

Annual Report
of the
National Illumination Committee of Great Britain

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1st October 2018 to 30th September 2019



National Illumination Committee of Great Britain

Report for the year ending 30 September 2019

We launched our new website during the year, modelled on the main CIE website. I wish to express my thanks to Steve Fotios for leading on this project.

On 16 May 2019 I was invited to speak on Light and Health on behalf of CIE at the International Day of Light keynote event in Trieste. This provided an opportunity to promote CIE to a wider audience.

The CIE held its 29th Quadrennial Session in Washington DC in June 2019. Prior to the Session, the General Assembly was held involving all the available National Committees (NCs). As part of that event, a workshop was held to discuss best practice between NCs. Most NCs suffer from a lack of members, particularly those early in their career. It was recognised that most NCs do not regularly use social media, so this was an opportunity to be developed. An International Lighting Workshop was also been held with presentations from a number of other organisations involved with light and lighting internationally.

CIE-UK proposed two people for CIE Certificates: Luke Price as Secretary to CIE JTC9 in ensuring the timely development and publication of CIE S026 "CIE system for metrology of optical radiation for ipRGC-influenced responses to light" and Nigel Pollard for his role as Chair and Trustee of CIE-UK and for leading the successful UK bid for, and delivery of, the 28th Session of the CIE in Manchester, 2015.

We were also delighted that Nigel was given the Waldram Gold Pin Award for exceptional and outstanding contribution in Applied Illuminating Engineering by CIE. Nigel was unable to attend the Session but accepted the Award remotely. I then had the honour of presenting the Pin and citation to Nigel at a ceremony hosted by the Herschel Museum in Bath on 9th August 2019. The Herschel Museum was chosen by Nigel as the venue, to link it to his work as Chair of the CIE Committee on Limiting the Effects of Obtrusive Light and whose Technical Report (No. 150) has been pivotal in the world-wide 'Dark Skies' campaigns against light pollution.

As a charity, we continue to support the science of light and lighting through financial assistance to UK members to attend CIE events. I was pleased that we were able to support several students and early-career individuals to attend the Session this year. This was the first time we had specifically done this, and I consider it important to continue for the future events. Some of the students gave presentations to the NIC in Sheffield in July on both their work and what they got out of attending the Session. All recipients of funding are required to provide reports. These are an important aspect of the process to ensure that others can receive some benefit from that investment. Please take the time to read their reports.

Members receive 66% discount on CIE publications, so please make use of this. CIE-UK also benefits from sales to people in the UK through a discount to our annual subvention to CIE.

We value feedback from our members, so please contact us if there are things we can do better or if you have suggestions for developing the membership. We do have an outreach kit to help anyone who needs some props for talks. If you are interested, please contact us.

An organisation like CIE-UK can only exist through the financial support of its members and the time given freely by the Trustees. I would also like to acknowledge the tireless work of Allan Howard, our Executive Secretary. He ensures we do the right things at the right time, as well as providing us all with relevant information.

Finally, I extend thanks to you all for your support to CIE-UK and to CIE more generally.

John O'Hagan

Chair CIE-UK

2 December 2019



National Illumination Committee of Great Britain

Treasurers Report

The Trustees presented their annual report and accounts for the year ended 30 September 2019

The charity number is 257185 and the working name of the charity is CIE-UK

Reference and Administrative Information

Trustees

Dr J O'Hagan Chairman

Miss T M Goodman

Mr Stuart Mucklejohn

Mr Nigel Parry Honorary Treasurer

Prof Steve Fotios Honorary Secretary

Mr Allan Howard Executive Secretary

Principal Office

c/o CIBSE, Delta House, 222 Balham High Road, London, SW12 9BS

Independent Examiner

R A Nelson FCA, MacIntyre Hudson, Lyndale House, Ervington Court, Harcourt Way,
Meridian Business Park, Leicester LE19 1WL

Bankers

CAF Bank Ltd, 25 Kings Hill, West Malling, Kent ME19 4JQ

Solicitors

None appointed

Investment managers

Brewin Dolphin Securities

1-2-1 Investments

Structure, Governance and Management

The Committee is an association governed by rules which were originally adopted on 22 October 1969. It was registered as a charity on 4 December 1969.

The objectives of the charity are the advancement, for public benefit, of the science and art of lighting together with the advancement and publication of the related research, through making grants to appropriate organisations and individuals, providing advice and sponsorship or undertaking research.

The Board of Trustees consists of five trustees who meet two or three times a year and serve for one full year. They may then offer themselves for re-election at the Annual General Meeting. Due to the

size and nature of the Committee it is not considered necessary for new trustees to receive any formal training or induction.

The Committee is made up of the trustees, a representative from each of the sponsoring organisations, the cooperating organisations, and the participating universities, and the individual members. It meets on an ad hoc basis. Its primary function is to set the technical policy of the Committee in relation to all fields of lighting research and provide related strategic advice.

Achievements and Performance and Financial Review

The Accounts are in accordance with the Trustees' expectations and objectives and further details are shown in the accounts and the accompanying notes. It is the policy of Committee to maintain sufficient free reserves to generate sufficient investment income to continue to support UK researchers at the current levels.

Budget 2018-19

The income and expenditure for last year is outlined below.

Income	Budget	Actual to date
Membership	£ 10,736.00	£ 9,107.00
Sales (offset to CIE subs)	£ 500.00	£ 1,055.56
Investment income	£ 13,500.00	£ 13,990.07
Total £	£ 24,736.00	£ 24,152.63

Expenditure	Budget	Actual to date
CIE/BSI	£ 10,105.00	£ 159.60
Website	£ 250.00	£ 1,281.00
Bank Charges	£ 60.00	£ 45.00
Support Payments (inc USA)	£ 27,416.00	£ 18,807.56
Other		
Total	£ 37,831.00	£ 20,293.16

Budget 2019-20

The projected income and expenditure for the year is outlined below.

Income	Budget	Actual to date
Membership	£ 11,342.00	£ 9,296.00
Sales	£ 500.00	£ 610.61
Investment income	£ 13,500.00	£ 10,644.61
Total £	£ 25,342.00	£ 20,551.22

Expenditure	Budget	Actual to date
CIE/BSI (inc CIE last year)	£ 10,105.00	£ 23,428.35
Website	£ 250.00	£ 256.80
Bank Charges	£ 60.00	£ 91.00
Members support (inc TG USA)	£ 10,000.00	£ 3,110.83
Total	£ 20,415.00	£ 26,886.98

Budget 2020-21

The projected income and expenditure for the year is outlined below.

<u>Income</u>	<u>Budget</u>	<u>Actual to date</u>
Membership	£ 10,965.00	
Sales (offset to CIE subs)	£ 900.00	£ -
Investment income	£ 11,500.00	
Total £	£ 23,365.00	£ -

<u>Expenditure</u>	<u>Budget</u>	<u>Actual to date</u>
CIE/BSI	£ 12,500.00	
Website	£ 250.00	
Bank Charges	£ 80.00	
Members support (Malaysia)	£ 10,000.00	
Other (AUDIT)		
Total	£ 22,830.00	£ -

Membership Income is based on a 2% rise and will be as below for 20/21

Sponsors	£1450
Co-Operating Org	£460
Universities	£245
individual	£110

Budget note.

For the current year the figures suggest a deficit in the budget, which is due to the late payment of CIE subs, however the support figure will be much lower than anticipated. This was following the 18-19 year that was under budget, again due to late Cue CB payment and lower than expected support payments. However assuming a conservative spend in 2019/20 and 20/21 the budget suggests a reasonable balance.

It is timely to note that the annual CIE CB subs and BSI membership figure will exceed the income from membership. This is in part due to to exchange rates, but as we have no control over these rates then we need to address our income.

Members support is usually covered from dividends and although the yield maybe lower than usual this year, overseas travel is expected to be much reduced.

However the markets should bounce back and that should provide cover for the mid-term meeting in Malaysia as the forecast suggests a balance if we keep support to around £10,000 -£15000

Investments.

During these strange times I have asked our investments managers for their current views on the market.

Ian Coopers comments:

Yesterday, marks the midway point of what has already become one the most eventful years of our lifetimes. Investors have had to process multiple massive shocks: a global pandemic; a historically deep worldwide recession; and in the US, nationwide social unrest and a now politically vulnerable president. Yet despite the severe economic shock and persistent uncertainties, financial market performance over the entire first six months of the year has not been terrible. The S&P 500 index is only down -5.5% year-to-date, while the NASDAQ index is up +10.5% over the same period.

Meanwhile, the Barclays Global Aggregate benchmark fixed income index is up +3.9% so far in 2020 (in hedged US dollar terms). In light of the magnitude of losses suffered by global equity and credit

markets in February and March, those are impressive year-to-date returns. Closer to home the FTSD Index is down 17% YTD and gilts are up slightly.

The portfolio is down -4.5% YTD which is comfortably ahead of the main UK index and the US Index as well as the relevant risk level 6 benchmark (-5%). The large exposure to the US market (25%) has been very helpful for returns and the timing of the changes that we made to the portfolio has also proved helpful.

Simon Knotts latest comments:

Please find attached the current portfolio valuation. The portfolio continues to recover and currently stands at £160,211.

The previous valuations I emailed to you on 27th April and 16th March were £147,100 and £142,365 respectively.

The original investment amount was £130,000.

The portfolio is performing exactly how we expect it to. We have controlled the risk through global diversification as well as diversification across a range of different asset classes.

The global economic recovery from the pandemic is starting to emerge. New economy industries such as tech, ecommerce, cloud storage and payment systems have all fared well due to increases in demand and holdings in such companies as Amazon, Apple, Netflix, Visa, Mastercard etc are held throughout various funds within the portfolio.

There are no urgent amendments required to the portfolio and I am more than happy to discuss this with your Board colleagues in August.

CAF Current account Balance (3 July 2020) £40,161.93

Financial Report to Charity Commission

I have been prompted to update our financial records on the Charity Commission and will do so following this meeting.

Nigel Parry

Hon Treasurer

Thursday 9th July 2020

CIE Division 1: Vision and Colour

Terms of reference

The Terms of Reference of Division 1 are:

To study visual responses to light and to establish standards of response functions, models and procedures of specification relevant to photometry, colorimetry, colour rendering, visual performance and visual assessment of light and lighting.

Division Officers:

Division Director:	Youngshin Kwak
Division Secretary:	Li-Chen Ou
Division Editor:	Peter Hanselaer
Associate Directors:	Nana Itoh (Vision), Ellen Carter (Colour)

Tribute

A tribute to Professor Robert William Gainer Hunt OBE (1923-2018), was given by Ronnier Luo at the Washington meeting. Many of us remember being taught or serving on technical committees alongside him. His knowledge and enthusiasm for colour measurement will be sorely missed. Colour science has lost a great pioneer.

Activities and achievements

Activities and achievements of the Division during the year October 2018 – September 2019 were as follows:

TCs and Divisional Meetings

20th -22nd June 2019, Washington DC

CIE publications

CIE 230:2019 Validity of Formulae for Predicting Small Colour Differences.

It reports on the performance of colour-difference formulae based on the results of experiments to evaluate colour differences visually. The report addresses small colour differences of adjacent colours. Visual responses are compared with calculated colour differences using five colour-difference formulae: CIELAB, CMC, LABJND, CIE94, and CIEDE2000. A power-function (PF) correction is also included. Using the STRESS index, the performances of the colour-difference formulae are tested without and with the PF correction.

In addition to the COM dataset used for the development of CIEDE2000, nine new datasets (with particular emphasis on colour differences below 2 CIELAB units) are included in this study. The datasets can be downloaded from the CIE server.

CIE 232:2019 Discomfort Caused by Glare from Luminaires with a Non-Uniform Source Luminance.

In 1995 the CIE Technical Committee 3-13 developed the Unified Glare Rating (UGR) to predict discomfort glare for indoor lighting systems. For practical reasons, the UGR is based on the average source luminance. The introduction of LEDs in general lighting enabled many new luminaire designs, sometimes with unprecedented high luminance contrasts. The literature review presented in this report shows that UGR tends to underestimate the discomfort provoked by such luminaires with highly non-uniform source luminance. Several UGR correction methods are evaluated by comparison to experimental data on experienced discomfort from uniform and non-uniform light sources. The preferred method involves a precise definition of the glare source area based on a luminance image of the source. This method solves the discrepancies between UGR and perceived glare from non-uniform light sources. To guide future work on glare prediction methods, the remaining shortcomings of UGR are briefly reviewed.

Status of Technical Committees

During the year 2 technical committees were closed, leaving 4 Vision and 6 Colour Divisional TCs. JTC7 and JTC9 lead by D1 were closed.

2 new JTCs with Division 1 as chair were set up:

JTC-16 (D1/D8) "Validity of chromatic adaptation"

JTC-17 (D1/D2/D8) "Gloss measurement and gloss perception: A framework for the definition and standardization of visual cues to gloss"

1-63 Validity of the Range of CIE DE2000

To investigate the application of the CIE DE2000 equation at threshold, up to CIELAB colour differences greater than 5.

This TC has been closed.

