000 in Oslo.
- h. The drafting procedure of CIE and ISO should be done in close connection. The final voting on the standards must be started in CIE and finalised by ISO allowing only a "yes/no" answer.

K. Witt was informed about the results of further meeting between Dr. Etzrodt and colorimetric experts from BASF (Dr. Gall, Mr. Unterforsthuber). Their idea is to formulate the new standard as the standard of basic colorimetry and to add further standards on applications that focus on sample preparation and formulae with only cross reference to the CIE colorimetric standard. The colorimetric standard should include:

- a. Calculation of tristimulus values optionally including tables of colour matching functions and illuminants, definitions of start and end wavelength and step width of spectral data and of an algorithm how to process data of different step widths, and how to proceed with subtraction of "gloss".
- b. Measuring procedure including calibration, reference standards, geometries, poly-chromatic or mono-chromatic illumination, nomenclature of measured values, fluorescence, transmission.
- c. Colour co-ordinates, colour differences (CIELAB, CIEELUV, CB94 (DIN99?), CMC etc.).
- d. Other colorimetric entities such as depth of shade, hue of near white colours, whiteness, yellowness index, metamerism index.

We must decide what CIE can do and what must be left to ISO for further standardisation. The reporter hopes to receive a clear answer for the ISO secretariat so that it may formulate an agenda for the forthcoming ISO/TC 35 meeting in consensus with CIE.

R1-26: CIE Encyclopaedia on Colour (P Walraven)

Negotiations with Wiley are continuing. A discussion with the Publications Board of CIE has taken place during the symposium on the 75th Anniversary of CIE 1924 V(A) regarding the format of the publication. It is essential that the publication should be in the framework of the publication-strategy of CIE. This will be further negotiated with Wiley.

DISCUSSION ON NETWORK ITEM PROPOSALS

Standards in Colorimetry

Terms of Reference:

To prepare a series of CIE/ISO/IEC Standards that describe:

1. *The method of calculating CIE tristimulus values and chromaticity coordinates*
2. *A uniform colour space and its associated metrics*
3. *A formula for industrial colour difference evaluation*



COMMISSION INTERNATIONALE DE L'ÉCLAIRAGE
INTERNATIONAL COMMISSION ON ILLUMINATION
INTERNATIONALE BELEUCHTUNGSKOMMISSION

Division 2: Physical Measurement of Light and Radiation

2001 Division 2 / TC meetings
May 14-19, 2001 at NIST, Gaithersburg, Maryland

May 14 (Mon)		8:00-9:00	9:30-10:30			
	NIST Rm1	TC2-45 w/CORM-CR7	TC2-51 w/CORM-CR6	(CORM subcommittee meetings) TC2-39 w/CORM-OP2		
May 17 (Thu)		8:30 - 10:00	10:30-12:00	1:00-2:30	2:30-4:00	4:15-5:45
	NIST Rm1	TC2-48	TC2-46		TC2-42	TC2-49
	NIST Rm2	TC2-25		TC2-47		
May 18 (Fri)		8:30 - 10:00	10:30-12:00	1:00 - 5:00		
	NIST Rm1			Division 2 meeting		
	NIST Rm2	TC2-43	TC2-16			
May 19 (Sat)		9:00 - 12:00				
	Holiday Inn	Div.2 meeting -cont'd				

Room names are tentative. The details are to be announced.

TC meetings on May 14 are joint meetings with the CORM subcommittees on the same subjects.

TC2-16 Characterization of the performance of tristimulus colorimeters (M L Rastello)

TC2-25 Calibration Methods and Photoluminescent Standard for Total Radiance Factor Measurement (J Zwinkels)

TC2-39 Geometric Tolerances for Colorimetry (D Rich)

TC2-42 Colorimetric Measurements for Visual Displays (C Wall)

TC2-43 Determination of measurement uncertainties in photometry (G Sauter)

TC2-45 Measurement of LEDs - Revision of CIE 127 (K Muray)

TC2-46 CIE/ISO standards on LED intensity measurements (J Scarangelo)

TC2-47 Characterization and Calibration Methods of UV Radiometers (G Xu)

TC2-48 Spectral responsivity measurement of detectors, radiometers, and photometers (G Eppeldauer)

TC2-49 Photometry of Flashing Light (Y Ohno)

TC2-51 Calibration of diode-array spectrometers (R Austin)

Dr. Gerhard Rösler*

Normung der Farbmessung goniochromatischer Materialien

Kurzfassung:

Dieser Überblick über die Multigeometrie Farbmessung beginnt mit den industriellen Einsatzbereichen und stellt den Stand der Normung Ende 1999 dar. Ein kurzer Ausblick auf weitere erforderliche Normung bildet den Abschluss.

