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Riga 2019 Symposium



The 25th Symposium of the ICVS was held in Riga, Latvia, 5-9 July 2019. Riga is the largest metropolis in the Baltics. It perfectly blends timeless tradition and cutting edge cool. In its 800 years of turbulent history, everyone from German knights to Swedish kings and Soviet commissars have left their footprints, and today Latvia's capital is at the crossroads of eastern and northern Europe. Central Riga is included in the UNESCO World Cultural and Natural Heritage list.

158 registrants from 19 countries participated. 116 papers (57 oral and 59 posters) were presented in a state-of-the-art venue at the University of Latvia. Meeting abstracts may be downloaded at: https://www.icvs2019.lu.lv/fileadmin/user_upload/lu_portal/projekti/icvs2019/daz/ICVS2019_ABOOK_web17.pdf

The meeting included a rich social program for participants to explore historical and cultural aspects of architecture, life style and history of Latvia's capital and the northeastern part of Latvia along the Vidzeme Region. This included the Woodcraft Museum where it was possible to get to know the nuances of how log-boats were made from the Stone Age until today.

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In the second part of the excursion we visited a Secret Nuclear Bunker placed under the rehabilitation hospital in the picturesque valley of Gauja river. Some original alcoholic drinks and snacks of the historic time were offered. After the excursion we had a banquet at the restaurant Santa Villa near the town of Cesis in the Vidzeme Region. This venue is surrounded by pine forests in an area of historical villas built by nobles for recreational purposes. The place is well beloved by Latvian poets and musicians. The Society is grateful to the local organizing committee, including *Sergejs Fomins (Chair)*, *Maris Ozolinsh*, *Evita Kassaliete*, *Ilze Ceple*, *Zane Jansone*, *Renars Trukša* and *Andris Šternbergs*.

The Society was able to support 27 students by subsidising half their registration fees and by providing merit awards to the two participants giving the best poster and oral presentations. Four additional travel grants were generously provided by the Patmalnieks Family. They were awarded to Paria Mehrani, Taishi Masumitsu, Sara Patterson and Tama Kanematsu.

The award winners for **Best Student Poster** were: 1st prize (£200), Anke Albers, and runners-up (£100 each), Kara Emery and Taiga Mikami. The award winners for **Best Student Oral Presentation** were: 1st prize (£200), Takuma Morimoto, and runners-up (£100 each) to Alice Skelton and Ruben Pastilha. Funding for student awards was provided by the Optical Society of America and the Colour Group of Great Britain. As both top prizes went to travel awardees, Anke and Takuma received merit awards from the society of £200 each.

The judges for the student awards are gratefully acknowledged: *Marina Danilova*, *Claudia Feitosa-Santana*, *David Foster*, *Anya Hurlbert*, *Galina Paramei* and *Keizo Shinomori*.

2019 Verriest Medal

The International Colour Vision Society bestowed its highest award to Professor Michael Webster at the 25th Biennial Symposium held at the University of Latvia in July 2019. This award was established in 1991 in memory of Guy Verriest (University of Ghent, Belgium), the first General Secretary of the Society, known then as the International Research Group on Colour Vision Deficiency. The Society has since expanded its purview and now honours outstanding contributions in any area of colour vision research.

Professor Webster's interest in colour vision is rooted in his undergraduate work at the University of California, San Diego. He went on to a Ph.D. in Psychology at the University of California, Berkeley and then was a postdoctoral research fellow at the University of Cambridge, UK. In 1994 he joined the faculty at the University of Nevada, Reno, where he rapidly rose to a Foundation Professorship in the Department of Psychology with affiliations to graduate programs in Cognitive & Brain Sciences and Integrative Neuroscience, which he helped found and co-directs. He is a fellow of the Optical Society of America.



