CIE NEWS

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CIE EXPERT SYMPOSIUM - EXTENDED RANGE COLOUR SPACES

On 11 November 2000, CIE Division 8 hosted an Expert Symposium entitled "Extended Range Colour Spaces". The symposium was held at the Sunburst Hotel and Resort in Scottsdale, Arizona, following the IS&T/SID Color Imaging Conference. The symposium featured talks from experts representing international standards bodies, academia, and corporations involved in imaging. It concluded with an open discussion of issues arising from the talks. Rob Buckley, Chair of TC 8-05 (Communication of Colour Information) explained that the symposium was held for two primary reasons: first, to help TC 8-05 in its effort to compare different extended gamut colour spaces; second, to increase communication between standards bodies and between standards bodies and users.

Todd Newman, Director of Division 8, laid out a conceptual framework for the Symposium by asking each speaker to address four questions:

- What problem are you trying to solve?
- Who has that problem?
- What are the criteria for a successful solution?
- What solution do you propose?

Comparing the answers to these questions is a helpful way to understand which standards address similar problems and audiences and which differ. Often, standards that appear to conflict actually address different issues.

In the first paper presented, "IEC-led Colour Space Standards", Michael Stokes provided an overview of the International Electrotechnical Commission (IEC)'s efforts in the creation of colour space standards. The IEC has created two types of extended gamut colour encodings. (A colour encoding includes both the selection of a colour space and the digital values used to represent locations in that space. The first encoding, called "scRGB", has a linear luminance encoding, and is suitable for games, virtual reality, 3D rendering and certain types of imaging operations. The second encoding, a revision of sRGB to support 10, 12, or 16 bits per colour channel, uses a non-linear luminance encoding. The gamut would also be extended by allowing values outside the range zero to one.

Next, Tony Johnson presented "Communicating Colour when Distributing Complex Images – Standard Solutions for Printing and Publishing (and elsewhere, perhaps)", which discussed the colour space needs as seen by ISO TC 130 (Graphic Arts). This included such issues as viewing conditions for hard copy and displays, measurement conditions, standard colour encoding and measurement spaces (including RGB and CMYK encodings and appearance/gamut issues), characterisation of devices, test images for evaluation of devices and process control issues.

IN THIS ISSUE

Jack Holm of ISO TC 42 (Photography) presented a paper, "Extended Colour Encoding Requirements for Photographic Applications" co-authored with Ken Parulski and Eric Edwards. TC 42 has begun work to define extended colour encodings for storage, manipulation, and interchange of digital still pictures. TC 42 has delineated two classes of extended colour encodings, input-referred and output-referred. Input-referred colour encodings are needed to encode scenes in terms of their colorimetry and the associated data needed by colour appearance or reproduction models. Output-referred colour encodings represent the colorimetry of images that have been colour rendered for specific output conditions.

Hiroaki Ikegami offered a different perspective in his talk, "Colour Space Selection for Colour Facsimile Standardization in ITU-SG8". He described how CIELAB came to be chosen as the standard colour encoding for colour facsimile. The methods used would also be useful in the selection of colour encodings for colour management systems.

The colour gamut reproduced by film is much larger that the colour gamut that can be reproduced by present day television. In "Extended Range Color Space Studies for Digital Cinema", Fred Van Roessel described how the Society of Motion Picture and Television Engineers (SMPTE) DC 28 Ad Hoc Group on Colorimetry developed a standard encoding for digital cinema. The requirement to match film or improve on film led to select a set of colorimetric primaries, outside the spectrum locus, that allow the reproduction of all possible colours. A logarithmic signal representation was chosen for the red, green and blue signals to accommodate a larger dynamic luminance range.

In "Standards Activities for the Colour Management of Colour Printers", Fumio Nakaya presented the work being done in the IEC toward the standardization of printer colour management. This involved issues such as standard illumination conditions, evaluations of preferred colour reproduction, gamut mapping based on marking technology, and standard colour targets.

Most of the talks in the Symposium focused on RGB colour spaces. Prof. Ikegami's talk on CIELAB was one exception. The other was Prof. Ronnier Luo and S. Y. Zhu's paper on "Testing the uniformity of colour spaces". A uniform colour space (UCS) provides that equal distances approximately represent equal perceived colour differences. Luo argued that a UCS is an ideal colour space for colour communication, gamut mapping, and imaging compression, because uniformity is vital for these applications. The talk compared several UCSs: CIELAB, OSA, ATD, Kuehni, CIECAM97s and colour difference formulae such as GLAB, CIE94, CMC, CIELAB2000.

One of the industrial representatives, Kevin Spaulding, presented the final paper "Image States and Standard Extended Color Gamut Color Encodings".

He presented two colour encodings developed by Kodak: RIMM RGB and ROMM RGB. RIMM is an input-referred encoding; ROMM is output referred. ROMM RGB has been submitted to PIMA (Photographic and Imaging Manufacturers Association) for consideration as a standard.

The meeting concluded with an open discussion between the speakers and other conference attendees. This gave people a chance to clarify points that had come up in the presentations and to contrast the differing goals of the various speakers.

Overall, the Symposium achieved its goals admirably. CIE TC8-05 met directly after the Symposium; committee members reported that they had gained valuable insights into the critical issues. And it was clear from the discussion at the end of the Symposium that standards committee members had also obtained a clearer understanding of the work being done by their colleagues in other areas.

Todd Newman
Division 8 Director

✉ News from the Divisions

Division 1 - Vision and Colour

http://nml.csir.co.za/~cie1/

The draft report of TC 1-47 “Improvement to Industrial Colour-Difference Evaluation” has been sent out for ballot among Division and Board members. Deadline is 2001-05-01.

The draft standard of TC 1-53 “Standard Method of Assessing the Spectral Quality of Daylight Simulators for Visual Appraisal and Measurement of Colour” has been sent out for ballot among Division and Board members. Deadline is 2001-06-25.

The January 2001 Activity Report of Division 1 has been finalized and can be visited at the Division 1 website at http://nml.csir.co.za/~cie1.