1-76 Unique Hue Data: Sophie Wuerger (GB)

To study and report on unique hue data, including an analysis of the scatter of those data: this to include practical viewing conditions

Intra: Inter-observer variability (Mean colour difference from the mean in CIEDE2000units) was presented as 0.8:1.5 for CRT data and 1.6:3.7 for Munsell chips. Inter-observer variability is on average around 2 times the intra-observer variability for both sets.

In reviewing the feedback, which has been received from Peter Hanselaer re our TC 1-76 report, Peter is not suggesting to present our data in CIELAB, therefore the current data presentation, i.e. use CIELUV will be continued with. The report is to be submitted soon.

1-81 Validity of Formulae for Predicting Small Colour Differences

To evaluate available formulae for small colour differences ($< \sim 2.0$ CIELAB). 2. To define a visual threshold colour difference.

This technical committee was disbanded following the publication of the Technical report as CIE 230 Validity of Formulae for Predicting Small Colour Differences.

1-83 Visual Aspects of Time-Modulated Lighting Systems: Malgorzata (Gosia) Perz (NL)

To investigate and report on current research on the perception of visual artefacts of temporally modulated lighting systems, including flicker, the stroboscopic effect and the phantom array effect. 2. Design methodology and gather data on the visibility of temporal artefacts. 3. Build a model for the visibility of temporal artefacts and their dependence on environmental, demographical and lighting parameters.

A TC was held in Washington DC 2019 at which a new Chair and 1-year extension were agreed.

A series of experiments in China and in Korea on the visibility of the phantom array, both direct and indirect view, link to general lighting application were reported and discussed.

Study on SVM: change of the normalization curve in the Netherlands was published in a journal paper in JOSAA.

A study on the phantom array from the UK was reported.

1-84 Definition of Visual Field for Conspicuity: Nana Itoh (JP)

To define and classify functional visual fields for universal tasks and develop guidelines for the layout of visual information to increase the visibility of visual signs, displays and markings.

Working Draft 1 of the report has been reviewed and is to be submitted to CIE CB.

1-86 Models of Colour Emotion and Harmony: Li Chen Ou (TW)

To recommend models of colour emotion and harmony based on existing psychophysical data obtained by different research groups or networks for applications in the colour design area. The members of this TC voted to close the TC. At the D1 meeting a vote was passed to close the TC.

1-89 Enhancement of Images for Colour Defective Observers: Po-Chieh Hung (US)

To study, evaluate and recommend image enhancing techniques for colour defective observers and to provide test procedures for the evaluation of those techniques.

Draft 2 of the report is to be reviewed. Some definitions in it, incompatible with the ILV need resolving.

1-91 Methods for Evaluating the Colour Quality of White-Light Sources: Yandan Lin (CN)

To evaluate available new methods for evaluating the colour quality of white-light sources with a goal of recommending methods for industrial use. (Methods based on colour fidelity shall not be included: see TC1-90)

Several Colour Quality models, preferences of users – relative gamut area index, colour rendering vector, colour saturation, colour preference, colour harmony, colour discrimination. Contributions and comments to DR5.5 was sent to all members on May 16, 2019 and a shortened version of the DR 1-68TN was added as one of the methods in this version, and the references were edited again. All comments to DR 6.0 have been addressed in Draft report V6.1, which discussed in Washington. The next step is to send the TR (V6.1) to the DE and to the TC for approval. With the goal to have the TR in the hands of the BA in late 2019.

1-92 Skin Colour Database: Kaida Xiao (GB)

1. To investigate the uncertainty in skin colour measurement and to recommend protocols for good measurement practice. 2. To tabulate skin colour measurements that accord with these protocols covering different ethnicity, gender, age and body location.

An array of skin colour data from a number of publications covering several ethnic groups was presented in Washington. The next steps are to prepare TC report and to explore further opportunity to promote skin colour data and related research in CIE.

1-95 The Validity of the CIE Whiteness and Tint Equations: Minchen Wei HK

Based on published and new experimental work the TC shall seek to recommend modifications to the existing CIE Whiteness and Tint Equations to extend their application to illuminants other than D65. Furthermore the TC shall review the restrictions imposed on the validity of the equations to samples that are measured on the same instrument at nearly the same time, and review the colorimetric limits hitherto set. If enough experimental data justify it, the TC may recommend modifications to the current CIE Equations for Whiteness and Tint.

Since the last meeting the Chair, Robert Hirschler (DE) has resigned and Minchen Wei (HK) was approved as the new TC Chair. This TC met yesterday. New experiments have been carried out by Minchen Wei (HK PolyU data), Ronnier Luo (ZJU data), and Michael Vik (CZ). There was good agreement between HK PolyU data and ZJU data.

The TC has been extended for one year to give the TC a change to complete the technical report.

1-96 A Comprehensive Model of Colour Vision: Ming Ronnier Luo (GB/CN)

Based on the published work and new experimental work should seek to recommend a model or models of colour vision that predicts of the appearance of coloured stimuli viewed in typical laboratory conditions. This shall include stimuli that appear as both related and unrelated colours, that are viewed under illumination from photopic down to scotopic levels, and that have varying size. The model shall also include a uniform colour space. Technical Report presenting a state of art models.

Work has been done on a number of colour appearance models. A number of models are currently under evaluation. A report is expected late 2019.

1-97 Age- and Field-Size-Parameterised Calculation of Cone-Fundamental-Based Spectral Tristimulus Values: Jan Henrik Wold (NO)

Following on from CIE TR 170, to recommend a procedure for age- and field-size-parameterised calculation of cone-fundamental-based spectral tristimulus values, compliant with the principles of the CIE XYZ concept. 2. To deliver a computer program for the calculations.

The last, and final, TC meeting was held in Washington DC 2019. The computer program is close to finishing and publishing. The user guide is to come.

JTC 7 (D1/D3): Discomfort caused by glare from luminaires with a non-uniform source luminance: Naoya Hara JP

The technical report was published in 2019. CIE 232:2019 Discomfort Caused by Glare from Luminaires with a Non-Uniform Source Luminance.

Having finished its work JCT7 has been closed.

JTC 09 (D1/D2/D3/D6) CIE system for Metrology of ipRGC influenced light response: Luc Schlangen (NL)

The technical report was published in 2018.

CIE S 026/E:2018 CIE System for metrology of optical radiation for IPRGC-influenced responses to light

Having finished its work JCT9 has been closed.

JTC 10 (D1/D8) A new colour appearance model for colour management systems: CIECAM16: Changjun Li (CN)

Draft version 4 is being worked on for completion by the end of 2019. CIECAM16 is mainly based on the following work:

- Zhifeng Wang, Cheng Gao, Yang Xu, Manuel Melgosa, Michael H. Brill, Michael Pointer, and Changjun Li*, Further Investigation on the Modified Hyperbolic Function in the CAM16 Color Appearance Model, Color Res Appl. Volume44, Issue3, June 2019, Pages 359-366
- Changjun Li, Yang Xu, Zhifeng Wang, Ming Ronnier Luo*, Guihua Cui, Manuel Melgosa, Michael H. Brill and Michael Pointer, Comparing two-step and one-step chromatic adaptation transforms using the CAT16 model, Color Res Appl. 2018;43:633–642.
- Changjun Li, Zhiqiang Li, Zhifeng Wang, Yang Xu, Ming Ronnier Luo, Guihua Cui, Manuel Melgosa, Michael H. Brill and Michael Pointer, Comprehensive colour solutions: CAM16, CAT16 and CAM16-UCS, Color Res Appl. 2017;42:703–718.

The final stage is to complete the TR publication process and close the JTC by the end of 2020, if not earlier.

JTC 12 (D1/D2/D8) The measurement of sparkle and graininess: A Ferrero (ES)/Y Kwak (KR)

To provide a methodology to measure sparkle and graininess, and to develop a measurement scale. Measurands will be defined and the requirements for their measurements will be well normalized, in such a way that different instruments can provide the same spectrophotometric data from the same specimen. A psychophysical method will be recommended to obtain visual data, and its correlation with the spectrophotometric data will be worked out to develop the measurement scale for sparkle and graininess.

New sections have been added covering, the theoretical framework, spectrophotometric measurements, visual sparkle and graininess and measurement scales. A number of terms were identified as needing proper CIE definitions. A discussion forum was created in CIE collaboration tool about the definition of sparkle. Others discussion fora will follow.

JTC 16 (D1/D8) Validity of Chromatic Adaptation: Minchen Wei (HK)

Recent experimental work revealed the incomplete chromatic adaptation under white light, especially those with low CCT and off-Planckian chromaticities, which are important to the performance of chromatic adaptation transforms. This was not considered in existing chromatic adaptation transforms (CATs). The TC will review the existing CATs and propose modifications by including a two-step transform to take the effect of white light chromaticity on degree of chromatic adaptation into consideration.

This TC was just formed in November 2018. The terms of reference include: 1)The TC will review the existing CATs and propose modifications by including a two-step transform to take the effect of white light chromaticity on degree of chromatic adaptation into consideration and will write a TR; 2) The TC will review the existing CATs and propose modifications by including a two-step transform to take the effect of white light chromaticity on degree of chromatic adaptation into consideration. At this point the membership includes: Chair: Minchen Wei (HK) – D1; Kaida Xiao (GB) – D8 co-chair; Members: Guihua Cui (CN), Youngshin Kwak (KR), Changjun Li (CN), Qiang Liu (CN), Ronnier Luo (GB), Yungkyung Park (KR), Michael Royer (US), Kevin Smet (BE), Shining Ma (BE), Kees Teunissen (NE). The first meeting will be held during CIE 29th Session. The tentative work plan schedule is:

- Jun 2019 - Jun 2021: carrying out new experimental work
- Jun – Dec 2021: discussing and evaluating new experimental work
- Jun 2022: Preparing Draft Technical Report
- Oct 2022: TC balloting of Draft Technical Report
- Dec 2022: Submitting to CIE CB

JTC 17 (D1/D2/D8) Gloss Measurement and Gloss Perception: A Framework for The Definition and Standardization of Visual Cues to Gloss: F Leloup (BE)

To describe recommendations for standardised visual assessment conditions of individual, established cues to gloss, to make recommendations for the definition of a standard gloss observer for individual diagnostic cues and, based on the findings from the above, to suggest optical methods and metrics for describing gloss in correlation with the established gloss cues.

The JTC was established in 2019 and contains 14 initial members from 8 different countries A first JTC 17 meeting will be planned in the second half of 2019.

Reporterships

R 1-60 Future colour-difference evaluation: Guihua Cui (CN)

No Report

R 1-62 Typical LED spectra: S. Jost (FR)

This reportership was tasked to select the typical LEDs for the update of CIE 15 Colorimetry. While this work was completed Sophie has agreed to prepare a brief Reportership Report detailing the method of selection so that it can be kept in the Division 1 records for future reference.

R 1-63 Tristimulus integration: Li Changjun (CN)

Discussed the vision to have one preferred method of integration, which then could be included in CIE documents.

R 1-64 Real colour gamut: Li Changjun (CN)

No Report.

R 1-66 The Effect of Dynamic and Stereo Visual Images on Human Health: Hiroyasu Ujike

A Report is currently being written and is close to submission.

R 1-67 Revisiting Correlated Colour Temperature: Y Kwak (KR)

No report.

R 1.68: A gamut area measure and colour-shift graphic, based on CIE 13.3-1995: K Teunissen (NL), Y Ohno (US), K Mukai (JP)

Kees reported based on the feedback received on the DR 1-68 ED/TN, various options to address the comments were discussed, but finally it was decided not to pursue the publication of a CIE TN. Instead, it was agreed to include the CRI-based method in the TC 1-91 technical report (TR), as one of the featured methods. However, the CRI-based method should first be published with all necessary details (which could not be included in the TC 1-91 TR). Fortunately, the members of the Global Lighting Association (GLA) unanimously approved the publication of the CRI-based method on their website, along with a tool to calculate the CRI and associated CRI-based index values.

Since December 2018, the two documents (a pdf with the details and an Excel tool for calculating the index values) can be downloaded from the GLA website:
<http://www.globallightingassociation.org/library>.

Application of CIE 13.3-1995 with Associated CRI-based Colour Rendition Properties (pdf document)

GLA Calculation Tool for CIE 13.3-1995 CRI and Associated CRI-based Colour Rendition Properties (Excel tool)

A vote was taken and agreed to close the reportership.

R 1-69 Applicability of Metrics for Evaluating Reflected Glare on Displays: Shao-Tang Hung (TW)

No Report.

Research fora

RF-03: Matters related to Colour Rendition: K Teunissen, (NL)

Topics to be addressed/discussed can include:

- a literature review of existing methods to characterize the colour rendition properties of white-light sources with their advantages and limitations (TC 1-91);
- a review of CIE activities and publications: e.g. the use of 10-deg CMF instead of 2-deg CMF, CIE 2006 Colorimetry (TC 1-97), CIECAM16 (JTC 10),
- a new CCT definition (DR 1-67) and/or a new chromatic adaptation transform (JTC 16) and their impact on colorimetry and on the lighting community;

- and creating an overview of the desired colour rendition-related specification items (from a manufacturer, designer, specifier, and consumer's point of view) for describing colour "quality" for a selected set of application areas and target groups.