His research on colour vision includes a stream of influential papers over the past 30 years. Two themes recur over the decades, adaptation and individual differences. His novel adaptation designs have advanced our understanding of the multiple pathways that mediate colour perception, including colour constancy and changes across the life span. The comprehensive breadth of his work on individual differences encompasses colour matching, unique hues and colour naming. He has also made exceptional contributions to his peers and the field by serving on NSF and NIH grant review panels, as an editor of *Vision Research*, as the color vision editor for the *Journal of the Optical Society of America A*, and as chair of the Color Technical Group of the Optical Society of America. He recently was elected to the board of directors of both the Vision Sciences Society and ICVS, reflecting the high regard of his colleagues. We thank the selection committee that included *Steve Shevell* (chair), *Rigmor Baraas*, *David Foster*, *John Mollon* (as ICVS president), *Keizo Shinomori*, *Hannah Smithson* and *Françoise Viénot*.

Members of Honour

Honorary members are elected by the ICVS in recognition of longstanding contributions to colour science and the Society. At the 2019 ICVS Symposium in Riga, Professors Françoise Viénot and Kenneth Knoblauch were nominated as honorary members by the board and voted unanimously by the membership for their long service to the Society. Professor Viénot is a former board member and Verriest Medalist. Professor Knoblauch has served on the board as General Secretary, has edited an ICVS Proceedings volume, and has chaired the Verriest Medal Committee. He was the organizer of the 2005 ICVS meeting held in Lyon. The complete list of Honorary Members follows:

1975	Louise L. Sloan* W. David Wright*	1997	Yasuo Ohta* Jean-Louis Vola*	2009	Stephen Dain John Mollon
1977	Ingeborg Schmidt*	2002	Carl Richard Cavonius*	2011	Joel Pokorny
1979	W.S. Stiles*	2003	Jennifer Birch Jack Moreland André Roth	2013	Barry Lee
1987	Romuald Lakowski*	2005	Janus Kulikowski Vivianne Smith	2017	Steve Buck Steve Shevell
1989	Manfred Richter* Jeanne Verriest*	2007	Gerald Jacobs Philippe Lanthony*	2019	Kenneth Knoblauch Françoise Viénot
1991	Wolfgang Jaeger* Marion Marré*				*Deceased

ICVS Summer School

In August 2018, the second ICVS summer school took place at Pembroke College, Oxford. Organised by Sérgio Nascimento, Hannah Smithson, Manuel Spitschan and Neil Parry, the school hosted 38 students from 18 countries along with 16 teachers. Comprising formal lectures, informal get-togethers and student-directed practical sessions, the week-long school provided many opportunities for students to meet their peers and leading scientists from around the world, and it is hoped that many of these connections will persist throughout their careers. The school was sponsored by Shamir Portugal, The OSA Color Technical Group, The Colour Group (GB) and ICVS, enabling the provision of grant support to 9 students. Of course the school could not have gone ahead without the dedication of all 16 teachers: *Jenny Bosten, David Brainard, David Foster, Karl Gegenfurtner, Anya Hurlbert, Hidehiko Komatsu, Barry Lee, João Linhares, John Mollon, Sérgio Nascimento, Neil Parry, Steven Shevell, Hannah Smithson, Manuel Spitschan, Andrew Stockman* and *John Werner*. This was the second school that Sérgio Nascimento organised, and he is now stepping down from this role. That we have a Summer School at all is entirely down to Sérgio, who originally proposed it at the Sendai meeting, with Hannah generously offering to play host.

With the Summer School fast becoming a regular fixture in the ICVS calendar, plugging the gap between the 2-yearly symposia, it was once again scheduled to take place at Pembroke College in August 2020. David Brainard has taken over the reins from Sergio, whilst Hannah Smithson, Manuel Spitschan and Neil Parry remain as organisers. 43 students applied from 15 countries. Sadly, plans looked like they would be scuppered by Covid-19. The committee held back as long as they could but at the end of May decided that a live event would not be possible this year. There are many practical reasons why the beginning of August is chosen for the summer school, prime among them being that Pembroke College is able to subsidise the costs of accommodation and meals at the school during this week. The school runs in parallel with Pembroke's Access Week, the culmination of year-long science and humanities courses for high-school students. This keeps the overheads relatively low. This year the plans include working with the ICVS students to deliver some 'public communication of science' activities with the access students. At the time of going to press, it seems that the next in-person Summer School will not take place until 2022. However, plans are afoot to lay on a virtual summer school. Whilst this will not replace the tremendous collegiate atmosphere that has characterised the last two schools, it will at least give the opportunity for some training in colour science and most importantly for interaction between students, and between students and faculty. It will be a closed event, provided free for all the students who applied. The details are being finalised, but the essential components will be on-line live or recorded lectures by the faculty, live Q and A sessions, and networking opportunities.