Division 2 - Physical Measurement of Light and Radiation

http://physics.nist.gov/cie2/

Please note that the webpage of Division 2 is now located at http://physics.nist.gov/cie2/

Division 2 will organize the 2nd CIE Expert Symposium on LED Measurement on May 10-12,

2001, in USA, in conjunction with CORM2001 and CIE Division 2 meetings. See page 7 of this NEWS issue for more information.

Division 3 - Interior Environment and Lighting Design

http://ciediv3.entpe.fr

The draft standard developed by TC 3-15 "Spatial Distribution of Daylight - CIE Standard General Sky" has been sent out for ballot among Division and Board members. Deadline is 2001-05-25.

CIE Draft Standard DS008.3/E-2001 "Lighting of Indoor Work Places" has been circulated to CIE National Committees for vote. Deadline is 2001-04-12.

Division 4 - Lighting and Signalling for Transport

http://www.tut.fi/cie4/

The draft report of TC 4-31 "International Recommendations for Colour Vision Requirements for Transport" has been sent out for ballot among Division and Board members. Deadline is 2001-06-10.

Division 8 - Image Technology

http://www.colour.org

The March 2001 Activity Report of Division 8 has been finalized and can be visited at the Division 8 website at www.colour.org.

🕮 CIE Publications

The Influence of Daylight and Artificial Light on Diurnal and Seasonal Variations in Humans - A Bibliography

CIE 139-2001 ISBN 3 901 906 04 5

In recent years, the study of the psychobiological effects of light has come forth as an important subfield of lighting research. This final report of TC 6-16 consists of an alphabetically ordered bibliography with 1100 entries and a basic list of 120 key words. The bibliography deals with the impact of light, both natural and artificial, upon the biological clock. The effects cited include physiological variations between day and night, during the menstrual cycle, and during the different seasons of the year. Also included are psychological variations in emotional tone and alertness, as well as pre-menstrual tension and seasonal affective disorder.

The selection of references has been restricted almost exclusively to research on humans. The bibliography covers the following topics: The biological clock; Melatonin and cortisol; Shift work and jet lag; Seasonality in hormones; Seasonal affective disorder; Light therapy; Other kinds of seasonality; Premenstrual syndrome; Windowless environments; Lighting characteristics; Individual and group differences; Confounding factors. There will be reason for CIE to plan ahead in order to assimilate this new knowledge, which will undoubtedly lead to the reformulation of present lighting standards and criteria.

The printed Bibliography consists of 68 pages. Alternatively to the printed list, the data are also available as a database on disk, in Microsoft® Access 97 format, so that people having this program installed on their computer can easily make queries and use all the search functions provided in this program.

Testing of Supplementary Systems of Photometry

CIE 141-2001 ISBN 3 901 906 05 3

This report contains the most recent versions of 10 photometric systems (4 for 2° and 6 for 10° fields) which have been proposed to CIE Division 1 as methods of assessing the relative brightness of lights across the entire range of human visual sensitivity. To provide quantitative tests of these systems, each system has been applied to several sets of data submitted by independent laboratories employing different stimulus sets and different experimental procedures for heterochromatic brightness matching (HCBM). Furthermore, each system was applied to data obtained in HCBM experiments performed by 6 research groups using the same coloured samples under very similar experimental conditions. These numerical tests were primarily intended to see the equality of equivalent luminances for brightness-matched stimuli but not to test the absolute level of scaling for brightness. This report describes the results of these quantitative tests; it makes no recommendation for a new CIE system.

The Technical Report consists of 82 pages with 94 figures.

CIE Standard CIE S004/E-2001 Colours of Light Signals

This Standard specifies the allowable colours for steady signal lights and flashing signal lights where the duration of the on period is at least one second.

It is applicable to the colours of signal lights used in sea, road, air and rail transport systems including signal lights on ships, aircraft, motor vehicles and trains, where the recognition of the colours involved is essential.

The Standard can also be used for guidance on the selection of the colours

- of light signals and warning lights on instrument panels in vehicles,
- of light signals and warning lights on instrument panels used for monitoring or control of industrial processes,
- used in visual display terminals when recognition of the colour code is important to interpreting the information displayed.

The Standard does not specify how signal lights should be used in the various transport modes nor does it specify the meanings to be associated with the different colours. Reference must also be made to international, regional and national conventions and regulations for the particular applications.

This Standard is not applicable to the colours of surface colour codes. Guidance on the allowable colours for surface colour codes is given in CIE Publication 39.2-1983 *Recommendations for Surface Colours for Visual Signalling*.

This Standard has been approved by the National Committees of the CIE and supersedes the recommendations made in CIE Publication 2.2-1975 *Colours of Light Signals*. Background information to this Standard can be found in the Technical Report CIE 107-1994 *A Review of the Official Recommendations of the CIE for the Colours of Signal Lights*.

A French and a German translation (CIE S004/F and CIE S004/G) are also available.

🕮 New Publications in the Field of Light and Lighting

Optical Metrology

Editor: Ghanim A. Al-Jumaily

SPIE Optical Engineering Press 1999
ISBN 0-8194-3235-0

The "Critical reviews of optical science and technology" series contains invited papers by leading researchers providing in-depth analysis and review in key optical technologies. The present book covers three main topics: ellipsometry, scatterometry and different types of up to date microscopy techniques.

Two papers give a thorough review on variable angle spectroscopic ellipsometry (VASE). Theory as well as basic and advanced applications are discussed for research and industrial applications mainly for semiconductor manufacturing. The ways of the determination of the desired material parameters extracted by VASE including layer thickness, surface and/or interfacial roughness and optical constants are discussed. A separate section is devoted to the analysis of the different realizations of VASE: rotating analyser, rotating polarizer, rotating compensator, phase modulation and null ellipsometer. This section includes the field of applications of the individual realizations, the material parameters to be determined as well as the limitations. Further sections detail optical modelling and the comparison with measured data. Further two papers deal with the questions of thin film production that is essential in the modern optics industry. In situ ellipsometry is reviewed that is capable to characterize thin film processes real-time. In addition it is illustrated how information obtained by in situ ellipsometry can predict the final thin film properties such as the transport properties.