Report presented by:

Peter Clarke
UK Representative CIE Division 1
December 2019

CIE Division 2: Measurement of Light and Optical Radiation

The first part of the D2 annual meeting is on 16 July and will be a review of progress, with the second part on 27 August to plan future activities. Both meetings will obviously be online.

D2 is involved in planning for 3 forthcoming CIE events:

1. CIE Tutorials on Colorimetry and Visual Appearance, Online, July 28 - 29, 2020

Originally intended to be held as a tutorial, workshop and symposium in Hong Kong back in April this year, this event has been shifted to late July, and will now be an online tutorial only - the symposium has been cancelled and the workshop parts will be held as tutorials. When you register for the event, the presentations will be made available for viewing online from July 17. You can then view them in your own time and submit questions in advance, and the questions will be answered in live Question and Answer sessions on July 28 and 29. Additionally, a bundle of publications will be provided for free and others at a discounted price.

More information can be found at <http://cie.co.at/news/cie-tutorials-colorimetry-and-visual-appearance>.

2. CIE/ICNIRP Online Tutorial on the Measurement of Optical Radiation and its Effects on Photobiological Systems, Online, August 25 - 26, 2020

This event was originally intended to be held as a tutorial and symposium in Eindhoven, Netherlands, however the symposium part has been cancelled and the tutorial part will now be online only. When you register for the event, the presentations will be made available for viewing online from August 14. You can then view them in your own time and submit questions in advance, and the questions will be answered in live Question and Answer sessions on August 25 and 26

More information can be found at <http://cie.co.at/news/cieicnirp-online-tutorial-measurement-optical-radiation-and-its-effects-photobiological-systems>.

3. CIE Workshop on the Calculation and Measurement of Obtrusive Lighting, Ostrava, Czech Republic, November 12 - 13, 2020

This is a D4/D2 event which was originally planned for late May but is now shifted to November. It is still planned as an on-site meeting but the local organisers are preparing contingencies in case the COVID-19 situation extends until November. The event is scheduled during the new moon and arrangements have been made with the local city council to switch off the road lighting system for a brief time during the night to allow for measurements of obtrusive light with and without the road lighting on.

More information can be found at: <http://cie.co.at/news/cie-workshop-calculation-and-measurement-obtrusive-lighting>.

Teresa Goodman

July 2020

CIE Division 3 UPDATE 03/12/19

DIVISION 3 TECHNICAL COMMITTEES

3-54: REVISION OF CIE 16-1970: DAYLIGHT

to revise and update publication CIE 16-1970: Daylight in the light of the advances in technology and design since 1970

Chair: Yannick Sutter (FR)

3-55: METRICS FOR SUNLIGHTING AND DAYLIGHT PASSING THROUGH SUNSHADING DEVICES

To propose a metric to assess contribution of sunlight to the daylighting a building, and to rate lighting contribution of daylight and sunlight passing through sunshading systems. The proposal should avoid performing long term climate based calculations, and be of interest both for building designers and manufacturers of window components.

Chair: Marc Fontoyront (FR)

3-56: ASSESSMENT OF DISCOMFORT GLARE FROM DAYLIGHT IN BUILDINGS

To complete the work of the former TC 3-39, fulfilling its Terms of Reference: To review existing discomfort glare assessment methods with respect to their suitability to daylight glare. To identify strengths/weaknesses and threats/opportunities in these existing methods. To make a recommendation on a provisional method for daylight glare assessment. To identify additional parameters that might influence the perception and assessment of discomfort and glare from daylight. To develop proposals for possible research directions and projects suitable to advance the understanding of these parameters.

Chair: Toshie Iwata (JP)

JTC 04 (D3/D6): VISUAL, HEALTH, AND ENVIRONMENTAL BENEFITS OF WINDOWS IN BUILDINGS DURING DAYLIGHT HOURS

To review the scientific literature in all relevant fields and to produce a concise document that identifies the values of windows in buildings. Examples of such values could be the provision of light for visibility, ventilation, means of egress; aesthetic benefits, access to a view, and light for physiological functioning, including circadian rhythm regulation. If possible, based on this literature, the committee will propose preliminary criteria for daylighting metrics (the metrics being already under development by TC 3-47) to support these functions.

Chair: Jan Wienold (CH)

JTC 06 (CIE-ISO): ENERGY PERFORMANCE OF LIGHTING IN BUILDINGS

To develop an ISO/CIE standard that specifies the calculation methodology for the evaluation of the amount of energy used by lighting systems in buildings. The standard - shall provide a numeric indicator for lighting energy requirements used for certification purposes; - can be used for existing buildings and of new or renovated buildings; - provides reference values as a basis for the targets for energy allocated for lighting usage, keeping in mind lighting design requirements; - provides a methodology for the calculation of instantaneous lighting energy use for the estimation of the total energy performance of the building.

Chair: Soheil Moghtader (DE)

JTC 08 (D1/D2/D3/D4/D5/D6/D8): TERMINOLOGY IN LIGHT AND LIGHTING

To address any issues regarding terms and definitions related to the International Lighting Vocabulary (ILV). This includes coordination within CIE Divisions to maintain and update the ILV, coordination with IEC on questions related to the incorporation of ILV terms and definitions into IEC 60050-845 "International Electrotechnical Vocabulary. Lighting", coordination with ISO/TC 12 on questions related to the incorporation of ILV terms and definitions into ISO 80000-7 "Quantities and units – Part 7: Light and radiation" and any further terminology issues within CIE.

Chair: [Peter Zwick](#) (DE)

JTC 13 (D4/D3): DEPRECIATION AND MAINTENANCE OF LIGHTING SYSTEMS

To revise CIE 97:2005 and CIE 154:2003 in order to bring them up to date by incorporating recently used approaches for determination of lumen maintenance of LED lamps, dealing with lamp and ballast/driver survival factor and upgrading the luminaire maintenance factor according to current technologies and environmental factors. To deal additionally with distortion of luminous intensity distribution due to environmental influences. To extend the document by maintenance of LED luminaires regarding their cooling specific requirements.

Chair: [Dionyz Gasparovsky](#) (SK)

JTC 14 (CIE-ISO): INTEGRATIVE LIGHTING

To undertake an analysis of published scientific studies and review experience from published application studies on non-visual effects of light on humans, with the aim to provide guidance for safe and beneficial use in lighting applications beyond illumination for vision. The material to be analysed is existing material plus the outcome from studies that will become available during the period of this JTC. In particular, the work of the CIE on light as an input for all known photoreceptors in the human eye is included. The outcome of this JTC shall not cover subjects where no proper scientific validation is available and will concentrate on "low hanging fruit" or only provide the status of the different aspects of this topic.

Chair: [John O'Hagan](#)

JTC 15 (CIE-ISO): LIGHTING OF INDOOR WORKPLACES

To revise ISO/CIE 8995-1 in response to its systematic review.

Chair: [Etsuko Mochizuki](#)

JTC 18 (D3/D4): LIGHTING EDUCATION

To revise and update CIE 99:1989 and to provide recommendations on curricula for higher education and continuing education. To propose recommendations for education of lighting professionals and recommend options to improve and support continuing lighting education throughout the professional working life.

Chair: [Piotr Pracki](#) (PL)

DIVISION 3 PUBLICATIONS

[CIE 232:2019 Discomfort Caused by Glare from Luminaires with a Non-Uniform Source Luminance](#)

[ISO/CIE TS 22012:2019\(E\) Light and Lighting — Maintenance Factor Determination — Way of Working](#)

[ISO/CIE 20086:2019\(E\) Light and Lighting — Energy Performance of Lighting in Buildings](#)

[CIE 227:2017 Lighting for Older People and People with Visual Impairment in Buildings](#)

[CIE TN 008:2017 Final Report CIE Stakeholder Workshop for Temporal Light Modulation Standards for Lighting Systems](#)

[CIE 222:2017 Decision Scheme for Lighting Controls in Non-Residential Buildings](#)

[CIE 218:2016 Research Roadmap for Healthful Interior Lighting Applications](#)

[CIE 215:2014 CIE Standard General Sky Guide](#)

[CIE 213:2014 Guide to Protocols for Describing Lighting](#)

[CIE 205:2013 Review of Lighting Quality Measures for Interior Lighting with LED Lighting Systems](#)

[CIE 173:2012 Tubular daylight guidance systems \(including erratum 1\)](#)

[CIE 190:2010 Calculation and Presentation of United Glare Rating Tables for Indoor Lighting Luminaires](#)

[CIE 171:2006 Test cases to assess the accuracy of lighting computer programs](#)

[CIE 97:2005 Guide on the maintenance of indoor electric lighting systems, 2nd ed.](#)

[CIE 164:2005 Hollow light guide technology and applications](#)

[CIE 161:2004 Lighting design method for obstructed interiors](#)

[CIE 157:2004 Control of damage to museum objects by optical radiation](#)

[ISO 15469:2004\(E\)/CIE S 011/E:2003 Spatial distribution of daylight - CIE Standard General Sky](#)

[x024:2002 Proceedings of the ARUP/CIE Symposium on Visual Environment, April 24-25, 2002, London, United Kingdom](#)

[CIE 146/147:2002 CIE Collection on Glare 2002](#)

[ISO 8995-1:2002\(E\)/CIE S 008/E:2001 Lighting of Work Places - Part 1: Indoor](#)

[CIE 117-1995 Discomfort glare in interior lighting](#)

[CIE 110-1994 Spatial distribution of daylight - Luminance distributions of various reference skies](#)

[CIE 108-1994 Guide to recommended practice of daylight measurement + Disk D006](#)

[CIE 055-1983 Discomfort glare in the interior working environment](#)

[CIE 052-1982 Calculations for interior lighting: Applied method](#)

[CIE 019.22-1981 An analytic model for describing the influence of lighting parameters upon visual performance, 2nd ed., Vol.2.: Summary and application guidelines](#)

[CIE 019.21-1981 An analytic model for describing the influence of lighting parameters upon visual performance, 2nd ed., Vol.1.: Technical foundations](#)

[CIE 040-1978 Calculations for interior lighting: Basic method](#)

[CIE 016-1970 Daylight](#)

CIE Division 4: Transportation and Exterior Applications

The Division 4 Terms of Reference are:

To study the procedures and prepare guides for the design of exterior lighting and signalling including work, recreation and transportation areas

Divisional Officers:

Director: Dionyz Gasparovsky (ST)
Associate Directors: Raoul Lorphevre (BE), Steve Fotios (GB), Sermin Onaygil (TR)
Secretary: Maurice Donner (NL)
Editor: Nigel Parry (GB)

The primary aim of the work of the Division is to enhance safety in transport by the publication of relevant technical reports and standards. The Division currently has several active technical committees working on a wide variety of topics.

Division 4 General Meeting 20th May 2020 (Zoom meeting) Report:

A Div 4 meeting was scheduled to be held in Ostrava in late May, but due to Covid-19, a Zoom meeting was held and Dionyz (DG) formally opened the meeting and reviewed:

- Technical Committees
- Reporter ships
- Liaisons
- Division Liaisons and interorganizational collaboration
- Other liaison activities
- Research Fora reports
- Research and Standardization:
- R&D and Education

Current Div 4 Technical Committees:

- TC 4-33 Discomfort Glare in Road Lighting (Stephan Völker)
- TC 4-47 Application of LEDs in Transport Signalling and Lighting (Hugh Barton)
- TC 4-50 Road Surface Characterization for Lighting Applications (Stephan Völker)
- TC 4-51 Optimizing of Road Lighting (Pal J. Larsen)
- TC 4-53 Tunnel Lighting Evolution (Jerome Dehon)
- TC 4-54 Road lighting for ageing drivers (Maurice Donners)
- TC 4-57 Guide for Sports Lighting (Alan Smith)
- TC 4-58 Obtrusive Light from Colourful and Dynamic Lighting and its Limitation (Steve Lau)
- TC 4-59 Guide for Lighting Urban Elements (Diana del Negro)
- TC 4-60 Road Traffic Lights – Photometric Properties of Roundel Signals (Ron Gibbons)
- TC 4-61 Artificial Lighting and its Impact on the Natural Environment (Annika Jägerbrand)
- TC 4-62 Adaptive Road Lighting (Thomas Baenziger)
- JTC 01 Implementation of CIE 191:2010 Mesopic Photometry in Outdoor Lighting (Stuart Mucklejohn)
- JTC 13 Depreciation and Maintenance of Lighting Systems (Dionyz Gasparovsky)
- JTC 18 Lighting Education (Dionyz Gasparovsky)

Future Division 4 meetings:

CIE Workshop on the Calculation and Measurement of Obtrusive Lighting, Ostrava, Czech Republic, November 12 - 13, 2020

This is a Div4/Div2 event which was originally planned for late may but is now shifted to November. It is still planned as an on-site meeting but the local organisers are preparing contingencies in case the COVID-19 situation extends until November. The event is scheduled during the new moon and arrangements have been made with the local city council to switch off the road lighting system for a brief time during the night to allow for measurements of obtrusive light with and without the road lighting on.