Was sind "goniochromatische Materialien"?

- Industriell bedeutendes Beispiel sind die Metallic- und andere Effektlackierungen an Autos. Über 70% der Neufahrzeuge werden mit Effektlackierung bestellt.
- Die Effektlackierung verstärkt optisch die Krümmungen der Fahrzeuge und bietet mehr Farbnuancen als Unilacke.
- Die Metallic-Effektlacke werden durch immer komplexere Perl- und Interferenz-Effektlacke ergänzt.

Wo sind genaue Effektlackierungen im Automobilbereich wichtig?

- Karosserie Erstlackierung
- Anbauteile Erstlackierung bei Zulieferanten
- Reparaturlackierung
- Lackherstellung
- Effektpigmentherstellung

Warum verwendet man goniochromatische Materialien?

- Attraktivität, Überraschung, Komplexität des Effektes.
- Wie bei vielen Produkten ist die Farbe zusammen mit der Form für viele Kunden ein primäres Qualitätsmerkmal.

Die tägliche Herausforderung

- Speziell bei der Applikation, die auf viele Einflussparameter reagiert, ist objektive Information wichtig zur Prozessoptimierung (Effektausbildung, Schichtstärke, Deckvermögen, Wolken, Orientierung).
- Verschiedene Standorte (Globalisierung!) der Fahrzeughersteller und der Zulieferanten formintegrierter Anbauteile in Wagenfarbe erfordern große Anstrengungen aller Beteiligten.

* GretagMacbeth GmbH, München, Mitglied des Beirates des FNF
Vortrag gehalten auf der Jubiläumstagung 50 Jahre Normenausschuss Farbe (FNF)

Ziele der Farbmessung goniochromatischer Materialien

- Instrumentelle Nachbildung der mittleren menschlichen Farbempfindung.
- Unterschiedliche Beleuchtungs- und/oder Beobachtungsrichtungen ergeben bei goniochromatischen Materialien oft einen anderen Farbort.
- Bei Unilackierungen (keine signifikanten goniochromatischen Effekte, diffuse Reflexion in der Farbschicht) sind einige Millionen Farben unterscheidbar.
- Bei Effektlackierungen gilt das aber bei jeder Geometrie (Die Nachstellung goniochromatischer Effekte stellt daher höchste Anforderungen an die Herstellungs- und Applikationsprozesse).
- Schnelle, objektive, reproduzierbare, dokumentierte Messdaten auch im Alltag sind daher notwendig. Das Auge bleibt die letzte Instanz, ist aber in vielen Situationen überfordert und beeinflussbar.
- Farbmetrische Akzeptanzgrenzen müssen erarbeitet werden (nicht Wahrnehmbarkeitsgrenzen).

Zwei Anwendungen der Multigeometrie Farbmessung

- Charakterisierung einer Effektprobe ("Farbmetrischer Fingerabdruck")
Die Multigeometrie Farbmessung einer Probe zeigt die Art und Stärke geometrieabhängiger Farbeffekte.
- Farbabstandsbewertung zweier Effektproben
Häufigste Anwendung um die Größe von Farbabständen objektiv zu beschreiben.

Chronik der Multigeometrie Farbmessung

- 1980 - 1985:
Multigeometriemessungen direkt am Fahrzeug möglich. Das Messgerät ER 10 (von Johne+Reilhofer, jetzt GretagMacbeth) wird in der Automobilindustrie eingeführt und führt zu neuen Erkenntnissen über die Applikation. Multigeometrie Farbmessung in der industriellen Praxis hat begonnen.
- 1985 - 1990:
Weitere Messgeräte am Markt (Zeiss, Minolta, Optronik, Johne+Reilhofer) Nutzen der Multigeometrie ist klar erkennbar für alle Beteiligten. Erste DIN Normungsarbeiten beginnen für Effektlackmessung.
- 1990 - 1995:
Multigeometriemessung wird in der Automobilbranche von vielen Beteiligten eingeführt. (Weitere Geräte: X-Rite, GretagMacbeth)
- 1995 - 1999:
DIN FNF 24 Normungsarbeit konvergiert und führt zu Ergebnissen

Normung

- **DIN FNF 24**
(Obmann Prof. Dr. Terstiege, jetzt Dr. Döring)
Seit 1985 wurde an der Normung der Multigeometrie Farbmessung gearbeitet. Mitarbeiter: Hersteller von Automobilen, Lacken, Rohstoffen, Farbmessgeräten, Autoversicherer und BAM.
- **DIN 6175 „Farbtoleranzen für Automobillackierungen – Teil 2: Effektlackierungen“** ist 1999 im Gelbdruck erschienen.