The next section reviews scatterometry from its infancy in the early 60's to its full capabilities at the turn of the millenium. Terms used to quantify scattered light are defined, for example BRDF, together with instrumentation basics of both laboratory and manufacturing environment. The given techniques that determine surface defects on bare and patterned wafers are discussed by the use of the scatter metrology known as "particle scanner". Scatter models and calibration techniques applied not only to surface roughness but to discrete defects are shown. In this section again models are compared with experimental data.

The last section is a collection of different microscopic and non-linear optical techniques used in morphologic investigations. The techniques described are: time resolved scanning Kerr microscopy, scanning force microscopy, near-field scanning optical microscopy as well as second and third order non-linear optics. This last section is beyond the general interest of lighting engineers, even of radiometrists, it is suggested to be read by experts familiar with wave optics.

Optical Scattering, Measurement and Analysis, Second edition

John C. Stover

SPIE Optical Engineering Press 1999
ISBN 0-8194-1934-6

Scatter measurement is proving to be a useful inspection technique in a wide range of applications

ranging from semiconductor industry and computer disk manufacturing to flat panel display. It can be used to detect and map component defects in a variety of materials, including painted surfaces, paper, metallic coatings, etc. This book is intended to explore and review the available various measurement and analysis techniques of optical scattering.

The first five chapters concentrate on background information. Chapter 1 introduces many of the notation and basic concepts. Chapter 2 overviews the various surface roughness terms and definitions. Scatter can be analyzed from diffraction theory as shown in Chapter 3. The fourth chapter combines the results of Chapter 2 and 3 to convert scatter data to surface statistics. Chapter 5 discusses polarization concepts: there are some very powerful polarization techniques used in process- and quality control applications. Experimental instrumentation, techniques and limitations are covered in Chapter 6. In the seventh chapter various scatter prediction techniques are presented. These include wavelength scaling for smooth optical surfaces and curve fitting for more generic samples. Chapter 8 discusses advanced measurement and analysis techniques that take advantage of polarization. Chapter 9 provides a small sample of industrial applications. In the last chapter scatter specifications are illustrated through the use of several examples.

The book contains more engineering than physics, it is intended to be used by application engineers, most of the basic expressions are given without any derivation.

✍ Meeting Reports

Report on the CIE Expert Symposium on Uncertainty Evaluation, Tutorial and Workshop

22-24 January 2001
CIE Central Bureau, Vienna, Austria

Division 2 organized a one-and-a-half-day tutorial session and a two-half-day workshop on methods for analysis of uncertainties in optical radiation measurement. A large international audience (55 persons for the Tutorial and 62 for the Workshop) from Australia, America (North and South), Canada, South Africa as well as Europe attended the meeting.

The Tutorial Session started with a short introduction by Teresa Goodman, Director of CIE Division 2, which was followed by an analysis of the basic concepts and calculation of propagation of uncertainties in optical measurements by Ray Lambe, NPL. Mr. Lambe covered questions like terminology, classification of individual sources of uncertainty associated with the measurement, methods to be used in combining the individual sources of uncertainty to arrive at the final overall uncertainty for the measurement, and showed some examples from the NPL practice of optical measurements.

The in-depth analysis of uncertainty calculation was given by Dr. Sauter, PTB, who discussed in more than one session how the uncertainty budget of a complex photometric or radiometric measurement has to be determined. He covered issues to be dealt with also in the CIE TC 2-43 draft report "Determination of measurement uncertainties in photometry", providing insight into the definitions, the standard method of stating the result of a measurement, units and traceability, questions of error and correction, the evaluation of standard uncertainty, correlation coefficient determination, presentation of uncertainty. He gave a model for the evaluation of standard uncertainty, combined standard uncertainty calculations and discussed the concept of expanded uncertainty, as well as the presentation of the results of a measurement. His presentation was accompanied by examples for training, covering a wide range of photometric and spectroradiometric measurements, from simple lamp current and voltage uncertainty determination to questions like illuminance measurement with a photometer and luminous intensity measurement of a lamp.

The theoretical and fundamental approach was extended next day by tutorials covering questions of application: Robert Broeckx (Philips Lighting) showed how the photometric testing of fluorescent lamps is done in a lamp company, and how the uncertainty budget is calculated. Peter Clarke, NPL, covered the question of improving uncertainty in industrial colour measurement. Mr. Clarke showed how the correction model can be established in case of a complicated measurement, such as the spectrophotometric measurement of colour standards. In colorimetry there are still very many variables, starting at problems of the

surface and texture of the samples, the characteristics of the measuring instruments (wavelength errors, band-width, stray-light, linearity, etc.) up to influences of temperature, moisture and others. Petri Kärhä (Helsinki University of Technology) discussed a radiometric characterization and error analysis question that occurs when UV radiometers with broadband detectors have to be evaluated.

Yoshi Ohno, NIST, discussed the question of sphere photometry. After reviewing fundamental issues of total luminous flux measurement using an integrating sphere, he also gave an insight into NIST practice of luminous flux uncertainty determination. He concluded that measurement uncertainties (k=2, k is the coverage factor of the uncertainty calculation, usual value that provides an above 95 % probability of correct measurement) in the order of 1 % can be achieved with a sphere coating of r=80 %.

The workshop that followed the Tutorial sessions gave further insight into uncertainty calculation. Jim Gardner (National Measurement Laboratory, CSIRO, Australia) discussed the uncertainty in quantities derived from spectral sums. He started from the "GUM", the ISO Guide to Expression of Uncertainty in Measurement, and discussed how this guide can be applied to spectroradiometric determination of colorimetric quantities, discussing both uncorrelated and correlated measurement issues. The more theoretical approach by Gardner was followed by a presentation by Yoshi Ohno (NIST), who presented numeric methods for colour measurement uncertainty. His method could be applied also, e.g. to determine the uncertainty of a colour rendering index calculation. The next speakers went into some still debated questions of uncertainty determination. Wolfgang Wöger (PTB) showed a method to determine the uncertainty in models with more than one output quantity. These are usually correlated quantities, and Wöger showed a matrix calculation method to cope with the problem. The paper by Georg Sauter (PTB) on correlation in photometric measurements expanded on the problem and showed practical solutions.