The students and faculty of the 2018 Summer School. To see a gallery of photos, click on the Summer School menu option on the ICVS website (www.icvs.info).

JOSA A Feature Issue on Color Vision

The *JOSA A* feature issue on colour vision was published online and in print. It contained peer-reviewed papers, many of which were originally presented at the Symposium of the ICVS held in Riga, Latvia, July 5-9, 2019. There were 31 published papers from 51 submissions. The editorial board included: *John S. Werner* (University of California, Davis), *Jenny Bosten* (University of Sussex), *David H. Brainard* (University of Pennsylvania), *Marina Danilova* (Pavlov Institute of Physiology, St. Petersburg), *Sergejs Fromins* (University of Latvia), *Anya Hurlbert* (Newcastle University) and *Neil Parry* (University of Manchester). The editors are grateful to the contributors and referees who have made this issue possible in a timely manner, and to Scott Carney, Editor-in-Chief, and the efficient OSA staff for their untiring support.

[Color Vision 2020: Introduction by the feature editors](#)

John S. Werner, Jenny Bosten, David H. Brainard, Marina Danilova, Sergejs Fomins, Anya Hurlbert, and Neil Parry
J. Opt. Soc. Am. A **37**(4), CV1-CV2 (2020)

The Verriest Medal Lecture

[The Verriest Lecture: Adventures in blue and yellow](#)

Michael A. Webster
J. Opt. Soc. Am. A **37**(4), V1-V14 (2020)

Color Detection and Discrimination

[Effect of cone spectral topography on chromatic detection sensitivity](#)

Alexandra Neitz, Xiaoyun Jiang, James A. Kuchenbecker, Niklas Domdei, Wolf Harmening, Hongyi Yan, Jihyun Yeonan-Kim, Sara S. Patterson, Maureen Neitz, Jay Neitz, Daniel R. Coates, and Ramkumar Sabesan
J. Opt. Soc. Am. A **37**(4), A244-A254 (2020)

[Anomalous pupillary responses to M-cone onsets are linked to L:M ratio](#)

Neil R. A. Parry, Elena Rodrigo-Diaz, and Ian J. Murray
J. Opt. Soc. Am. A **37**(4), A163-A169 (2020)

[Discrimination of hue angle and discrimination of colorimetric purity assessed with a common metric](#)

M. V. Danilova and J. D. Mollon
J. Opt. Soc. Am. A **37**(4), A226-A236 (2020)

[Chromatic discriminations along two cardinal axes share a common attentional resource](#)

Xiaohua Zhuang and Dingcai Cao
J. Opt. Soc. Am. A **37**(4), A55-A60 (2020)

[Predicting color matches from luminance matches](#)

Kassandra R. Lee, Alex J. Richardson, Eric Walowitz, Michael A. Crognale, and Michael A. Webster
J. Opt. Soc. Am. A **37**(4), A35-A43 (2020)

Color Vision Deficiency, Diagnosis, and Clinical Applications

[Tritan color vision deficiency may be associated with an OPN1SW splicing defect and haploinsufficiency](#)

Maureen Neitz, Elise D. Krekling, Lene A. Hagen, Hilde R. Pedersen, Jessica Rowlan, Rachel Barborek, Jay Neitz, Adam Crain, and Rigmor C. Baraas
J. Opt. Soc. Am. A **37**(4), A26-A34 (2020)

[Suprathreshold contrast response in normal and anomalous trichromats](#)

Kenneth Knoblauch, Brennan Marsh-Armstrong, and John S. Werner
J. Opt. Soc. Am. A **37**(4), A133-A144 (2020)