USA: ASTM E12.12

Chairman Allan Rodrigues, DuPont)

Norm in Arbeit. Gemeinsame Lösungen mit DIN FNF 24 werden angestrebt. Zur Zeit noch Unterschiede wegen unterschiedlicher Startpunkte.
Gute Aussichten für eine weltweite Lösung.

Auswahl der Beleuchtungs- und Beobachtungsgeometrien

- Eine Reduktion der Vielfalt an Möglichkeiten auf eine praktikable aber aussagekräftige Anzahl ist wesentlich für die Anwendung der Multigeometrie Farbmessung.
- Der Effektwinkel (früher auch Winkel vom Glanz genannt) ist der Winkel zwischen der gespiegelten Lichteinfallrichtung und der Beobachtungsrichtung. Diese Vereinfachung hat sich bisher gut bewährt

Probenmodulation

- Beleuchtungs- und Beobachtungsrichtung sind fest, die Probe wird gedreht.
- Wird visuell meist angewendet bei manueller Handhabung kleiner Proben.
- Wird bei Messgeräten nicht mehr angewendet.

Beleuchtungsmodulation oder Beobachtermodulation möglich

- Probe und Beobachtungsrichtung bleiben konstant, die Beleuchtungsrichtung wird variiert. (Geräte von GretagMacbeth, Optronik, Minolta)
- Probe und Beleuchtungsrichtung bleiben konstant, die Beobachtungsrichtung wird variiert. (X-Rite, früher Zeiss)
- Die Umkehrbarkeit der Strahlengänge hat sich auch in der Praxis bestätigt. Daher sind die Ergebnisse der Geräte auch absolut vergleichbar.

Festgelegte Geometrien

DIN 6175 Teil 2 Gelbdruck 1999

- 45°_{eff}
- ($45^{\circ}/0^{\circ}$ bzw. $0^{\circ}/45^{\circ}$) muss eingeschlossen sein
- (Anbindung an bisherige CIE Normgeometrie)
- 25°_{eff}
- ($-20^{\circ}/45^{\circ}$ oder $45^{\circ}/-20^{\circ}$):
- Aufsicht (am Glanz).
- Gute Information über die Orientierung der Effektpigmente
- 75°_{eff}
- ($30^{\circ}/45^{\circ}$ oder $45^{\circ}/30^{\circ}$) oder
- 110°_{eff}
- ($65^{\circ}/45^{\circ}$ oder $45^{\circ}/65^{\circ}$)
- Schrägsicht (weit weg vom Glanz):
- Informationen über Streuung der Farbmittel

Aperturen

- Die Messgeometrien in den Farbmessgeräten müssen in der Praxis realisierbar sein.
- Sie sind aber besonders bei der Messung goniochromatischer Materialien wesentlich und müssen genau spezifiziert werden. Dazu reichen die Angaben von Aperturen für Beleuchtung und Beobachtung allein nicht mehr aus.
- Als neuer, zusätzlicher Weg wird die Häufigkeitsverteilung aller im Strahlengang auftretender Effektwinkel genormt.
- Das lässt den Herstellern der Farbmessgeräte einigen Freiraum für neue Geräte, sichert aber die Übereinstimmung der Ergebnisse innerhalb enger Toleranzen.

Toleranzen

- Das CIELAB System ist nicht ausreichend empfindungsgemäß gleichabständig.
- Daher wurde für die Effektlackmessungen eine Transformation der Farbabstandsergebnisse entwickelt. Diese beruht auf Erfahrungen in der automobilen Anwendung.

Ausblick auf weitere erforderliche Normungsarbeit

- **Visuelle Abmusterungsbedingungen für Effektlacke**

Geometrien und Randbedingungen bei der visuellen Abmusterung von Effektlackierungen sind auch im Labor immer noch eine schwerwiegende Schwachstelle.

Dies hat auch Auswirkungen auf die Korrelation zu den Messergebnissen, die unter genau festgelegten Geometrien erfolgt.

Die neuen visuellen Abmusterungsbedingungen sollten Farbabweichungen zwischen zwei Proben erkennbar machen.

Unter den vielen realen Bedingungen im Alltag beim Kunden sollten keine (negativen) Überraschungen auftreten, die man nicht schon bei der Abmusterung gesehen hat.

- **Erweiterung der Multigeometrie Farbmessung**

Farbmetrische Charakterisierung neuer Interferenz Effektmateriale -

Die Anwendung dieser Materialien in Effektlackierungen erfordert vermutlich eine Erweiterung der visuellen Abmusterung und Messtechnik.