Two papers by Maurice Cox (NPL) introduced supplements to the GUM and an Introductory Guide that will hopefully make the use of this very important document easier, and discussed how an objective approach to key comparison reference values could be achieved. Rainer Köhler (BIPM) reported on the key comparisons in photometry and radiometry, as well as what further progress can be expected from the system of Mutual Recognition Arrangement of measurement standards, in which the BIPM is heavily engaged.

Two further contributions by Vukadin (Federal Bureau of Measures and Precious Metals, Yugoslavia) and Castelletto (Istituto Elettrotecnico Nazionale G. Ferraris, Italy) showed examples of uncertainty determinations in smaller national laboratories and for extreme low light levels (photon counting).

Both the Tutorial and the Workshop sessions were followed by lively discussions that helped to clarify many still obscure questions. Proceedings of the Workshop will be available at the CIE Central Bureau.

Participants requested the organizers to arrange a similar meeting within one to two years time.

Dr. János Schanda

Light & Lighting 2000

International Conference and Exhibition

11-13 May 2000, Bucharest, Romania

The conference and the exhibition were organized by Romanian National Committee of CIE (CNRI).

Having the subject “Comfort, Aesthetics, Functionality and Energy Efficiency of Interior and Exterior Lighting Systems”, LIGHT & LIGHTING 2000 included the following events:

- paper and poster presentations in interior lighting, exterior lighting, common and fundamental aspects of lighting;
- technical visits of Philips Application Center for Lighting Systems and exhibition of equipments for lighting systems.

Over 220 specialists from 12 countries participated. They were from universities, institutes/firms for designing/execution and producers or distributors of equipments used for lighting or within adherent installations.

The honour quest was Prof.em.PhD. H. C. Hans-Walter Bodmann (Past President of CIE).

Prof.PhD.Eng.Cornel Bianchi (CNRI President) started the conference, emphasizing that this event is a new opportunity for putting in practice the aims of CIE and of CNRI (as part of CIE). This event also represented a way to realize an exchange of ideas, technical and scientific information, in this period when light and lighting regain their normal place in a modern society, taking into account the decisive role which they have in realizing the comfort and functionality of interior and exterior environment.

The conference was also the occasion of exquisite anniversaries for CNRI:

- 50 years from the first approaches for setting up (and 43 from the admission in CIE);
- 10 years from the return in CIE, after four years of absence (1986-1990).

Mr.Hans Allan Löfberg (CIE President) offered some information about CIE objectives at the

beginning of the new millennium: acceptance of new members, intensification of activity of Divisions and Technical Committees, elaboration of international standards in the field of lighting.

Within the conference, 52 papers were included in the program (39 for presentation in plenum, 13 posters). They dwelled upon a large range of present problems in:

- interior lighting:
  - new ideas in integrated (artificial and daylight) lighting systems and global treatment of building energy system;
  - new generation of luminaires equipped with T5 fluorescent lamps;
  - daylight and artificial lighting for churches;
  - utilization of flat prism;
  - new generation of fluorescent lamps;
- exterior lighting:
  - colour of light;
  - visibility level in street lighting;
  - most propitious solutions for rehabilitation of lighting systems;
  - indicators of luminous pollution;
  - command/control of lighting systems;
  - variation of public lighting parameters;
  - lighting dimensioning of façades depending on luminance;
  - energy efficiency measures in street lighting;
- common aspects:
  - virtual design of luminaires;
  - modern aspects in photometry techniques;
  - actions for an efficient lighting;
  - audio and visual indicators for special working conditions;
  - aspects regarding Lighting Engineering Center from Cluj-Napoca, Romania.

☞ Future Meetings

2nd CIE Expert Symposium on LED Measurement

Standard Methods for Specifying and Measuring LED and LED Cluster Characteristics

10 - 12 May 2001
Holiday Inn, Gaithersburg, Maryland, USA

The first CIE Expert Symposium on LED measurement was held at the CIE Central Bureau in Vienna in 1997. During the past four years LEDs observed a considerable progress. Both as individual lamps and as clusters for signalling and recently even for lighting purposes LEDs have become competitive with more traditional light sources. Currently there are considerable efforts within the LED industry and the community who use LEDs to standardise on LED characterisation and measurement. Several CIE Technical Committees are active in the field.

The goals of the meeting are:

- Characterisation of LEDs and the measurement of individual LEDs,
- Measurement of LED clusters and arrays,
- Other aspects of LED measurements, including safety issues.

This meeting is open to all participants. To insure adequate space and support, and to allow distribution and adequate review of relevant documents, prior registration is required. The following individuals are specifically encouraged to attend:

- Quality control laboratory personnel at LED manufacturers and users.
- Those responsible in specifying and testing LED properties.
- Those working in research laboratories dealing with new LEDs and LED-clusters.