More information can be found at: <http://cie.co.at/news/cie-workshop-calculation-and-measurement-obtrusive-lighting>.

- 2021 April - CIE Mid-Term Penang, Malaysia:- format and date are under review
- 2022 China - being considered
- 2023 Quadrennial - Ljubljana, Slovenia

Technical Reports and Standards published in last Twelve Months or so....

TC4-15 = CIE 140:2019

ROAD LIGHTING CALCULATIONS, 2ND EDITION

TC4-55 = CIE 083:2019

GUIDE FOR THE LIGHTING OF SPORTS EVENTS FOR COLOUR TELEVISION AND FILM SYSTEMS, 3RD EDITION

JTC11 = ISO/CIE TS 22012:2019(E)

LIGHT AND LIGHTING — MAINTENANCE FACTOR DETERMINATION — WAY OF WORKING

ISO/CIE TS 22012:2019(E)

TC4-52 = CIE 236:2020

LIGHTING FOR PEDESTRIANS:

TC4-56 = CIE 234:2020

A GUIDE TO URBAN LIGHTING MASTERPLANNING

To Be Published:

TC 4-33 Discomfort Glare in Road Lighting (Stephan Völker)

- The report was completed and submitted in September 2019. However the format was not in line with CIE standards and Stephan has resubmitted in the correct format and should be published later this year.

Nigel Parry

UK Representative - CIE Division 4

July 2020

CIE Division 6: Photobiology and Photochemistry

Terms of reference

The Terms of Reference of Division 6 are:

To study and evaluate the effects of optical radiation on biological and photochemical systems (exclusive of vision).

Division Officers:

Division Director:	John O'Hagan (until June 2019), Luc Schlangen (from June 2019)
Division Secretary:	Luke Price
Division Editor:	Eric Liggins
Associate Directors:	David Sliney Shu Takeshita Karl Schulmeister (until June 2019)

Activities and achievements

Activities and achievements of the Division during the year October 2018 – September 2019 were as follows:

Two Division publications were issued during the year:

CIE S 026/E:2018 – CIE System for Metrology of Optical Radiation for ipRGC-Influenced Responses to Light

ISO/CIE 17166:2019(E) – Erythema reference action spectrum and standard erythema dose

A CIE Tutorial was held in Eindhoven on 14/15 March 2019 to cover CIE S 016. This was well attended, and it is proposed that the Tutorial should be run in other parts of the world.

The annual Division 6 meeting was held in conjunction with the 29th Quadrennial Session in Washington DC, USA, on 20th June 2019. 18 delegates (of which 11 were National Committee Division 6 Representatives) and 16 observers attended. John O'Hagan handed over the Division 6 Director position to Luc Schlangen from The Netherlands during the meeting.

Status of Technical Committees

TC6-52 Proper Measurement of Passive UV Air Disinfection Sources (Richard Vincent)

This report was nearing completion, subject to the TC Chair addressing some editorial issues.

TC6-64 Optical Safety of Infrared Eye Trackers Applied for Extended-Durations (David Sliney)

This TC report was nearly complete.

JTC-04 Visual, Health, and Environmental Benefits of Windows in Buildings during Daylight Hours (David Sliney)

D3 had been the lead of this joint TC with D6 but were currently without a TCC. The JTC members met during the Washington Session and agreed to close the JTC, reforming it as a D3 TC with input from D6, as appropriate.

JTC-05 Joint Technical Committee to Revise CIE S009/IEC 62471 (John O'Hagan)

This JTC relates to the Photobiological Safety of Lamps and Lamp Systems. The IEC participation was not registered with IEC, despite the proposed IEC TC76 Secretary thinking it was. So, CIE is going to complete and present it to IEC for a jointly-badged standard under

the IEC fast-track agreement. This is possible mainly because most JTC5 members are in the IEC WG too.

JTC-08 International Lighting Vocabulary (Peter Zwick)

The process was nearing completion to have a revised International Lighting Vocabulary.

CIE CB's Peter Zwick has led this complex detailed work, coordinating with IEC's technical editor and ISO, and with the DDs of CIE. The new standard is hoped to be published fairly soon and will have a number of both revisions and new terms.

It was noted that there are already new terms that have been introduced since the cut-off for inclusion, that will form part of the ongoing process of keeping the ILV up to date.

JTC-14 Integrative Lighting CIE/ISO (John O'Hagan, chair for CIE)

John O'Hagan is the CIE co-chair for this JTC (or ISO JWG4, ISO Chair Raphael Kirsch). The terms Human Centric Lighting and a second term had been rejected by CIE in favour of the agreed term "Integrative Lighting". It was hoped to move to a draft document within the next year.

RF-02 Temporal Light Modulation (n/a)

RF-02 on Temporal Light Modulation was of specific interest to Division 6. It had grown out of a workshop held by Jennifer Veitch in Ottawa in 2017, and there was an email mailing list allowing regular discussion about points of interest, opportunities to share data and ask questions.

R6-43 Illuminators for Treatment of Infant Hyperbilirubinemia (Graham Hart, Michael Lynn)

The report deals with the lamps used to treat neonates for Hyperbilirubin in hospitals. The neonates nowadays always wear eye protection during treatment sessions. Blue wavelengths are used for historical reasons, but the use of longer wavelengths might have greater efficacy and have additional safety advantages. OLEDs are another development discussed, which can now be used to wrap the body in a light emitting blanket.

R6-44 Optical Radiation Hazard Measurements in the Workspace (David Sliney, Robert Angelo)

David Sliney broadly felt that this reportership was no longer worth continuing, and its function was mostly taken over by the liaison with the IEC TC76. It was felt it would be possible to close this reportership and reopen it if necessary later.

Report presented by:

John O'Hagan

UK Representative CIE Division 6

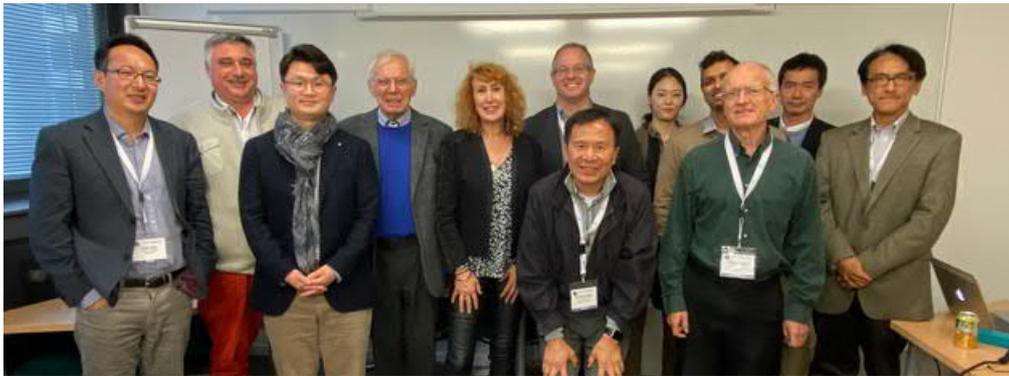
2 December 2019

CIE Division 8: Image Technology

The Terms of Reference of Division 8 are:

To study procedures and prepare guides and standards for the optical, visual and metrological aspects of the communication, processing, and reproduction of images, using all types of analogue and digital imaging devices, storage media and imaging media.

The most recent informal meeting of CIE Division 8 was held as part of the 27th IS&T Color and Imaging conference in October 21st, 2019 in Salle 116 Sorbonne Université, Paris France. 19 people attended (4 via the internet) including 6 National committee representatives.



TECHNICAL COMMITTEE REPORTS

TC8-12: Image and Video Compression Assessment, Pascal Bourdon (FR), 2007

Po-Chieh explained that the chair, Pascal Bourdon, cannot join the meeting but he had sent the final version for CD to Division Editor to be reviewed by Technical Editor. Now, the final report has been sent to Technical Manager, CIE Central Bureau. The TC chair needs to handle the comments from the Technical Manager for the document to move to publication.

TC8-13: Colour Gamuts for Output Media, Kiran Deshpande (GB), 2013

Kiran Deshpande explained that the TC meeting was held earlier in the morning, and the TC is now working on the WD to finalize it. Requirements for gamuts of displays have been added. It was confirmed that the criterion of 'at least 5 members from 5 different countries' applies when you start a new TC; it does not apply for the authors of Technical Report. The target of WD ballot is Dec. 2019.

TC8-16: Consistency of colour reproduction within a single reproduction medium, Craig Revie (GB), 2017 Craig Revie presents the TC and presents some studies as "Does consistent colour appearance exist". A draft Technical Report has been started.

TC8-17: Methods for Evaluating Colour Difference between 3D Colour Objects, Kaida Xiao (GB), 2017

Kaida Xiao presented his work on this very challenging TC. He currently has 8 members and 2 advisors. A meeting had been organised in July 2019 in Leeds. He explained that experimental methods and viewing conditions for colour difference evaluation of pair of 3D colour objects were discussed. Recommendations on the experimental protocol and viewing conditions were defined for this TC as a result of the meeting.

RESEARCH FORUM REPORT

RF-01 Spectral Imaging, Masahiro Yamaguchi (JP) 2018

Po-Chieh suggested that Masahiro make a concrete plan on how to manage the RF and to execute it. So, we are waiting now for his concrete plan.

LIAISONS

Klaus Richter presented SO/IEC/JTC 1/SC 28 about Office Equipment.

DISCUSSION ON RESEARCH STRATEGY

Kaida Xiao makes a short description of the latest activities. He provided some examples of research grants related to 3D printing described in the CIE research strategy.

NEXT MEETING

Division 8 annual meeting will be held online, right after or right before Color & Imaging Conference in this November.

Dr Kaida Xiao

08 July 2020

APPENDIX A

THE CIE & NIC

Each country participating in the work of the International Commission on Illumination (the CIE) forms a National Illumination Committee (NIC). This Committee is representative of all bodies in that country which have an interest in light and lighting.

The CIE:

- provides an international forum for the discussion of all matters relating to science technology and art in the fields of light and lighting
- co-ordinates the international activities of individuals and organisations, to identify outstanding and fundamental issues pertaining to light and lighting and to find solutions
- develops basic standards for measurement and application design
- publishes Technical Reports and Standards and maintains liaison with other international standards organisations.

The CIE technical programme is divided into seven Divisions covering Vision and Colour; Physical Measurement of Light and Radiation; Interior Environment and Lighting Design; Lighting and Signalling for Transport; Exterior and Other Lighting Applications; Photobiology and Photochemistry; and Image Technology. Each Division establishes Technical Committees (TCs) with international representation of experts, to undertake specific tasks. Each TC is disbanded when the work is complete.

The CIE holds a Sessional Conference every four years, which reviews the latest developments in the field and plans the work of the divisions and their Committees for the next quadrennium.

The CIE Central office is based in Vienna. The Secretary General and her assistants are responsible for the administration associated with co-ordinating the activities of all member countries and for publishing the Commission's Technical Reports and Standards.

The CIE is supported through the time and expertise of individuals, most of whom are associated with companies, institutions and organisations interested in light.

The CIE is supported financially by each country's National Illumination Committee which contributes according to a Central Office allocation based on the scale of assessments for the contribution of Member States of the United Nations Organisation, but with modified upper and lower limits. Each NIC depends on contributions from supporting organisations, income from the sale of published Technical Reports and Standards and from the organisation of seminars.

The National Illumination Committee of Great Britain is supported by sponsoring and co-operating organisations. Many universities and colleges participate, as do Government Departments and official bodies interested in or concerned with the design, development and use of light. There are also representatives of the lighting industry as well as independent consultants and architects representing professional bodies.

The NIC selects and sends delegates to the sessions of the CIE. It keeps in close touch with developments throughout the world, both in research and in practical applications, by personal contact as well as via the issues of the CIE News and CIE Division Activity Reports. It also ensures that the British contributions are made known and properly recognised in other countries.

Great Britain, one of the founder members of the CIE, established its National Illumination Committee in 1913 and since then has played a major part in the development of the Commission. The original decision to establish the CIE was considerably influenced by Leon Gaster, the founder of the British Illuminating Engineering Society, now the Society of Light and Lighting.