Zusammenfassung

- Multigeometrie Farbmessung hat gegenüber der visuellen Abmusterung viele neue Erkenntnisse ermöglicht
- Die Anwendung im Alltag ist heute in der Lack- und Automobilindustrie selbstverständlich
- Die Normung macht erfreuliche Fortschritte

Interessante Adressen aus dem Internet

Deutsche farbwissenschaftliche Gesellschaft	DfWG	www.dfwg.de	
American Society for Testing Materials	ASTM	www.astm.org	
Applied Optics, Journ. Opt. Soc. of Am.	JOSA	www.osa.org	
Commission Internationale de l'Éclairage	CIE	www.cie.co.at	(01.01)
CIE Division 1	CIE D-1	www.nml.csir.co.za/~cie1	(03.01)
CIE Division 2	CIE D-2	www.nml.csir.co.za/~ci2/	(02.01)
CIE Division 4	CIE D-4	www.ee.tut.fi/ta/cie	(03.01)
CIE Division 8	CIE D-8	www.colour.org/tc8	(03.01)
Commission Européenne de Normalisation	CEN	www.cenorm.be	
Council of Scientific Industrial Research, SA	CSIR	www.csir.co.za	
Deutsches Institut für Normung	DIN	www.din.de	
International Standardization Organization	ISO	www.iso.ch	

Gerätehersteller:	www.byk-gardner.de
	www.datacolor.com
	www.drlange.de
	www.gretagmacbeth.com
	www.lmt-berlin.de
	www.minolta.com
	www.optronik.de
	www.techkon.com
	www.willing-online.com
	www.x-rite.com
	www.uv.groebel.de



Künftige nationale und internationale Veranstaltungen

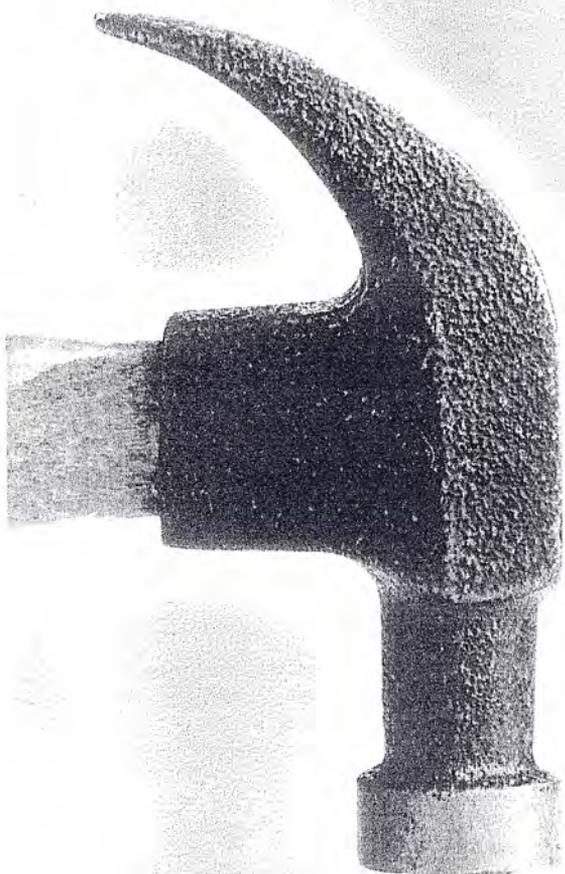
10. – 12. 05. 2001	CIE Expert Symposium on LED Measurement, NIST, USA
13. – 17. 05. 2001	NIST 100-Jahr-Feier, Gaithersburg, Maryland, USA
14. – 16. 05. 2001	CORM im NIST, Gaithersburg, Maryland, USA
16. – 19. 05. 2001	CIE Division 2, NIST Gaithersburg, Maryland, USA
07. – 09. 06. 2001	Farbe im Gespräch, Radebeul
24. – 29. 06. 2001	AIC-Tagung, Rochester, NY, USA, Riverside Convention Center
Juli 2001	Tagung: International Color Vision Society in Cambridge
03. – 05. 09. 2001	XXVIII Colouristic Symposium, Tata, Ungarn
06. – 09. 11. 2001	9. Color Imaging Conference, Scottsdale, Arizona, USA
06. – 14. 09. 2001	CIE Midterm Meeting in Istanbul, Türkei, Division 4
18. – 19. 10. 2001	DfWG-Jahrestagung, Hagen
22. – 25. 10. 2001	NEWRAD, NIST, Gaithersburg, Maryland, USA
Herbst 2002	CIE Divisionen 1 & 2 in Slowenien
01. – 10. 07. 2003	CIE Tagung in San Diego, Kalifornien, USA, Division 2
2003	Tagung: International Color Vision Society in Seattle, USA

Kann FARBE so einfach sein?

**JA - mit
den richtigen
Werkzeugen.**

Lösungen zur Licht- und Farb-
messung vom Weltmarktführer.

www.x-rite.de www.optronik.de



X-Rite