Program:
10 May 2001 (Tutorial)

- Yoshi Ohno: *Introduction to photometry and radiometry of LEDs*
- Teresa Goodman: *Introduction to spectroradiometry and colorimetry of LEDs*
- Georg Sauter: *Uncertainty principles and their application to LED measurement*
- Kathleen Muray: *CIE work on LED measurement*
- János Schanda: *Visual aspects connected with LED measurement*

11 & 12 May 2001 (Symposium)

Invited Papers

- CK Andersen: *Considerations in the use of LED clusters for transportation signalling*
- G Heidel: *Measurement problems in LED production*
- S Jenkins: *Use of LED clusters for signals and their measurement*
- S Johnson: *State of the art of OLED technologies*
- K Kohmoto: *Development of white LEDs in Japan*
- G Mueller: *State of the art of LED technologies* (Key-Note paper)
- DH Sliney and BE Stuck: *The potential ocular hazards of LED emitters*
- R Young: *LED measurement instrumentation*

Contributed Papers

- W Horak et al: *Comparative optical radiation safety analysis of new LED-devices and -lamps*
- B Kránicz and Y Ohno: *Deconvolution for spectral data of LEDs*
- C Lányi et al: *Introducing a CD-ROM on LEDs*
- WJ Marshall: *Laser source size as a function of distance*
- CC Miller and Y Ohno: *Luminous intensity measurements of light emitting diodes at NIST*
- CC Miller and Y Ohno: *Luminous flux calibration of LEDs at NIST*
- K Muray et al: *Comparison measurements of LEDs: Spectral power distribution*
- T Nägele: *Problems and requirements of the optical characterization of LEDs*
- Y Ohno and B Kránicz: *Spectroradiometer characterization for colorimetry of LEDs*
- J Schanda et al: *Light emitting diode standards*
- K Suzuki et al: *Round robin LED photometry test in Japan*
- T Tarczali et al: *Colour rendering properties of LED sources* (pending on partner clearance)
- R Young et al: *Quantifying photometric spectral mismatch uncertainties in LED measurements*

Registration fee for LED measurement tutorials, 10 May 2001: US$ 400,- (Several CIE publications and lecture notes will serve as background material for the tutorials.)

Registration fee for LED Symposium, 11-12 May 2001: US$ 250,-

For participants of both parts a reduced registration fee of US$ 500,- holds.

The Symposium will be followed by meetings of CORM 2001 and CIE Division 2:

- May 13 pm: CORM/CIE social event at Smithsonian National Gallery of Art (Symposium participants invited)
- May 14: CORM subcommittee and CIE TC meetings at NIST (open to nonmembers as guests)
- May 15 to 16: CORM2001, with NIST laboratory tour on May 16 pm (open to CORM and CIE participants)
- May 17 to 19: CIE Division 2 and TC meetings at NIST and Holiday Inn Gaithersburg

For the most up-to-date information, check the Symposium website at

http://physics.nist.gov/LED2001

CIE Midterm Meeting 2001

The next CIE Midterm Meeting in conjunction with TCs, Division 4, 5, 6 Meetings and the International Lighting Congress & Exhibition will be held in Istanbul, Turkey between 6 and16 September 2001

- General Assembly: 8 September 2001
- Division and TC Meetings: 10-11 September 2001
- Congress: 12-14 September 2001
- Exhibition: 12-16 September 2001.

The second announcement of the Congress and Meetings with the social program and hotel information will be sent by mail in a few days. The congress will cover all of the subjects of lighting, the main theme is *Lighting & City Beautification*.

Registration fee is 250 $, which covers the proceedings, coffee breaks, panoramic evening sightseeing tour, Opening Ceremony & Cocktail. CIE Divisional and Technical Meetings are free of charge.

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The Colouristic Section of the Hungarian Chemical Society in co-operation with the Hungarian National Committee of the CIE and the Hungarian National Committee of the AIC organises the

XXVIIIth Colouristic Symposium

3-5 September 2001, Tata, Hungary

Subjects of the Symposium:

- colour perception, colour appearance, colour order systems,

- colour measurement, colour difference formulae, standardisation in colour,
- application of colorimetry and of colour matching in different industries,
- colour education,
- colour in architecture and design,
- chemical research and technological investigation at manufacturing of coloured products.

Languages of the Symposium will be English and Hungarian.

An exhibition will be organized all along the Symposium.

For further information and registration, please contact the

Hungarian Chemical Society
Fő u. 68 H-1027 Budapest, Hungary
tel.: +36 1 201 6883
fax: +36 1 201 8056

9th Congress of the European Society for Photobiology

3-8 September 2001, Lillehammer, Norway

The Programme of the Congress will reflect all the major current areas in which photobiology researchers are involved. As with earlier meetings, there will be a mixture of plenary lectures, symposia, workshops, and poster sessions.

Some of the subjects are:

- photomedicine,
- photobiology and epidemiology of skin cancer,
- action spectra,
- standardisation,
- environmental ultraviolet radiation: present and future,
- dosimetry in phototherapeutics,
- optical radiation systems for photobiology.

For further information please contact:

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Colour in Nature, Science and Technology

24-27 September 2001, Szklarska Poręba, Poland

The scientific programme will include, among others:

- colour in natural sciences,
- colour and structural aspects of chemical compounds,
- models, methods and standards in colour measurement,
- colour and its importance in industrial design,
- colour in art and architecture,
- colour and artifical intelligence.

The official languages of the conference presentations will be Polish and English.

For further information and registration, please contact

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PAL 2001
Progress in Automobile Lighting

25-26 September 2001, Darmstadt, Germany

The subject of automobile lighting has become more important during the last years. The PAL-symposium is aimed at engineers, scientists, designers and governmental people to accelerate the progress of new ideas and technologies. In order to combine the different points of view the symposium deals with all of these subjects. In this connection for example latest scientific reports on visual performance are as interesting as reports on new prototypes.

The programme includes:

- visual performance of drivers,
- drivers' visual perception and its improvement,
- artificial vision,
- accident/pedestrian,
- trends in headlamp design, rear, side, and interior lighting design,
- road equipment,
- regulations, directives, standards,
- measuring procedures and test setups,
- lighting and risk compensation,
- lighting and environment.

For further information please contact

PAL 2001
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Ninth Color Imaging Conference:

Color Science and Engineering: Systems, Technologies, Applications

6-9 November 2001, Scottsdale, Arizona, USA

This year's conference will feature basic and advanced tutorials on colour science, imaging, measurement, and processing. Tutorials are planned on:

- colorimetry and colour appearance models,
- colour in hardcopy and displays,
- internet and web colour,
- colour management systems,
- colour image quality and halftoning,
- digital photography.