APPENDIX B

CONSTITUTION OF THE NATIONAL ILLUMINATION COMMITTEE AT 30 SEPTEMBER 2019

Officers and Trustees

Chair	John O'Hagan
Vice Chair	Teresa Goodman Stuart Mucklehohn
Honorary Secretary	Steve Fotios
Honorary Treasurer	Nigel Parry
Secretariat	
Executive Secretary	Allan Howard 4 Symonds Green Road, Stevenage, Herts SG1 2HA

Sponsoring Organisations

Institution of Lighting Professionals	Nick Smith Allan Howard
Society of Light & Lighting	Brendan Keely Peter Raynham John Fitzpatrick

Cooperating Organisations

Ceravision Limited	Stuart Mucklejohn
College of Optometrists	Alan Smith
Colour Group (Great Britain)	Vien Cheung
Public Health England	John O'Hagan
International Association of Lighting Designers	Kevin Theobald, Emma Cogswell
Lighting Industry Association	Tariq Malik
National Physical Laboratory	Teresa Goodman
Society of Dyers and Colourists	Andrew Filarowski (Ronnier Luo)
Thorn Lighting Ltd	Peter Thorns
Trinity House Lighthouse Service	Alwyn Williams
OrangeTek Ltd	Nigel Parry
Qinetiq Ltd	Dr Eric Liggins
Tintometer Ltd	Dr P J Clarke
VeriVide Ltd	John Dakin

Participating Universities

University of Leeds	Kaid Xiao
University of Manchester	Ann Webb
University of Reading	Geoff Cook
University of Sheffield	Steve Fotios
University College, London (The Bartlett)	Kevin Mansfield Peter Raynham

Individual Members

Enrico Biabchi

Gareth Johns

Gareth Jones

Leslie Lyons

Nick Smith

Ian Tutt

Christopher Wilkes

Diana Del-Negro

CIE Division Representatives

Division 1

Peter Clarke

Division 2

Teresa Goodman

Division 3

Peter Thorns

Division 4 / 5

Nigel Parry

Division 6

John O'Hagan

Division 8

Kaida Xiao

Appendix C

Reports from recipients of the 1975 bursary.

As a general principle, funds are available from the 1975 Fund to support travel and subsistence to attend CIE business meetings: this includes CIE Division meetings, CIE Board of Administration meetings, and CIE Technical Committee meetings.

Each individual who receives support is required to provide a written report (of around 1,000 words) on the event they attend, or the work they carry out, for distribution to members through the web site and these will also form part of the annual report.

Report on the 29th Quadrennial Session of the CIE

Jing Lin

It was an honour for me to attend the 29th Quadrennial Session of the International Commission on Illumination (CIE), hosted by the United States National Committee of the CIE. The session was held from June 14 to 22, 2019, in Washington DC. I attended the three-day conference and here is some highlights of each day at the conference.

DAY 1

The opening session was hosted by the local organizing committee chair Ron Gibbons, and current CIE president Yoshi Ohno. The invited speech was given by Dr. William D. Phillips, who shared the Nobel Prize in Physics for 'development of methods to cool and trap atoms with laser light' in 1997. Dr. Phillips delivered an impressive presentation which gave us a nice overview on the historical revision of the international system of units. Oral presentations started afterwards and I heard a few presentations on colour appearance, including an interesting initial study of colour in virtual reality and some updates on the modelling and revision on CIECAM16.

In the afternoon I presented my 5-minute presentation on the effect of intensity of short-wavelength light on subjective and objective alertness, briefly explained my experiments and outcomes to the audience. After oral presentation followed the 1-hour poster session. Quite a few people came to me for questions. I received many helpful comments especially on the experimental lighting settings and measuring geometry. I feel that people are happy with the overall outcomes of my study, whereas they had some questions regarding the part of lighting set up. I got a few very good suggestions on revising and improving these parts. I also heard the ideas about what I can do next for the study to go further, which is what I was hoping to hear about. These information given by other researchers are going to be very helpful for me, especially that I am planning to publish this work, and I am also in the stage of my PhD when I need expertise ideas on what's best for me to do next.

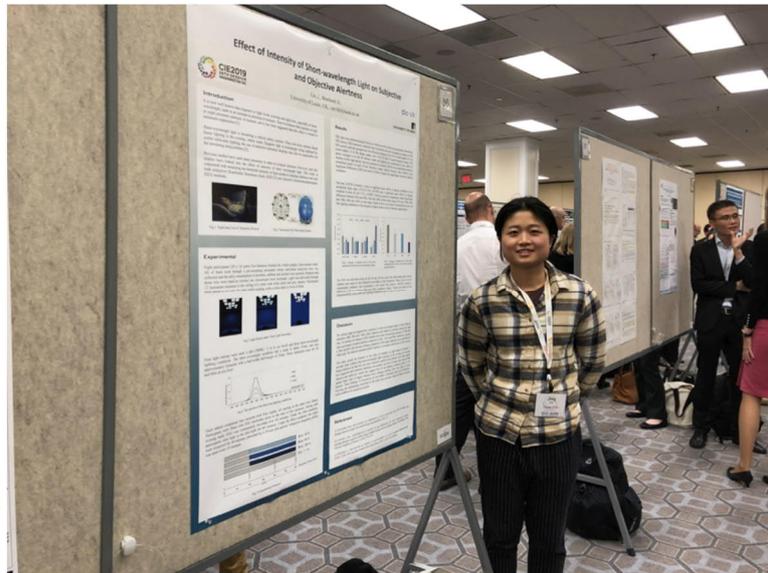
Some pictures from today:



President Yoshi Ohno on the Opening Session



Me giving my talk



Poster Session

DAY 2

The invited presentation in the morning was given by Dr. Luc Schlangen, who has been elected Director of CIE Division 6, starting June 2019. He delivered an insightful talk on the non-image forming effects of light and lighting. Generally he introduced three aspects: (i) visual and non-visual responses to light, (ii) their impact on human health, performance and well-being, (iii) how to translate these responses into innovative lighting applications and strategies in health/elderly care, education, homes and workplaces. And he discussed in details on human circadian rhythm and the function of ipRGCs, and explained some new metrics to quantify light for ipRGC-influenced light responses. In a following oral presentation on the evaluation of blue light hazard (BLH), the speaker gave us a good overview on BLH e.g. the relevant International Standard IES 62471 and the recommendations in the Technical Report IEC/TR 62778. He also explained the current work on a new standard based on IEC/TR 62778 and introduced how to evaluate BLH with different measurement techniques. Another interesting presentation I heard this morning was a project trying to collect the data of the blue sky from different places around the world. The speaker introduced how her team finished a 72-day round-the-world

trip to measure the sky in 20 different destinations, with the aim to develop an approach to analyse seasonal and geographical variations in daylight illuminants. There were also a couple of other related presentations on alerting effect of light this morning.

This afternoon I attended the workshop held by Luc Schlangen and Luke Price. Luc's speech was on 'specifying light for its eye-mediated non-visual effects in humans' and he generally explained the use and application of the new CIE S 026:2018 metrology for ipRGC-influenced responses to light. The other part of the workshop was delivered by Luke and he introduced how human pupil size is controlled by photoreceptors and how the steady-state pupil size can be predicted by melanopsin spectral sensitivity.

Some pictures from today:



Pictures of Blue Sky Collected from Different Destinations around the World



An Interesting Poster Showing Car Crash Experiments with ipad

DAY 3

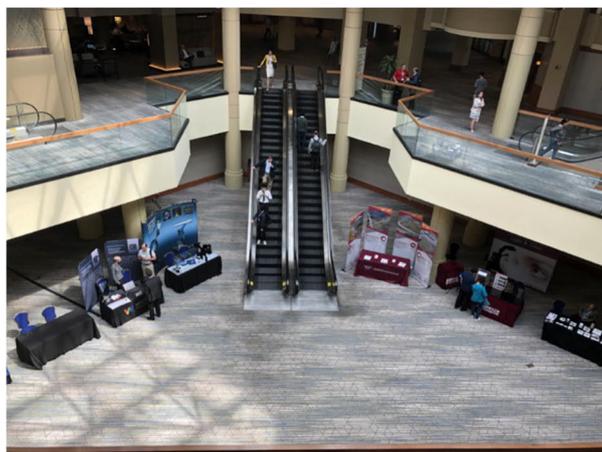
I spent this morning in the same room listening to the presentations related to interior lighting. A study conducted on-site experiments to investigate on human centric lighting in industrial environment in multiple aspects such as heartrate. Another interesting study conducted experiment on lighting environments for blood cancer patients based on virtual reality technology. I also heard from Dr. Mariana Figueiro about her recent case study on light and alertness. She tested, in a 3-week field study, the impact of morning blue light and afternoon red light on sleep quality at home, subjective sleepiness and vitality scores during work. Overall it was found that (i) High CS (circadian stimulus) in the morning appears to have advanced participants' circadian phase (ii) The high morning CS did not significantly increase morning KSS and SVS scores (both are questionnaire-based subjective measures) (iii) The red light intervention around the time of the post-lunch dip significantly reduced subjective sleepiness and increased subjective vitality.

In the afternoon there was a joint CIE (D1/D8)–OSA–IS&T workshop focusing on colour imaging, perception, and reproduction. A few talks were delivered by several speakers: i) New directions in colorimetry, colour vision, and colour appearance ii) Contributions of melanopsin to visual functions in humans iii) Perceptual aspects in high-dynamic range imaging iv) Perceptual aspects in virtual reality and augmented reality. A few topics e.g. the recent updates to cone fundamentals (CIE170), efforts to improve dynamic range imaging and the practical implications of melanopsin signals for vision and lighting were discussed afterwards.

Some pictures from today:



Dr. Mariana Figueiro Giving Her Talk



Conference Venue in Washington, D.C.

In the three-day conference I have learned some about technical knowledge and also heard a lot of results of new research in lighting and colour areas, through presentations and posters. It was an invaluable experience for me to present my work to many other top researchers on the stage and heard about their questions and advise at the poster session. Attending CIE meeting has been extremely helpful to me in many aspects, and I really appreciate the support of CIE-UK to fund me for the trip.

Report to CIE-UK on the CIE Quadrennial Session, Washington 14-22 June 2019

John O'Hagan

14 June 2019 – Division Directors' (DD) Meeting

The DD meeting considered the future list of CIE articles for LED Professional Magazine. Articles up to February 2020 were planned and the articles would be uploaded to the CIE website.

It was agreed that the CIE Research Strategy needed to be updated.

A number of international collaboration opportunities were discussed.

With the joint working with ISO TC274, it was agreed that the ISO committee secretary should have access to the Division Associate rooms on Collaboration Tools.

Following the publication of CIE S026 and the associated Toolbox, it was agreed that the source codes were stored on Collaboration Tools for future reference and archive purposes.

15 June 2019 – 1st Board of Administration (BA) Meeting

This was the final BA meeting of the Board for the 2015-2019 Quadrennial period.

Reports were received from the President and the Treasurer. There was then a break to convene a meeting of CIE GmbH agree legal issues required under Austrian law.

The financial statement for the financial year 2018 was approved.

Reports were then received from Vice-Presidents Technical, Standards and Publications.

A Task Group on Standardisation Strategy had completed its work during the year. The incoming Vice-President Standards and Secretary would work together to implement the Strategy.

The General Secretary presented her report covering the new CIE website, social media, active liaisons and the proposed move from Collaboration Tools to the new IEC Collaboration Platform.

It was agreed that the Board would not make a recommendation for the 30th Session and allow the National Committees to decide.

A sub-group of the Board would meet during the week to discuss CIE's involvement in the International Day of Light 2020.

It was proposed to have a new Task Group on the maintenance of the CIE Code of Procedure, which would be chaired by the General Secretary.

16 June 2019 – General Assembly (GA) Meeting

CIE-UK was represented at the GA by John O'Hagan with support from Steve Fotios.

Reports from the CIE Officers, as presented to the BA meeting, were presented at the GA.

Presentations were given by the National Committees for Russia and Slovenia to host the 30th Quadrennial Session in 2023. The vote was fairly equally split, but Slovenia won. The Session will take place in Ljubljana from 15-23 September 2023.

National Committee Awards were presented. Luke Price and Nigel Pollard were recognised from the UK.

The next mid-term meeting will take place in George Town, Penang, Malaysia, from 18-28 April 2021.

The GA was closed and was followed by a Workshop for National Committees to share ideas. There were major differences in how National Committees work and engage with various stakeholders.

The final part of the day was a Workshop with the International Lighting Network. This was led by the General Secretary and consisted of presentations by the Global Lighting Association, IALD, IES(NA), OSA, SPIE, UL, ICNIRP, Design Light Consortium and LUCI. One of the outcomes was the recognition of the need to educate politicians on lighting matters.

17 June 2019 – Day 1 of the Conference

After an opening ceremony led by the President, Yoshi Ohno, and the Chair of the Local Organising Committee, Ron Gibbons, there was a keynote presentation by Bill Phillips of NIST on the Historic Revision of the International System of Units, finalised in 2018.

CIE Gold Pin Awards were then presented, which included the Waldram Gold Pin to Nigel Pollard for his contribution to applied illuminating engineering.

The Conference then split into three parallel streams.

Temporal light modulation is challenging in terms of assessment for adverse health effects. One of the interesting results (from NRC Canada) was the suggestion that light modulated at 500 Hz appeared to improve cognitive performance.

The photobiology session covered a range of topics from assessments of the blue light hazard, whether the lack of red light from LEDs used for illumination compromised damage repair (perhaps a risk factor for age-related macular degeneration), the importance of retinal light exposure geometry, the return to the use of UV for treating hospital infections and nocturnal melatonin suppression for different exposure scenarios.

The presented poster session provided presenters with a five-minute window to describe their posters. Division 4 and Division 6 had a combined session. Glare and obtrusive light, along with the exposure of light to night-shift critical care nurses were covered.