[Visual acuity and color discrimination in patients with cataracts](#)

Z. Langina-Jansone, R. Truksa, and M. Ozolinsh
J. Opt. Soc. Am. A **37**(4), A212-A216 (2020)

[Color discrimination assessment in patients with hypothyroidism using the Farnsworth–Munsell 100 hue test](#)

Kalina Racheva, Tsvetalin Totev, Emil Natchev, Nadejda Bocheva, Raymond Beirne, and Margarita Zlatkova
J. Opt. Soc. Am. A **37**(4), A18-A25 (2020)

[Visual losses in early-onset and late-onset Parkinson's disease](#)

Claudia Feitosa-Santana, Marcelo Fernandes Costa, Henrique Ballalai Ferraz, Luiz Augusto F. Andrade, Ana Laura Moura, Edson Amaro, Russell D. Hamer, and Dora Fix Ventura
J. Opt. Soc. Am. A **37**(5), A285-A293 (2020)

[Cambridge Colour Test: reproducibility in normal trichromats](#)

T. P. Fernandes, N. A. Santos, and G. V. Paramei
J. Opt. Soc. Am. A **37**(4), A70-A80 (2020)

[Lighting for color vision examination in the era of LEDs: the FM100Hue Test](#)

Stephen J. Dain, David A. Atchison, Jeffery K. Hovis, and Mei-Ying Boon
J. Opt. Soc. Am. A **37**(4), A122-A132 (2020)

[Predicting the Farnsworth–Munsell D15 and Holmes–Wright-A lantern outcomes with computer-based color vision tests](#)

Ali Almustanyir, Jeffery Hovis, and Mackenzie G. Glaholt
J. Opt. Soc. Am. A **37**(4), A1-A10 (2020)

Brightness and Interactions with Color Perception

[On a lightness phenomenon](#)

Baingio Pinna
J. Opt. Soc. Am. A **37**(4), A11-A17 (2020)

[Rhodopsin and melanopsin contributions to human brightness estimation](#)

Andrew J. Zele, Ashim Dey, Prakash Adhikari, and Beatrix Feigl
Opt. Soc. Am. A **37**(4), A145-A153 (2020)

[Relative contributions of melanopsin to brightness discrimination when hue and luminance also vary](#)

Tanner DeLawyer, Sei-ichi Tsujimura, and Keizo Shinomori
J. Opt. Soc. Am. A **37**(4), A81-A88 (2020)

[Color and brightness constancies depend reciprocally on saturation](#)

Adam Reeves and Kinjiro Amano
J. Opt. Soc. Am. A **37**(4), A237-A243 (2020)

[Influence of naturalness of chroma and lightness contrast modulation on colorfulness adaptation in natural images](#)

Taishi Masumitsu and Yoko Mizokami
J. Opt. Soc. Am. A **37**(5), A294-A304 (2020)

[Helix rotation: luminance contrast controls the shift from two-dimensional to three-dimensional perception](#)

Arthur G. Shapiro and Anthony LoPrete
J. Opt. Soc. Am. A **37**(4), A262-A270 (2020) [Suppl. Mat. (1)]

Color Appearance, Feature Integration, and Cognitive Processes

Color variance and achromatic settings

Siddhart S. Rajendran and Michael A. Webster
J. Opt. Soc. Am. A 37(4), A89-A96 (2020)

Comparison of two methods of hue scaling

Courtney N. Matera, Kara J. Emery, Vicki J. Volbrecht, Kavita Vemuri, Paul Kay, and Michael A. Webster
J. Opt. Soc. Am. A 37(4), A44-A54 (2020)

When does “bright” mean “prototypical”? Color-term modifiers in eight European languages, examined with color-survey data

Mari Uusküla and David L. Bimler
J. Opt. Soc. Am. A 37(5), A305-A312 (2020)

Bidirectional relationships between semantic words and hues in color vision normal and deuteranopic observers

Keizo Shinomori, Honami Komatsu, and Ippei Negishi
J. Opt. Soc. Am. A 37(4), A181-A201 (2020)

Skin-color perception of morphed face images

Hyejin Han and Keiji Uchikawa
J. Opt. Soc. Am. A 37(4), A217-A225 (2020)

The effect of tissue paper on the color appearance of colored papers

Mitsuo Ikeda and Chanprapha Phuangsuan
J. Opt. Soc. Am. A 37(4), A114-A121 (2020)

Does feature integration affect resolution of multiple simultaneous forms of ambiguity?