For further information please contact:

IS&T
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CEN has sent us the following information on their upcoming conference:

Construction Products for the Single Market: Expectation and Reality

4-5 December 2001, Brussels, Belgium

A conference in association with: European Commission, Enterprise Directorate-General and The EFTA secretariat

The conference will offer a forum for an open and transparent debate of the major issues surrounding the establishment of the single European market in construction products. Several key questions will be tackled:

- How far will the Union directive for construction products remove barriers to trade within Europe or will it give rise to new barriers?
- What is the role of CE marking and will it be policed effectively?
- What was expected from the directive and what does it mean to a market traditionally characterized by national practice?
- What further action is needed to create an effective single market in construction products?

The first harmonized standards for this sector are currently in the process of finalization and the process is accelerating. CE marking already exists through European Technical Approvals and, by the time of the conference, there will be 100 or so "harmonized" European Standards (ENs) ready. An increasing number of CE marked products are expected to appear on the market. The impact of these harmonized technical specifications in their industry is still largely unquantified and industry will be assessing the benefits of CE marking compared to compliance with former national specifications.

The conference is aimed at representatives from all of those involved in the construction process e.g. manufacturers, producers, distributors, designers and architects as well as Notified Bodies, regulators and enforcers, non-governmental organizations, consumer organizations and academic representatives.

The chairman is Mr. Anthony Brian Davies, who has been involved with the Construction Products Directive since its early days.

For being kept up-to-date about progress in the conference programme, how to register etc., pay a visit to:

www.cenorm.be/news/conferences/construction

We have received an invitation to participate in an internet-conference on the subject of light and lighting (in English and German), with the objective to present, increase and link the knowledge of light. If you are interested, check:

www.cyberlux.de

✞ In Memoriam

Prof. J.B. de Boer ✞

Prof. J.B. (Nito) de Boer from the Netherlands, past President of CIE, passed away just before Christmas on December 17th 2000 at the age of 90 years.

Prof. de Boer had been active for a very long period in CIE from as early as 1939. In CIE he was active as road lighting and signalisation expert, as chairman of many different working groups and technical committees, as chairman of the Action Committee, as Vice President and as President for the period 1979-1983. Under his guidance and presidency a totally new CIE administrative and management structure with Divisions and Technical Committees was developed and put into practice in 1983. This structure is still in use today. He completed his 48 active years in CIE as immediate Past President in 1987. On the occasion of the 75th anniversary of CIE in 1988, Prof. de Boer was the first person to receive a CIE Award.

Prof. de Boer started his lighting career with the lighting laboratory of the Dutch Institution "KEMA" and joined the Philips Lighting Company in the early nineteen forties. Initially he was very much involved in road and airfield lighting research. Soon he widened his research fields to include all aspects of both interior and exterior lighting. He became the overall manager of the joint Philips Lighting application laboratories in Eindhoven (the Netherlands), Aachen (Germany) and Gmunden (Austria).

During the CIE Session in Washington in 1967 he was informed about his (part-time) appointment as Professor at the University of Technology of Eindhoven to teach illuminating engineering to students of the faculties of physics and electrotechnics. I had the privilege to be one of his first students. His wide practical knowledge of lighting application and of the aspects that required research, made studying with him a tough but pleasant, stimulating and instructive experience.

In his CIE function Prof. de Boer met many lighting people from all over the world. He had a great capability to make people enthusiastic about, and active in, the world of lighting.

Also as author of innumerable papers, publications and books he contributed to the advancement of global lighting know-how.

The University of Technology of Berlin honored Prof. de Boer with a doctorate Honoris Causa.

Prof. de Boer is survived by his wife, son and daughter and by many grandchildren.

The family can be contacted at the address of daughter Elsa Rademaker de Boer

Leeuweriklaan 23
5561 TP Riethoven
The Netherlands

Wout van Bommel

From the Lighting Journals

Color Research and Application

Volume 26, Number 1, February 2001

A theory of colors in combination - A descriptive model related to the NCS color-order systems
A. Hård, L. Sivik

Influence of a holistic color interval on color harmony
M.-C. Chuang, L.-C. Ou

A cross-cultural colour-naming study. Part 1: Using an unconstrained method
H. Lin, M.R. Luo, L.W. MacDonald, A.W.S. Tarrant

Determination of unique hues using Munsell color chips
R.G. Kuehni

Derivation of the 1964 CIE 10° XYZ colour-matching functions and their applicability in photometry
P.W. Trezona

A study of digital camera colorimetric characterization based on polynomial modeling
G. Hong, M.R. Luo, P.A. Rhodes

Evaluating gamut mapping algorithms for universal applicability
J. Morovic, M.R. Luo

Flare - Architectural Lighting Magazine
(in English and Italian)

Number 25, December 2000

Rilancio per lo Space Needle di Seattle (The Seattle Space Needle Relaunch)
R. De Alessi

La ristrutturazione di un Archivio di Stato (Restructuring a State Archives), The Hague
“Light!” La luce e la sua storia (“Light!” and its history, exhibition at the Van Gogh Museum in Amsterdam)
G. Antonelli

Il Museo Bernareggi di Bergamo (The Bernareggi Museum in Bergamo)
G. Allevi

Il Centro Danese del Design (The Danish Design Centre)
G. Antonelli

Incognito Night Club
M. Vercelloni

Illuminare per vendere (Lighting attracts sales)
M. Turinetto

Uno spettacolo di luce (A performance of light, Genoa Aquarium)

Una “casa per la biosfera” (A “home for the biosphere”)

L’arte californiana e la luce (Californian Art & Lights)

Modulazione di luce e colore (Modulations of light and colour, The antique stained glass windows in the Upper Basilica of San Francesco)
A. Mingozzi, S. Bottiglioni

International Journal of Lighting Research and Technology

Volume 32, Number 2, 2000

Radiance algorithm to simulate laser-cut panel light-redirecting elements
P.J. Greenup, I.R. Edmonds, R. Compagnon

Lighting design based on luminance contrast
M. Moeck

Effect of brief exposure to glare on brightness perception in the scotopic-mesopic range
E. Colombo, J. Barraza, L. Issolio