18 June 2019 – Day 2 of the Conference

Luc Schlangen from the Technical University of Eindhoven was the invited speaker at the start of day 2, covering non-image forming effects of light and lighting: new insights and metrics. He described the development and content of CIE S026, and the challenges for health and wellbeing of getting too much light at night and too little during the day.

Jennifer Veitch of NRC Canada was the Convenor for a Workshop on Temporal Light Modulation and Assessing its Effects on Viewers: Moving towards setting limits. This consisted of several short presentations from the University of Oxford, Pacific Northwest National Laboratory and Lund University, followed by a discussion. Several confounding factors were recognised for the impact of temporal light modulation on symptoms – including coffee, age and tiredness.

The following session on Daylight covered practical issues of balancing artificial and natural light to aid energy saving, how to analyse seasonal and geographical variations in daylight, and the impact of daylight on alertness. Yingjun Dong presented data that claimed to show that students exposed to light before waking were more alert and in a better mood.

The first part of the afternoon session covered goniophotometry. The first presentation covered the challenges of doing goniophotometric measurements in the near field. Johannes Ledig had compared measurements with ray tracing techniques, especially for sources containing several LED chips. Jianguo Pan looked at how to assess the spectral distribution of light reaching plants as a function of time and plant growth. Alexander Kokka compared a fisheye camera with a goniophotometer for measuring the relative angular intensity distribution of light sources. This was part of an EMPIR programme. The advantage of the camera was speed of measurement, but there were limitations.

The second part of the afternoon was a Workshop on the Use and Application of CIE S026 – Specifying light for its eye-mediated non-visual effects in humans. The Workshop convenor was Luc

Schlangen with presentations by Dave Sliney and Manuel Spitschan. Dave spoke about the spatial distribution of light, with relevance to the spatial distribution of ipRPG cells in the retina. The cells are concentrated in the inferior retina. Manuel covered the importance of photoreceptor input to pupil control.

The final formal part of the afternoon was a Workshop on Horticultural Lighting and I was the convenor. Bruce Bugbee participated remotely and spoke about the importance of non-visible wavelengths (ultraviolet and infrared) for plant health. Tess Pocock covered the visible part of the spectrum and the Damon Bosetti spoke about the importance of characterising lighting products for effective horticultural lighting.

During the poster session I was able to meet all but one of the students funded by CIE-UK and hear about their work and the value to them of attending the Conference.

19 June 2019 – Day 3 of the Conference

Day 3 was opened with an invited presentation from Kevin van den Wymelenberg on Light the Unseen: research at the interface of architecture, energy engineering, microbiology and daylight, and newfound gaps. This presentation raised the potential benefit of good architectural design that allowed daylight to manage to spread and viability of microbes. Options for controlling hospital acquired infections were discussed.

The first parallel session was Interior Lighting. Hillevi Hemphälä described a new method for evaluating the visual environment, taking into account issues such as daylight on screens. Parameters were assessed, such as level of eyestrain, muscular problems, headache, migraine, vision and rating of the visual environment. Ferenc Szabó looked at the biological effect and user preference for lighting in an industrial environment. The spectral power distribution of the light was changed throughout the day and it was claimed that alerting effects could be seen (through heart-rate monitoring) for spectra that were expected to be “simulating”, compared with those intended to be “relaxing”. Peter Dehoff presented a tribute to Luc Bedocs and then described the revision of various standards for lighting of the interior workspace. Shao Rongdi spoke about the use of virtual reality technology to simulate various indoor environments for patients on a cancer ward. Varying the conditions with time appeared to improve patient satisfaction. Louxi Hao described evidence-based research and applications of a therapeutic lighting system on circadian rhythm and mood regulation for Chinese patients. This again used virtual reality goggles to give the patient an impression of being in different environments. Mariana Figueiro spoke about the use of light for increasing alertness in a US government office environment. Red and blue light was found to be effective, but there was less evidence for green light. Personal dosimetry was carried out and actigraphy was used to assess alertness.

The final oral session attended was on Spectroradiometry. Ralph Zuber spoke about combined out of range and in band stray light correction for array spectrometers. The options were discussed, and it was concluded that corrections could be made to two orders of magnitude. Yuqin Zong described using tuneable laser sources for the calibration of spectroradiometers. The line spread function was determined, with the slit scattering function. Marek Smid covered the design and development of a tuneable and portable radiation source for in situ spectroradiometer characterisation. This was originally intended to be used for the calibration of Dobson spectrometers. The temporal stability was important. Tomi Pulli spoke about a general tool for estimating the effects of unknown correlations on spectral integrals.

20 June 2019

I chaired the first part of the Division 6 meeting before handing over to Luc Schlangen. The work of the Division 6 Technical Committees was reviewed. The Division received a presentation from Lorna Wen on the concerns about myopia in children in China.

I held a handover meeting with Ad de Visser, to discuss taking over as Vice-President Standards.

ISO TC 274 JWG4/CIE JTC14 on Integrative Lighting met in the afternoon, which I co-chaired with Raphael Kirsch. The technical report is moving towards completion. It was stressed that the document needed to be useable by lighting designers.

21 June 2019

JTC5 on Review of IEC 62471/CIE S009 met with 20 participants in the room and three online. There was a great deal of discussion about how uncertainties should be considered from both a CIE and IEC (test house) perspective.

JTC4 on Visual, Health, and Environmental Benefits of Windows in Buildings During Daylight Hours met to decide its future. The JTC is joint between Division 3 and Division 6, but there had been challenges in the appointment of the Chair. It was agreed to close the JTC and start again with a new Technical Committee within Division 3, but with input from members of Division 6.

The Research Forum (RF-02) on Temporal Light Modulation met to provide an update on recent research. Arnold Wilkins participated remotely. Naomi Miller raised the concerns about the assessment of complex temporal light emissions.

JTC8 on Terminology met to discuss the preparation of the Final Draft International Standard on the International Lighting Vocabulary. This will be voted in parallel between IEC and CIE. New terms are required as technology and applications develop. For example, a new project to consider terms for Horticultural Lighting will probably deliver during the lifetime of this edition of the ILV. It would be possible to produce a supplement in a similar manner to that produced for LEDs.

22 June 2019 – 2nd Board of Administration

The new Board met at the end of the Session. It was agreed that the 29th Session had been a success. The delivery of several oral presentations followed by questions seemed to work well, but perhaps 6 presentations in a row was too many.

Division Directors presented their reports and plans for the next Session.

CIE 29TH QUADRENNIAL SESSION – WASHINGTON DC, 16-22 JUNE 2019

CONFERENCE REPORT

I attended the CIE conference between 17 and 19 June and a number of Technical Committees, Workshops and Division Meetings between 20 and 21 June.

I gave an oral presentation about my research into lighting for cyclists in the morning session on 17 June. My presentation was titled "The influence of road lighting on cyclist numbers and safety". Slides from the presentation are available here: <https://www.jimuttley.co.uk/talk/cie-2019/slides.pdf>, and the abstract of my talk is outlined below. Following my presentation I was involved in a question and answer panel discussion with other presenters during that morning session. The conference paper related to my talk is available open access here: http://files.cie.co.at/x046_2019/x046-OP12.pdf.

Abstract: Lighting can play an important role in encouraging cycling after-dark and making it safer. This paper describes ongoing research to establish a basis for design guidance when lighting for cyclists. Comparison of cyclist counts and estimated illuminance levels suggest a small increase in illuminance after-dark can significantly reduce the negative impact darkness has on cycling rates. Experimental work investigating obstacle detection by cyclists reveals that cycle lighting may not provide any benefit for detecting obstacles on lit roads and may even make detection worse, with the vertical position of the front cycle lamp being important. Cycle lamps also serve the purpose of making cyclists more visible but drivers often fail to detect cyclists even when they are highly visible. Lighting should therefore be considered alongside other approaches to cyclist safety, one of which is introducing presumed liability as a legal consideration to increase driver's attention for cyclists.

ATTENDANCE OF WORKSHOPS AND PRESENTATIONS



Figure 1. Ron Gibbons talking about road lighting characteristics for drivers.

During the conference I attended a number of other sessions that included presentations on work that was highly relevant to my own research areas, or that introduced me to new areas of lighting research. For example, I listened to Ron Gibbons talk about evaluating road lighting levels (see Figure 1), surround ratios and uniformity. This was useful for my research work related to road lighting for traffic safety and will support my contribution to the work of the Sheffield Lighting Research Group, for example the EPSRC-funded HAROLD project about road lighting, driver distraction and pedestrian detection.

I also attended a workshop about methods used in colour research, convened by Minchen Wei and Kevin Houser. This was a useful discussion about the processes and methods involved in conducting good quality, scientific lighting research. This discussion will help me in designing and analysing future lighting experiments. The workshop also prompted some

debate about an area of scientific research I am highly interested in – reproducibility and the potential benefits of pre-registration of research studies. This discussion has motivated me to investigate how to promote pre-registration within the lighting research community and I hope to pursue this over the forthcoming year, possibly through a new journal publication.

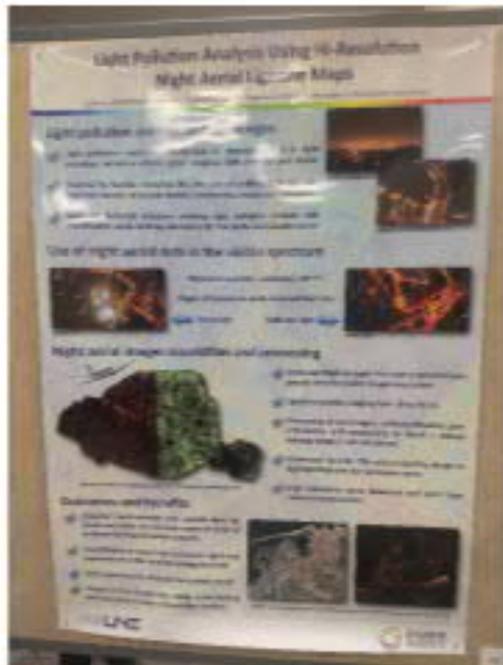


Figure 2. Poster about use of night-time aerial imagery.

The conference had poster sessions on two separate days, both of which I attended. These sessions showcased a number of interesting and relevant research projects, and provided some new contacts that I will pursue over the next few months. For example, I found out about research carried out in France using night-time aerial photography to understand light pollution. This links strongly with some work I have recently completed, using night-time aerial photography to estimate the influence of light levels on cycling rates. I plan on contacting the researcher who presented this poster (see Figure 2) in the next month, to discuss opportunities for collaboration and sharing of data.

NETWORKING AND MAKING CONNECTIONS



Figure 3. Joanne Wood presenting about effects of headlight technologies on night-time visual performance

Attending the conference allowed me to strengthen existing connections with a number of researchers and lighting professionals, as well as make new connections and establish potential lines of collaboration. For example, I had a number of discussions with Professor Joanne Wood (see Figure 3) about her work related to the conspicuity of pedestrians and cyclists after-dark. Joanne's research is highly relevant to my own research interests, particularly in relation to the visibility of cyclists and how light and lighting influences cyclist safety. We have agreed to keep in contact and I hope to work with Joanne on future research opportunities related to active travel at night.



Figure 4. Example tweet showing promotion of my presentation and research by others.

I also spoke to two researchers in the US (Kevin Houser and Raj Bhagavathula) who have access to cycling simulator facilities. The use of a cycling simulator would be a big boost to my own research related to cycling at night and in forming these connections with Kevin and Raj, I hope to explore future opportunities for working with them on cycling-related research.

During the conference I was able to engage with a number other people in the lighting community through the use of social media. By providing regular updates about the conference via my Twitter account, I was able to promote not only the research work of our group at Sheffield, but also lighting research more generally. My social media presence also helped others to promote our work (e.g. see Figure 4). I was also able to make links with lighting researchers who were not able to attend the conference.

CONTRIBUTION TO WORK OF CIE

I attended a number of CIE Technical Committees and Division meetings, which allowed me to contribute to the work of CIE and to gain more experience in how the organisation works and how I could integrate my own research work into CIE activities. For example, I attended the following meetings:

- Division 4 Annual Meeting
- TC4-33 – Discomfort glare in road lighting
- TC4-52 – Lighting for pedestrians: New empirical data (*TC member*)
- TC4-50 – Road surface characterization for lighting applications
- TC4-51 – Optimisation of road lighting
- TC4-54 – Road lighting for ageing drivers
- JTC 01 – Implementation of CIE 191:2010 Mesopic Photometry in Outdoor Lighting
- New proposal for TC about smart road lighting

Attending these various technical meetings has given me greater confidence to get involved in CIE work in the future and I plan on volunteering for future TCs that are within my research area.

During the Division 4 Annual Meeting, my proposal to establish a Reportership about Lighting for Cyclists was approved. Following this, I chaired an initial meeting / workshop related to this Reportership that was well attended. At this workshop I gave a presentation about the need for the Reportership (to establish what evidence there is related to lighting for cyclists, and where more evidence is needed) and held a discussion with attendees about

current knowledge in this area, and the potential scope the Reportership had. A number of people expressed interest in being involved in this research area and I will be following up these contacts over the coming months. I will establish a schedule of actions for the Reportership and aim to provide an update on progress at a future CIE event.