Ryan Lange and Steven K. Shevell
J. Opt. Soc. Am. A 37(4), A105-A113 (2020)

Hue selectivity of collinear facilitation

Tomoharu Sato, Takehiro Nagai, and Ichiro Kuriki
J. Opt. Soc. Am. A 37(4), A154-A162 (2020)

Grouping ambiguous neural representations: neither identical chromaticity (the stimulus) nor color (the percept) is necessary

Emily Slezak and Steven K. Shevell
J. Opt. Soc. Am. A 37(4), A97-A104 (2020)

Seeing fruit on trees: enhanced perceptual dissimilarity from multiple ambiguous neural representations

Jaelyn R. Peiso and Steven K. Shevell
J. Opt. Soc. Am. A 37(4), A255-A261 (2020)

Color Reproduction and Lighting in Art and Science

How to make a #theDress

Christoph Witzel and Matteo Toscani
J. Opt. Soc. Am. A 37(4), A202-A211 (2020)

Color quality evaluation of Chinese bronzeware in typical museum lighting

Zheng Huang, Qiang Liu, Michael R. Pointer, Wei Chen, Ying Liu, and Yu Wang
J. Opt. Soc. Am. A 37(4), A170-A180 (2020)

Demonstrating a multi-primary high dynamic range display system for vision experiments

Allie C. Hexley, Ali Özgür Yöntem, Manuel Spitschan, Hannah E. Smithson, and Rafal Mantiuk
J. Opt. Soc. Am. A 37(4), A271-A284 (2020) [Suppl. Mat. (2)]

Observer metamerism in commercial displays

Hao Xie, Susan P. Farnand, and Michael J. Murdoch
J. Opt. Soc. Am. A 37(4), A61-A69 (2020)

Webinars on Colour Organized by the OSA Technical Group

Starting in December 2019, the OSA Color Technical Group has been developing a program of one-hour webinars focused on all aspects of colour. These webinars have been well attended, are accessible to a wide audience, and focus on current developments in colour. Four upcoming webinars have been scheduled for the remainder of 2020. The dates, title, speaker and registration link follow:

8 July 2020

"Data blitz" webinar on new findings in color perception and its mechanisms. Various invited speakers.

https://osa.zoom.us/webinar/register/WN_Mma126vcTQ6zXlOb0yGW0A

21 July 2020

Modeling the Initial Steps of Human Vision. Prof. Brian Wandell (Stanford University) & Prof. David Brainard (University of Pennsylvania)

https://osa.zoom.us/webinar/register/WN_JvUSu4jWSImQ_PXbhywzlw

22 September 2020

TBC

Prof. Roland Fleming (Giessen University)

November 2020

Advances in characterizing color rendition of light sources

Prof. Kevin Houser (Oregon State University and PNNL) and Dr. Michael Royer (PNNL)

TBC

To keep up to date with the webinars and other OSA Color Technical Group events, please visit [https://www.osa.org/en-us/get_involved/technical_groups/vc/color_\(vc\)/](https://www.osa.org/en-us/get_involved/technical_groups/vc/color_(vc)/)

Past Webinars Available to Watch on Demand

Seeing Color Through Different Eyes - Individual Differences in Human Color Perception

Prof. Michael Webster (University of Nevada Reno)

https://www.osa.org/en-us/meetings/webinar/2020/seeing_color_through_different_eyes_-_individual_d/

"Blue" Light and Its Effect on Circadian Rhythms, Sleep, Alertness and Cognition

Prof. Christian Cajochen (University of Basel)

https://www.osa.org/en-us/meetings/webinar/2020/blue_light_and_its_effect_on_circadian_rhythms_sle/

Genetics of Normal and Defective Color Vision

Prof. Maureen Neitz (University of Washington)

https://www.osa.org/en-us/meetings/webinar/2020/genetics_of_normal_and_defective_color_vision/

The Blue Light Hazard - What Does it Really Mean?