Comparison of real Sydney skies with model skies
G.G. Roy, R. Kittler, S. Hayman, W. Julian

Perceptions of safety at night in different lighting conditions
P.R. Boyce, N.H. Eklund, B.J. Hamilton, L.D. Bruno

Vertical solar radiation and daylight illuminance data for Hong Kong
D.H.W. Li, J.C. Lam

Journal of Light & Visual Environment

Volume 24, Number 2, 2000

The self-ballasted compact fluorescent lamp of an “A60” bulb shape
T. Yasuda, K. Nishio, Y. Shibahara, S. Hakuta

An electronic ballast using modified two-switch boost converter
N. Takahashi, Y. Kato, M. Ohkita, K. Okutu, M. Matsuyama, M. Nakaoka

A study on the practical use of a task and ambient lighting system in an office
K. Yamakawa, K. Watabe, M. Inanuma, K. Sakata, H. Takeda

A new daylight glare evaluation method
A. A. Nazzal

Brightness-to-luminance ratio of colored lights in various environments
E. Toriumi, S. Morii, M. Ayama, T. Kumagai

Senescent changes in color discrimination and color appearance
K. Shinomori

The use of multiple reflection method for calculation of luminous flux in interiors
R. Nawrowski

Lighting Design + Application

November 2000: Progress Report 2000

Luce
(in Italian)

Volume 39, Number 7, November 2000

Illuminazione naturale/artificiale: Il progetto “Arthelio”
R. Casalone

L’Acquario sotto le stelle
L. Iadeluca

Norma UNI 10840: L’illuminazione nelle scuole
S. Bruni

Il centro commerciale “Metropoli”
G. Fumagalli

Le lampade a induzione
L. Tassi, S. Bruni, F. Piersimoni

Torino - Museo del Cinema: La protagonista invisibile
M. Filippi

Luces
Revista Semestral del Comité Español de Iluminación
(in Spanish)

Number 14, 1999

Resplandor del Cielo Nocturno - Mesa Redonda (XXV Simposium de Alumbrado - Lugo)
(resumen de las intervenciones)

El Palacio de los Condes

Un plan de luz para la Habana Vieja, Cuba
F. de la Noval Ravelo

La Font Mágica de Montjuic
B. Jiménez de Anta Losada

Cuando el color habla, los sentidos escuchan ...
R. Aguayo González

Number 15, 2000

Valla Paracelso: Una forma diferente de disfrutar de la luz
J. Cabanes

Iluminación ornamental exterior de la Catedral de Lugo
A. Picado

Conducción de luz natural en aulas de la biblioteca municipal de El Masnou
R. San Martin, R. Serra Florensa

Aplicación de la tecnología “Minos System” en el ámbito ferroviario para la telegestion/telecontrol de las instalaciones de iluminación
Sata

La luz en los aeropuertos y helipuertos
M. Mateos

Number 16, 2000

Reus, una ciudad con personalidad
J. M. Ollé

Biblioteca central de Igualada “Cal Font”
J. Murgou

Iluminación de las fachadas de la Plaza Mayor de Valladolid
J. J. González

Proyecto de iluminación del vestibulo principal del edificio historico de la Universitat de Barcelona

Museo Nacional de Cerámica y Artes Suntuarias González Martí, Valencia
J. L. Cañas

Iluminación artística de la Catedral de Jaén: Del candil al halogeno

Cuadros inteligentes para alumbrado publico
J. M. Urbiztondo Perdices

Lux, la revue de l’éclairage

Number 210, Novembre/Décembre 2000

La quête de connaissance sur le “gisement lumineux” de la planète me fascine
F. Viénot

Quand couleur et lumière stationnent sous terre

Tunnels: une circulaire sur la sécurité

Circulez, il y a à voir dans les tunnels !

La gestion de l’éclairage industriel et tertiaire

La nouvelle réglementation thermique
A. Maugard, J.-C. Visier

GreenLight, une démarche volontaire
H. Lefebvre, P. Bertoldi

Vers une meilleure maîtrise des ambiances nocturnes urbaines
V. Laganier

Symbolisme ou rationalisme pour le Mont Saint-Michel?

Des LEDs de plus en plus belles

Éclairages extérieurs: nuisances et halo lumineux
C. Remande

Number 211, Janvier/Février 2001

Le Festival Lyon Lumières
M. Fontoynont

Notre profession est maîtresse des savoirs du métier
R. Monnami

Musée Guimet: le retour à la lumière

Eclairage des musées: concilier art et technique

Lyon Confluence: le “néon” y écrit l’avenir

L’équipement des ménages en éclairage: les enseignements d’une enquête

Lys
(in Danish)