CONCLUSION

Being able to attend the CIE conference has significantly supported my development as an early career researcher in the lighting research community. It allowed me to present my research to others in the lighting field, to make a number of useful contacts that I hope can lead to future collaborations, and has given me greater insight into how CIE works and how I can contribute to this work. In particular, it has led to the establishment of a Reportership about Lighting for Cyclists that I shall lead.

The conference paper related to my presentation has been made open access, and I have posted the slides from my presentation to my personal website, for greater exposure and transparency. I plan on writing a post on my website about the conference and will acknowledge CIE-UK in this, for helping support my attendance.

Jim Uttley

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Attendance Report for the 29th Quadrennial Session of the CIE in Washington D.C., USA, June 2019

The goal of attending this conference:

Attending conferences for PhD students is very important. It gives us a chance to communicate with other researchers and to see the broader range of research topics and methods. The CIE is a big and active lighting organization; attending its conferences will expand our knowledge in the lighting industry. For this conference my research was accepted as a poster presentation, which is a chance to explain my study, defend it from criticism, and have a good feedback from lighting researchers.

The three days conference:

The first three days had so many interesting works and clever researchers. I met again some PhD students who had also attended the CIE research methods workshop in Copenhagen, Denmark, Aug 2018. Having previously met them, I was more confident to go and talk with them, asking about their research progress and telling them what is new in mine.

There were four presentations in particular that were interesting to me:

1. First, in the opening session, I really enjoyed the presentation of William Phillips; The Historic Revision of the International System of Units. It was comprehensive and interested, especially the part of the fixed unit of the CIE; the value of a constant luminous efficacy.
2. Second, In D-4 Road Lighting session, I found the presentation of Ronald Gibbons; Evaluating the Lighting Levels, Surround Ratio and Uniformity in an Led Lighted Environment had relevant points to my research such as safe stop analysis and the surround ratio for pedestrian detection. Definitely, I am going to use his research because my research is focusing on evaluating other people, especially in my third experiment when I test the effect of different light levels on hands/face visibility.
3. The third is a workshop/seminar leaded by Kevin Houser; Research Method for Investigating Light Source Colour Rendition. This session was in two hours, but I felt it like a 30 mins. Method's workshop is always interested and useful especially for PhD students. What I really like here is the deep cover from psychosocial procedures to test bias; going through apparatus, investigator, observer, and order. I have two experiments left to be conducted, and I have learned to ask myself at every stage of my experiment; did I influence the results? Another benefit in this workshop, they have shared a document included a checklist for colour perception, and worksheets for variables, biases, and reporting that can help lighting researchers and students to improve their research method.
4. The last interesting presentation was Integrating Research on Safety Perceptions under Parking Lot Illumination presented by John Bullough. My study is not focusing on parking lots, but it concerns about pedestrian safety

and how road light can enhance that. This presentation highlighted some lighting factors that might influence perceptions of safety include; the over light level, spectral disruption, and uniformity of illumination. These factors might play critical roles and appropriate foundations to guide my third experiment.

Poster feedbacks and questions:

The content of my poster was a brief introduction to my first experiment, the results and conclusion. It was my first time presenting my work as a poster, I really liked the one-to-one discussion, (Figure 1). The feedback really helped me to improve for future research, in particular my second experiment which will be an extension of the first. There were many questions about the design of my experiment and the results, but the most useful three were given by the lighting researchers Joanne Wood and Jennifer Veitch:

	Question	Impact for future research
1	In the category rating results of gender; is it matter if I am (the observer) male or female?	It will be in consideration to write it in the future.
2	How did you calculate the conclusion; face is important?	It would be helpful if I put the Dunn-Rankin result in the results table.
3	Have you considered the sound in the experiment?	I did not consider it in the first experiment, but I did in the second one.



Figure 1: Explaining my research to Prof Jo Wood

Division / TC Meetings:

I have attended the CIE Technical Committee Meeting in the last two days. It was my first time attending divisions and TC meetings. It gave me an idea of how my work might fit into the field, and how many do people from different counties communicate and discuss a research matter, as well as how they put a plan for next year.

WHAT ARE YOU LOOKING AT? TESTING NANCY'S RULES FOR PEDESTRIAN INTERACTIONS

Steve FOTIOS, Khalid HAMOODH, Nancy CLANTON
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INTRODUCTION

Our ability to see other people affects our feeling of safety about them (Fig. 1). Variations in lighting design (luminance, SPD etc) affect how well we can see other people. While past work has focused on the face [1,2] it is not yet certain that the face is the critical focus. We tested a set of potential factors.



Fig 1– What features of other people affect our feeling of safety?

Safety factors. We feel safer if ..

- **Gender:** the other person is female.
- **Group size:** the approaching person is engaged in conversation with others.
- **Walking direction:** they are walking away, not towards.
- **Face visibility:** the face of the other person is not obscured, e.g. by wearing a hood or strongly backlit.

METHOD

16 target images, evaluated (n=32) using two procedures

Category rating: how safe would you feel in this situation (1 = very unsafe, 5 = very safe).

Paired comparisons: in which situation do you feel safer?



RESULTS

Table 2 – Average ratings of safety for each image

Image #	Image characteristics					Rating results	
	No. of people	Gender	Walk direction	Light direction	Wearing a hood	Mean	Std dev
1	1	M	Towards	Front-lit	No	3.75	0.94
2	1	M	Towards	Front-lit	Yes	3.28	1.01
3	1	F	Towards	Front-lit	No	4.31	0.73
4	1	F	Towards	Front-lit	Yes	3.91	0.80
5	1	M	Towards	Back-lit	No	3.31	1.16
6	1	M	Towards	Back-lit	Yes	3.09	0.95
7	1	F	Towards	Back-lit	No	3.88	0.78
8	1	F	Towards	Back-lit	Yes	3.34	0.99
9	1	M	Away	Front-lit	No	4.09	0.68
10	1	M	Away	Front-lit	Yes	3.25	0.97
11	1	F	Away	Front-lit	No	4.25	0.66
12	1	F	Away	Front-lit	Yes	3.22	1.02
13	2	M&F	Towards	Front-lit	No	3.72	0.94
14	2	M&F	Towards	Back-lit	No	3.19	0.88
15	2	M&F	Away	Front-lit	No	4.28	0.80
16	2	M&F	Away	Back-lit	No	3.94	0.75

- **Gender:** if we can see gender, we tend to consider females as safer than males.
- **Group size:** single people were considered safer than pairs.
- **Walking direction:** walking away had a greater feeling of safety rather than towards.
- **Light direction:** front-lit targets were considered safer than backlit.
- **Face visibility:** targets not wearing the hood were rated safer than those wearing a hood.

CONCLUSION

The visibility of the face is important: if face visibility is reduced by clothing or lighting then the degree of safety is reduced.

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Report for 29th Quadrennial Session of the CIE

Introduction

The 29th Quadrennial Session of the International Commission on Illumination (CIE), hosted by the United States National Committee of the CIE. The Session, which will be held from June 14 to 22, 2019, in Washington DC, is an important event, which will bring together the international membership of the CIE, as well as other experts and stakeholders in the fields of light and lighting – vision and colour, measurement, lighting applications, photobiology and image technology.

As part of the meeting, a CIE Division general meeting and various technical committee meetings were held. This report has been prepared by Dr Kaida Xiao, from the School of Design at the University of Leeds, UK. The topic will cover the CIE Division 1 meeting, CIE Division 8 general meeting and the TC meeting for CIE TC 1-92.

Attendance

Apart from attending the conference, I also attend CIE Division 8 general meeting as the national representative for Great Britain and vote for various issue during the meeting. I also attended the CIE Division 1 general meeting as the Technical Committee Chair for CIE TC 1-92. As the TC chair, I organised and chaired technical committee meeting for CIE TC 1-92, Skin Colour database. I also attended the Joint Technical Committee meeting of Validity of Chromatic Adaptation, as the TC co-chair for Division 8.

Key activities

1. CIE Division 8 general meeting

During the general D1 meeting, current progress and the next work plan for each technical committee were discussed. Highlights included:

- Po-Chieh Hung (US) started a new term as Division 8 Director
- Division officers are approved (Christine Fernandez-Maloigne (FR) and Dany Rich (US) as Division Secretary and Division Editor respectively)
- TC8-12 Image and Video Compression Assessment ,extension to Oct 2019, approved.
- TC8-14 Specification of Spatio-Chromatic Complexity, one year extension, approved
- TC8-15 Archival Colour Imaging is closed, no report, approved
- R8-14 Office Lighting for Imaging , extend to Oct 2019, approved
- R8-15 A survey on Quality Metrics on Stereoscopic Imaging, one year extension, approved.
- R8-16 Material Adjustment Transforms, one year extension, approved.

A short meeting will be held as part of the 19th Color Imaging Conference to be held in Paris France, 21-25 Oct 2019. The meeting next will be held as part of the 5th CIE Expert Symposium on Colour and Visual Appearance, to be held in Hong Kong, 20-24 April 2020.

2. CIE Division 1 general meeting

During the general D1 meeting, current progress and the next work plan for each technical committee were discussed. Highlights included:

- Youngshin Kwak (KR) started the new term as Division 1 Director
- Two Division Officers are approved (Li-chen Ou and Peter Hanselaer (BE) as Division Secretary and Division Editor respectively)
- Two Associate Directors, Ellen Carter (US) and Nana Itoh (JP) are retired and new associate director to be decided in 2019
- TC 1-76, Unique Hue Data, extension to end of this year, approved
- TC 1-86, Models of colour emotion and harmony, closed, no report given, approved
- TC 1-89, Enhancement of images for colour defective observers, one year extension, approved.
- TC 1-91, Methods for evaluating the colour quality of white-light sources, one year extension, approved.
- TC1-93 Calculation of self-luminous neutral scale has been closed by BA after publishing CIE 228:2018.

The next meeting will be held as part of the 5th CIE Expert Symposium on Colour and Visual Appearance, to be held in Hong Kong, 20-24 April 2020.

3. Technical Committee meeting of CIE TC 1-92 Skin Colour database

As the TC chair, I hosted the sixth TC meeting for TC 1-92, Skin Colour Database in 20th June 2019. A large amount of work has been carried out to collect data for the skin colour database and to investigate the uncertainty of skin colour measurement. In this TC meeting, we review the background of TC and summarize all achievement we have made according to TC term of reference. We decide to prepare TC report and close the TC next year. We also discussed how to best use the skin colour data collected from this TC. Possible further work for different applications were suggested by attendees (including Professor Ronnier Luo for skin colour difference, Prof Yoko Mizokami for human perception in skin colour, Dr Tommy Wei and Dr Sophie Jost for skin colour in lighting application).

What you go out of the event / activity attended

During this event, I attended the CIE Session 2019, the CIE Division 1 and Division 8 general meeting and the TC 1-92 meeting and JTC 16 meeting. I also had many useful discussions with other Division members.

It is my great honour to attend the CIE session 2019 and I thank CIE-UK for their financial support.

Dr Kaida Xiao
16 July 2019
University of Leeds

Report on 2019 CIE meeting in Washington DC

Title of CIE meeting 29th Quadrennial Session, Business and Division Meetings

Venue Washington DC, USA, 14-22 June 2019

Conference 17-19 June

Conference started with an interesting presentation on the new version of the SI Brochure by Nobel Laureate William Phillips from NIST. Constants like the speed of light are now defined exactly, rather than continuing to use separate physical realisations the kilogram or meter. Perhaps surprisingly, CIE's contributions, concerning the new modified definitions of action spectra, were not presented <https://www.bipm.org/utis/common/pdf/si-brochure/SI-Brochure-9-App3-EN.pdf>, definitions developed by myself, Peter Blattner (AT) and Luc Schlangen (NL).

The various symposia on day one included sessions on the measurement and effects of Temporal Light Modulation, Photobiology and presented posters on a range of CIE topics. My co-researcher, Ljiljana Udovičić from [BAuA](#) in Dortmund presented the re-use of dosimetry data we collected from shift working nurses in the UK and Germany to study their blue light hazard weighted exposures (http://files.cie.co.at/x046_2019/x046-OP19.pdf), and compared these to the much higher exposures used in live animal and animal retinal tissue studies. I later presented a poster on the circadian light exposures of the same nurses (http://files.cie.co.at/x046_2019/x046-PP30.pdf). This attracted a great deal of interest from business, designers and researchers interested in non-visual wearable monitoring dosimeters, their performance and accuracy. There will also be a new Division 2 reporter set up to report on non-visual dosimeter performance metrics.

Unfortunately, I was forced to miss the second day of the conference due to worsening flu, but recovered enough for the final day. Luc Schlangen was happy to step in to give my presentation on my behalf at our Workshop on CIE S 026/E:2018. This covered the Toolbox on non-visual effects of light, based on the standard. The third day included symposia on Detector Characterization and Interior Lighting and there was a joint CIE/OSA workshop on New Directions on Colour Science and Technology, which included melanopsin photoreception amongst its four topics.