Prof. John O'Hagan (Public Health England).

https://www.osa.org/en-us/meetings/webinar/2019/the_blue_light_hazard_-_what_does_it_really_mean/

For any suggestions, comments or questions, please write to Chair Dr. Manuel Spitschan (manuel.spitschan@psy.ox.ac.uk) or Chair-Elect (from 2021) Dr. Francisco Imai (fimai@apple.com).

Colour Vision at V-VSS, June 2020

Vision Science Society's annual meeting went online this year with an ambitiously organised virtual conference including a mixture of live speaker sessions, pre-recorded content and ample opportunity for interaction. As always there was a range of work presented featuring colour, with a few themes emerging.

On methods, **Alex Richardson** from Michael Webster's lab presented a poster titled "How to find a tritan line, without actually trying," where he demonstrated, using a modelling approach, that it is possible to characterise both individual differences in the tritan line and individual differences in luminance based on heterochromatic flicker measurements typically taken by experimenters to produce isoluminant coloured stimuli - individual differences in the S-cone axis could be accounted for without requiring additional measurements. **Andrew Silva** at the University of Waterloo showed in work that is currently in press at *PNAS*, that humans can discriminate the polarisation of light if polarisation and phase are coupled in a beam of structured light with orbital angular momentum, so that different polarisations appear at different spatial positions. The macular pigment, as a radial filter, causes the entoptic phenomenon of Haidinger's brushes when polarised light passes through. The work opens the possibility of using the phenomenon to measure the macular pigment and to monitor macular degeneration.

In two posters, one by **Erin Goddard** in Kathy Mullen's lab and one by **Jasper Hajonides** at Mark Stokes' lab, classifier performance and RSA were used to reconstruct cortical colour representation using MEG and EEG, respectively. Hajonides showed that a plausible circular 'colour space' could be reconstructed using multidimensional scaling applied dissimilarity matrices constructed from classifier performance on the spatial pattern of EEG across electrodes. Goddard looked for evidence of evolution of colour representation by applying RSA and MDS to the decoding ability of classifiers at different time points along the MEG signal. Although they found that hue can be decoded throughout the stimulus-induced response, there was no evidence for an evolution towards a colour category model at later time points.

The use of virtual reality in colour research is an emerging theme: **Raquel Gill Rodriguez** from Karl Gegenfurtner's lab presented work where OLED head mounted displays were successfully colour calibrated to demonstrate high levels of colour constancy in virtual scenes that contain detailed cues to illumination comparable to those present in real physical scenes. **Michael Cohen**, presenting work done in Caroline Robertson's lab published recently in *PNAS*, used virtual reality to explore the limits of colour awareness in active vision. He showed that, surprisingly, when colour is strongly desaturated in the periphery in a gaze contingent virtual reality display, people routinely fail to notice its absence even when 97% of the visual field is achromatic. People fail to detect the absence of colour beyond about 40 degrees even when prompted.

Further presentations of interest to readers of *Daltoniana* included **Ling-Qi Zhang's** talk on Bayesian image reconstruction from retinal cone signals which modelled the effect on reconstruction of differences in the relative numbers of the three cone types. He concluded a low optimal number of S-cones similar to that known to exist in the retina, while the L:M ratio can vary substantially without sacrificing the fidelity of image reconstruction. **Delwin Lindsey** presented a poster on unique yellow and other special hues in anomalous trichromacy, concluding that postreceptoral compensation may explain why hue selections in anomalous trichromacy are closer to normal than may be expected. **Christopher Shooner** and **Kathy Mullen** presented comprehensive work investigating the effect of luminance pedestals on reducing detection thresholds for L/(L+M) increments and decrements, presenting a computational model to account for how signals are combined in the cortex.