Number 4, December 2000

Nordic Lighting Award to Denmark
D. Gram

Light on the Øresund Bridge
G.K.S. Rotne

Esbjerg Main Square
G. Hansen

Competition for lighting in corridors
D. Gram, P. Karbo

Light in the Øresund tunnel
J. Gudum, P. Øbro

DaimlerChrysler
P. Edstrand

A living home
S. Falch

Sylvania sells lighting
D. Gram, J. Klausen

El-Tech 2000
G. Kofoed

Serial story: When the night disappeared
J. Thorndahl

Daylight, electric savings and user comfort
C. Henriksen

Darkness behind the light
J. Bolther, E. Hvid, S. Niros, P. Schmidt

Young light
U. Nordentoft, T. Frandsen

Number 1, March 2001

Lighting Award to Sondersø
D. Gram

Turn the light loose
S. Falch

New competition for lighting in corridors
P. Karbo, A. Velk

Electric savings in the automobile sector
J. Lauridsen

Light in the air
D. Gram

The airport through all times
D. Gram

New lighting around Bagsværd Church
G. Hansen

Husum Church Square
G. Hansen

The Sophus Foundation
L. Poulsen

Light in Helsinki
K. Nørregaard

Use of energy efficient lighting in the commercial sector
C. Kofod

The Opera Holger Danske
J. Kongshaug

Aarhus Theatre
P. Østergaard

Serial story: When the night disappeared
J. Thorndahl

Light the town
D. Gram

Young light
L.R. Thøgersen, A. Ruggard

The Lighting Journal

Volume 66, Number 1, January/February 2001

What are the risks that could mean jail ?
H. Walker

The road not taken
M. Rea

A useful learning experience
C. Gardner

Heart of lightness
C. Gardner

The use of illuminated bollards in improving highway safety
D. Wootton

The bollard base: 20 years on
J. Brewis

Volume 66, Number 2, March/April 2001

The role of lighting in the renaissance of historic urban areas
P. de Figueiredo

LED technology: the questions answered
R. Tuck

All change in the workplace ?
D. Burton

Domes and sails in Oxford Circus

Photo-therapy: the treatment of seasonal affective disorder

How to do it No.6: Specifying a lighting column
C. Lane

Stopping the rot in Birmingham
J. Needham, A. Hill

For your Diary

Date	Title of Meeting	Organizer	Place of Meeting
2001			
April 2001	1ères Journées de la Lumière	S.Co.O.A Éclairage, Oran fax: (213) 4140 83 29	Alger, Algeria
April 11-14	Russian Light 2001	http://mordovia.bizland.com/RussiaLight/	Saransk, Russian Federation
April 22-25	Image Processing, Image Quality, Image Capture, Systems Conference	IS&T fax: +1 703 642 9094 info@imaging.org	Montréal, Quebec, Canada

Date	Title of Meeting	Organizer	Place of Meeting
May 10-12	2nd CIE Expert Symposium on LED Measurement	CIE Division 2	Gaithersburg, USA
May 13-17	CORM 2001	Danny C. Rich, RichD@sunchem.com	Gaithersburg, USA
May 16-19	CIE Division 2 Meeting	CIE Division 2	Gaithersburg, USA
May 21-23	Showlight 2001	Showlight 2001 Administration fax: +44 1323 64 6005 ruth@plasa.org.uk	Edinburgh, Great Britain
May 22-23	LTG Fachtagung 2001	LTG, tel/fax: +49 (0) 2236 426 51 office@ltg.at	Wels, Austria
May 29-June 1	Lightfair International 2001	AMC, reneeg@lightfair.com www.lightfair.com	Las Vegas, Nevada, USA
June 11-16	Summer Study: European Council for Energy Efficiency Economy	ECEEE www.eceee.org	Côte d'Azur, France
June 13-15	Light 2001 - Lighting Architecture Design	BNCI, fax: +359 2 654 883 KLWEL@vmei.acad.bg	Varna, Bulgaria
June 16-17	CIE Division 3 Meeting	CIE Division 3	Reykjavik, Iceland
June 18-20	Lux Europa 2001	Ill.Eng.Soc.Iceland fax: +354 515 9008 luxeuropa@lv.is	Reykjavik, Iceland
June 23	Division 1 Meeting	CIE Division 1	Rochester, NY, USA
June 24–29	AIC Quadrennial Congress	AIC paula.alessi@kodak.com	Rochester, NY, USA
June 28-30	Iluminat 2001	F. Pop, Florin.Pop@insta.utcluj.ro	Cluj-Napoca, Romania
July 29 – Aug. 3	Lens & Optical System Design	SPIE, PO Box 10 Bellingham, WA 98227-0010 annualmeeting@spie.org	San Diego, CA USA
Sep. 3-5	XXVIIIth Colouristic Symposium	Hungarian Chemical Society fax: +36 1 201 8056	Tata, Hungary
Sep. 3-8	9th Congress of European Society for Photobiology	PO Box 55, NO-1332 Osteras fax: +47 22 461304 http://esp.nrpa.no	Lillehammer, Norway
Sep. 6-8	CIE Midterm Meeting	CIE	Istanbul, Turkey
Sep. 10-11	CIE Division 4 Meeting	CIE Division 4	Istanbul, Turkey
Sep. 10-11	CIE Division 5 Meeting	CIE Division 5	Istanbul, Turkey
Sep. 10-11	CIE Division 6 Meeting	CIE Division 6	Istanbul, Turkey
Sep. 12-16	International Lighting Congress & Exhibition	Yıldız Teknik Üniversity serefhan@yildiz.edu.tr	Istanbul, Turkey

Date	Title of Meeting	Organizer	Place of Meeting
Sep. 24-27	Colour in Nature, Science and Technology	A. Bartecki, fax: +48 71 328 43 30 BARWA@ichn.ch.pwr.wroc.pl	Szklarska Poręba, Poland
Sep. 25-26	PAL: Progress in Automobile Lighting	Univ. of Techn. fax: +49 6151 165468 pal@lichttechnik.tu-darmstadt.de	Darmstadt, Germany
Nov. 5-6	48th Annual General Meeting and Congress of SANCI	SANCI, fax: +27 012 460 4264 dcronje@mweb.co.za	South Africa
Nov. 6-8	Nat. Measurement Conf. NMC 2001 and BEMC 2001	D. Hall fax: +44 020 8943 6821 nmp_sec@npl.co.uk	Harrogate, Great Britain
Nov. 6-9	9th Color Imaging Conference: Color Science & Engineering	IS&T, fax: +1 703 642 9094 info@imaging.org	Scottsdale, AZ, USA
Dec. 4-5	Construction Products – Time ripe for CE marking	CEN, rue de Stassart 36 B-1050 Bruxelles	Bruxelles, Belgium
Dec. 9-11	Building for the 21st Century	R. Abdussalam, tel. +1 610 758 3515 inctbuh@lehigh.edu	London, Great Britain
2002			
May 6-8	Lighting for Places of Workship and Historical Sites	Assoc. of Eng. & Arch. of Israel fax: +972 3 523 5993 aeai@netvision.net.il	Jerusalem and Tel Aviv, Israel
Sept. 22-25	Licht 2002	NSVV arommers@kema.nl, www.nsvv.nl	Maastricht, Netherlands

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