Division and technical meetings 20-22 June

- The annual Division 6 meeting was held on 20 June and was well attended with at least 11 National Committee Representatives and 15 observers. Luc Schlangen (NL) took over the role of Division 6 Director from John O'Hagan at this Session, with Eric Liggins remaining as Division 6 Editor. I have agreed to remain as Secretary of Division 6 on an annual basis for the time being. There was interest amongst the Division in the Research Forum on Temporal Light Modulation, and on the project presented by Lorna Wen (CN) on investigating the causes of increasing levels of myopia in children in China. Other new activity started this year included a new technical committee and my two reporterships: JTC-14 (CIE-ISO) on Integrative Lighting (below), DR 6-45 on Publication and maintenance of the CIE S026 Toolbox and DR6-46 on the Second International Workshop on Circadian and Neurophysiological Photoreception.
- For the JTC-14 meeting on Integrative Lighting, I attended along with the other representatives from both ISO and CIE (chair John O'Hagan). The meeting was informative, reflecting a broad agreement on how to progress to a completed report.
- At the JTC-04 meeting on the benefits of windows it was agreed that a new Division 3 Technical Committee would be a better way to complete a report, provided D3 could find a new chair. Martine Knoop put forward a paper in press she had written with several co-

authors. It was generally agreed the paper would be a useful starting point, subject to various agreements, but she did not want the TC chair role.

- The “Research Forum” is a new structure in CIE to share information on a topic within CIE without a formal requirement to produce a report. RF-02 on Temporal Light Modulation took place late on 21 June. In this research forum CIE is considering how to investigate and prevent the adverse effects of unsteady light output. The discussion largely related to engineering problems that it was broadly felt cannot be remedied easily by the existing metrics. There was little detailed discussion of the advantages and disadvantages of the various proposed metrics and regulations (the emphasis of my presentation at ILP a week earlier). However, there was a positive initiative to discuss measurement methods and the possibility of an intercomparison study.

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Dated	4 July 2019

Additional questions from CIE UK:

What you got out of the event / activity attended

- Were your aims achieved?

Yes, the conference and meetings provided opportunities for sharing scientific information, building networks for future scientific work relating to the effects of light on health, and administration to supporting expert technical reports and standards on photobiology.

The CIE conference greatly helps towards my overriding aim at Public Health England relating to promoting better health and controlling health hazards through understanding the effects of optical radiation, light and lighting on health and in health treatment.

- What learning did you gain?

From posters, particularly, about a range of experiments and early results being conducted on lighting intervention trials in occupational and laboratory settings relating to performance under spectra with different proportions of melanopic irradiance, CCT or short wavelength light determined using other metrics.

The joint CIE/OSA workshop provided me with an insight into other research departments' ideas about melanopsin photoreception in both visual and non-visual applications. Manuel Spitschan's presentation on “melanopsin in vision” provided an interpretation of the latest results about the dynamic response of the non-visual system to melanopic exposure levels, which I will be able to apply directly.

There were instructive presentations about sensing using pyro-electric technology, and linearity testing techniques from a Division 2 symposium. The latter has previously been considered in relation to my work on performance of dosimeters, so it was helpful to see the practical side of their approach presented.

Jennifer Veitch gave a presentation showing some surprising results on the dependence on frequency and modulation depth of the stroboscopic effect visibility, noting that further testing would be needed to validate the findings and that it demonstrated the tight control over conditions needed to test stroboscopic effect visibility. She compared it to other findings on human sensory perception where under the right conditions noise increases detectability.

- Overall evaluation of event

Outside of the workshops, the interest in circadian rhythms (CR) within CIE is steadily growing. Ideally, I would like to see more of the Division 6 symposium presentations relating to CR health, light exposure & its analysis and/or daylighting – and it could afford to include somewhat less about the concerns relating to LEDs and blue-light-hazard (BLH), much of which is already well understood. Hopefully, CIE's position statement in April on the BLH will be reflected in future events.

The event was very well run by the local committee. CIE is an excellent forum for these discussions, as the other Divisions' expertise overlap with CR and photobiology a great deal, and CIE's growing interest in temporal light modulation adds considerably to the relevance to health of these conferences.

Funding awarded to: Steve Fotios

Event: 29th Session of the CIE,
Washington DC, 14-22nd June 2019.

My contributions to this event were:

- Attend the general assembly on Sunday 16th June.
- Session chairman (PA9-2 D4 - Visibility and Visual Performance in Road Lighting, Wednesday afternoon)
- Present five technical papers (one oral presentation, three poster presentations in association with PhD students, a further oral presentation given by a colleague).
- Attend the technical committee sessions as Associate Director of Division 4, chair of TC4-52, and member of TCs 4-51, 4-33, 4-50, JTC-01 and the Cycling reporter.

The five papers were:

- Fotios S. Which metrics are needed to specify good lighting for pedestrians? 29th Session of the CIE. 14-22 June 2019. Washington DC, USA. Vol 1, Part 1: 62-67.
- Fotios S, Uttley J, Bohm A, Qasem H. The influence of road lighting on cyclist numbers and safety. 29th Session of the CIE. 14-22 June 2019. Washington DC, USA. Vol 1, Part 1: 68-76.
- Fotios S, Hamoodh K, Clanton N. What are you looking at? Testing Nancy's rules for pedestrian interactions. 29th Session of the CIE. 14-22 June 2019. Washington DC, USA. Vol 1, Part 2: 1669-1674.
- Fotios S, Liachenko Monteiro A. Uniformity predicts pedestrian reassurance better than average illuminance. 29th Session of the CIE. 14-22 June 2019. Washington DC, USA. Vol 1, Part 2: 1746-1752.
- Fotios S, Mao Y, Yao Q. Hazard detection: testing the caveats of previous studies. 29th Session of the CIE. 14-22 June 2019. Washington DC, USA. Vol 1, Part 2: 1768-1773.

There were three days of conference, largely with three parallel sessions. Four sessions were devoted to outdoor lighting issues.

The aim of the papers I presented was to raise awareness of research of lighting for active travel (walking and cycling) carried out at Sheffield University, which is the basis of TC4-52 and the new D4 reporter on Lighting for Cycling which was established at the Session.

Two papers presented by others were of specific significance because they largely confirmed the findings of work carried out at Sheffield:

- OP60: John Bullough. Integrating Research On Safety Perceptions Under Parking Lot Illumination

- OP83: Maurice Donners. Illumination Requirements For Gaze Perception

One notable event was the workshop session on *Research Method For Investigating Light Source Colour Rendition* led by Minchen Wei, Michael Royer and Kevin Houser (WS1, Monday afternoon). This followed from the 2018 CIE Expert Tutorial and Workshop on Research Methods for Human Factors in Lighting (Aalborg University, Copenhagen, Denmark. 12-14 August 2018), of which I was a co-organiser, with the aim being to promote better research methods in a specific area of study.

For the first time, papers included in the CIE conference proceedings are available open access to the public, i.e. they can be downloaded for free.

Regarding the TCs of which I am a member:

- TC4-52 Lighting for pedestrians. The committee draft was submitted shortly before the conference, and is now waiting for approval.
- TC4-33 Discomfort Glare. The near-final report was discussed, and should be submitted by September 2019.
- TC4-41: Optimisation of road lighting. This is still ongoing, partly due to a change in TC chair.
- JTC-01: It was agreed that the report supports the previous proposal of TN-07, and can therefore be published as a TR to confirm that TN.

Outcomes

- *Was the conference aim achieved?*

Yes: it gathered over 400 international people concerned with light and lighting and led towards improved understanding of how lighting can and should be used.

- *Where your aims achieved?*

Yes. (1) It prompted discussion about lighting for active travel. (2) Thanks to CIE-UK support I was able to take three PhD students, and conference attendance is a valuable part of their learning.

Report on the CIE 29th Quadrennial Session, Washington DC, 14 to 22 June 2019

During the Session I concentrated on the work of JTC1, roadlighting and horticulture lighting as these topics form the basis of my responsibilities within CIE and my current research. This is reflected in the contents of this report.

Technical conference

Monday 17 June

After opening ceremony and plenary lecture I attended the D4 session on roadlighting, the D6 session on photobiology, the D4/D6 presented posters session and poster session 1.

Tuesday 18 June

After a most informative plenary lecture titled 'Non-image forming effects of light and lighting: new insights and metrics' I attended the D1 session on colour in applications, the D4 workshop - 'In search of a new approach to the maintenance factor', part of the D3 session on glare and the D6 workshops on the use and application of the new CIS S 026:2018 metrology for ipRGC-influenced responses to light and horticultural lighting and finally poster session 2.

Horticulture lighting workshop

Bruce Bugbee (University of Utah via WebEx) presented a summary of the importance of radiation 700 to 800 nm for photosynthesis. This was termed 'The forgotten photons' and arose from the widely used curve for photosynthetic active radiation (PAR) which is restricted to 400 to 700 nm. This range is based on the often quoted but widely mis-used papers of McCree in the early 1970s. Bugbee's recent research has confirmed the role of far-red radiation in determining plant shape. His work has also shown that plant leaves have significant transmission above 700 nm and hence he is of the opinion that filtered light is a better measure of light quality for plants than the light falling on the leaves.

Tessa Pocock (Plenty) emphasised that plants have 5 families of photoreceptors covering the far-red to UV-B and these can be regarded as switches to trigger responses in the plant. She illustrated her talk with a study of 3 cultivars grown under identical conditions except for the lighting. Large differences in plant growth and morphology resulted. She introduced the use of Principal Correlation Analysis (PCA) to determine which wavelength ranges were responsible for particular responses in the plant. For example the anthocyanin content of red lettuce was found to be strongly influenced by the intensity of 570 to 640 nm portion of the spectrum.

The presentation by Damon Bosetti (DesignLights Consortium) was essentially a promotional exercise and although of much interest to me from the commercial aspect was, in my opinion, far outside of the usual remit of the CIE. However, the presentation did highlight some important commercial points: photosynthetic photon flux (PPF) is regarded as the key measure for greenhouse lighting in North America with the 1000 W DE HPS system regarded as the baseline.

Wednesday 19 June

After a highly stimulating plenary lecture covering recent research into the interaction of architecture, energy engineering, microbiology and daylight I attended the D4 session on urban lighting, the D3 session on interior lighting, the D4 session on visibility & visual performance in roadlighting and the D3 workshop titled 'Towards an integrated discomfort glare measure based on the human visual system'.

Divisional & Technical Committee meetings

Thursday 20 June - D4 meeting

This was a long, wide ranging meeting but did cover all of the agenda items in one session.

JTC1 - Implementation of CIE 191 Mesopic Photometry in Outdoor Lighting

The meeting was attended by 20 members & observers. The committee's objective is to complete the draft of the technical report for members' voting by the end of 2019. None of the research reviewed during the work of the committee has proved to be in conflict with the interim guidance given in Technical Note 007. The

committee have started discussions with Peter Zwick about the best way to revise Technical Note 007 and remove the ambiguity of the term 'interim guidance'.

Completion of the draft document will depend on the committee co-chairmen and secretary. Committee voting will bring the usual challenge of determining the list of those who have voting rights. For example, some committee members have moved their place of work but have not informed the committee secretary nor the chairman nor CIE CB and have also not resigned their membership.

The session was plagued by IT problems which precluded one committee member from being able to participate. The onsite technicians offered little support.

Lighting for cyclists

A highly informative session led by Jim Uttley (University of Sheffield) which I am sure will be covered in detail by other members of CIE-UK present.

JTC - Lighting education

The proposed target is to review and revise CIE 99-1992. However, the target audience for the report was unclear. There was a general feeling that using the same format as the 1992 report would be inappropriate as it would always be out of date and internet based source would always be more reliable. The meeting did feel that a useful contribution might be guidance for course content at all levels, e.g. HNC/HND or equivalent; undergraduate; postgraduate; professional body qualifications. Providing guidance for continuing lighting education throughout the professional career was also seen as a major benefit. Minutes of the meeting have been issued and the next meeting is expected to be held by WebEx in October 2019.

Conclusions

The CIE 29th Quadrennial Session had lots of interesting content together with stimulating plenary lectures. From the papers and posters presented it is clear there is still much interest in streetlighting & roadlighting and a growing appreciation of the need to design outdoor lighting to meet the needs of cyclists & pedestrians. The nature of human centric lighting is being supported by growing body of quantitative data from research conducted over recent years. Key topics included: glare; maintenance factors; horticulture lighting. The move to open source conference proceedings is to be applauded.

This was a well organised meeting in an excellent location (although expensive). The venue was easy to reach from airport. The LOC, together with researchers from Virginia Tech, offered a warm welcome and good support for participants.

The disappointing aspects of the meeting included: poor support from the conference IT contractors; many presenters had slides with too much information, hence small font size thus making them extremely difficult to read.

I greatly appreciate the financial support from CIE-UK, without this I could not have attended the CIE 29th Session and I would not have benefitted from such a stimulating, highly informative and immensely enjoyable event.

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Date: 11 Jul 2019