Jenny Bosten

Obituary for Viktor Govardovskii (1939 - 2020)



We record with sadness the death on June 26, 2020, of Viktor Govardovskii, who was prominent in the field of comparative colour vision. He was taken to hospital on June 12 with symptoms of COVID-19. Yet as late as May 21, for the benefit of colleagues during the lockdown, he had given an online lecture, 'How we see photons' (in Russian; <https://drive.google.com/drive/folders/12d9ryC2-8qCt2ozlKrdggusZ1Wl4o2lw>). It is planned to publish the English text of the lecture in the *Russian Journal of Physiology*.

Graduating from the Leningrad Electrotechnical Institute in 1962, Viktor Govardovskii joined the Sechenov Institute of Evolutionary Physiology, initially as an engineer. The Sechenov Institute remained his base throughout his life, but his shrewd understanding of phototransduction, his fluent English and his convivial manner led to several productive collaborations with sensory physiologists in the west

– for example, with Tom Reuter and Kristian Donner in Helsinki, with Jim Bowmaker and David Hunt in London, and with Ellis Loew at Cornell.

The Anglo-Russian collaboration gave rise to what became a classic paper in ecological vision, a study of the Cottoid fish of Lake Baikal, the world's deepest fresh-water lake (Bowmaker *et al*, 1994, *Vision Research*, 34, 591). With increases in the depth at which a given species lived, both rod and cone pigments shifted systematically to shorter wavelengths. In the case of rods, the data favoured Govardovskii's explanation in terms of the lower noise levels of short-wavelength pigments – rather than an explanation in terms of the spectral composition of the residual light; but it remains mysterious why sparse short-wave *cones* exist at all in fishes from the gloomiest depths of Lake Baikal.

Govardovskii's most cited paper (*Visual Neuroscience*, 2000, 17, 509) – it is also the second most cited paper ever published in *Visual Neuroscience* – was based on microspectrophotometric measurements carried out in Helsinki and St Petersburg. The authors confirmed the original hypothesis of Dartnall that a single template describes all A1 photopigments (a second template similarly describes A2 pigments). Their modification of Lamb's template has been very widely used in modern modelling of how diverse visual systems respond to diverse biological signals.

In a very recent paper (*J. Compar. Physiology A*, 2020, 206, 71), written with colleagues from the Sechenov Institute and based on specimens caught in the local Neva during their upstream migration, Gavordovskii returns to one of the most celebrated questions of visual evolution, that of whether the shorter-wave receptors of the lamprey are rods or cones. Although morphologically these receptors resemble cones, suction recordings from individual receptors showed the high sensitivity and the saturation characteristic of rods. The paper disarmingly concludes: 'So are the short photoreceptors of lampreys "real" rods? We do not dare to answer the question.'

Marina Danilova, John Mollon

Obituary for Robert Fletcher (1925 - 2019)

A founding member of IRGCVD/ICVS, Robert (Bob) Fletcher, passed on 5 August of last year, after a career in optometry and colour science spanning 70 years. After qualifying as an optometrist, he received a Masters degree from Manchester University in ophthalmic optics. Fletcher's teaching and research began with his affiliation with The Northampton College of Advanced Technology in London which became City University. There, he became the first Professor of Optometry outside the US, and served as head of department for more than 20 years.

Fletcher was an enthusiastic member of The Colour Group (GB) for many years and served as Chairman (1987-9). He maintained strong professional friendships with many early members of IRGCVD including W. David Wright, Keith Ruddock, Guy Verriest, Marion Marré, Lucia Ronchi and Hans Kalmus.

Fletcher had many interests in the human eye and its function, principally mechanisms of accommodation, industrial vision and contact lenses. He is best known amongst our Society for his development of three editions of the City University colour vision test, marketed by Keeler UK. In the early 1970's he developed the CAM (Civilian, Aviation, Maritime) lantern. This was produced in response to a competition run by the British College of Optometrists to design the replacement for the Board of Trade Lantern and the Wright Holmes lantern. These colour vision tests continue to be used today.

He wrote more than 16 textbooks and 150 papers, including eleven papers in the Proceedings of the IRGCVD. One textbook, published in 1985 is a 600-page volume written with his daughter, Janet Voke, on *Defective Colour Vision Fundamentals, Diagnosis and Management*.



Fletcher was an external advisor to other burgeoning programs of optometry in Universities in over twenty countries, liaising with governments and academics in countries as far apart as Ethiopia and Hong Kong, and Norway and New Zealand. He is remembered by colleagues and students for his warmth and a deep faith which guided him to support students experiencing trauma in their home countries. Fletcher was a dedicated mentor and had a number of students who became well known in the field of colour vision, including Stephen Dain (Emeritus Professor of the University of New South Wales and former member of the Directorial Board).

Janet Voke

ICVS 2021

The International Colour Vision Society announces that our 26th Biennial symposium will take place Friday to Tuesday, 2-6 July, 2021, in the city of Heraklion, Greece. Heraklion is the capital of the prefecture of Crete, and it can be reached by plane from major Greek and European cities with flight connections from international destinations. Heraklion can also be reached by ferry from Athens and many more Greek and Mediterranean ports.

The symposium will be held at the conference center of the Aquila Atlantis Hotel, which is located in the city center. There is a plethora of hotels within walking distance from the conference center. Please check out the Hotel section of the meeting's website (www.icvs2021.org) for several room deals. The ICVS members are encouraged to book their hotel accommodation as soon as possible (you can always cancel later), as Crete is a bustling tourist destination during the summer months.

On the website, you can also find some important dates relevant to the meeting. The abstract submission will open on January 11th 2021, and will remain open until January 31st 2021. Due to the busy location of the meeting, the organizing committee wants to make sure that (1) members have enough time after abstract submission/acceptance to finalise their travel and accommodation plans, and that (2) the organizing committee has a good, early estimate of the total numbers of participants to finalize the social program of the meeting that we will all enjoy. For these reasons, and contrary to ICVS tradition, there will be no deadline extension for abstract submissions to ensure that adequate time is allowed for everyone.

At this moment, we are closely monitoring how the COVID-19 pandemic evolves and how new regulations might affect next year's meeting. The organising and scientific committees are working diligently for the social and scientific program, and any updates will be communicated through the website.

Organising Committee: *Dimitris Mylonas*, University College London & Goldsmiths, University of London, *John S. Werner*, University of California Davis, *Maria Makridaki*, Foundation for Research and Technology Hellas, *Neil Parry*, University of Manchester, *Sotiris Plainis*, University of Crete, and *Thanasis Panorgias* (Chair), New England College of Optometry.

Scientific Committee: *Claudia Feitosa-Santana*, University of Sao Paulo, *Jasna Martinovic*, University of Aberdeen, *Maureen Neitz*, University of Washington, *Michael Webster*, University of Nevada Reno, *Miltiadis Tsilibaris*, University of Crete, and *Thanasis Panorgias* (Chair), New England College of Optometry.

Colour Vision Tests for Sale

We have been contacted by Robert Fletcher's daughter, Janet Voke, whom many of you know. She writes:

I have inherited many PIC plates from my father (some rare and unusual), a 100-Hue test, many copies of his City University tests and a CAM lantern that he designed which is still being sold by Evans Instruments of Thetford. In addition, I have a complete Munsell Book of Color. I have photographed and documented all the ones for sale with new and expected sale prices.

If you are interested in acquiring any of this interesting collection, please contact Janet directly at vokejanet11@gmail.com



About the logo: Co-organizer Dr. Dimitris Mylonas designed the meeting's logo. His inspiration derived from the labyrinth of Minotaur at the Minoan Palace of Knossos. Inspired by the meaning of this ancient symbol for the journey to inner- and outer- knowledge of the world, he used an abstract labyrinth-style font that also has some common line elements with the logotype of the ICVS. He also used a colour gradient between "Thalassi," which is the Greek word for the colour of the sea (Thalassa), and yellow that symbolizes the sun.

All members are welcome to contribute to *Daltoniana*. Past issues can be accessed via www.icvs.info. Along with the Society's published Proceedings, they provide an historical record of many major advances in the field of colour vision.