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## 2024 ICVS Ljubljana



Our conference committee has been working hard over the past months to get everything ready for the ICVS 2024 meeting in Ljubljana, Slovenia. We are now pleased to announce a call for abstracts for the 27<sup>th</sup> Symposium of the International Colour Vision Society. The meeting will take place from July 5<sup>th</sup> to July 9<sup>th</sup>, 2024. The conference will offer invited talks, oral and poster presentations, and social and cultural events to promote networking. We are looking forward to hosting you all!

In the upcoming meeting, the Society will honour Professor Karl Gegenfurtner (Justus-Liebig-University Giessen, Germany) with the Verriest Medal for his outstanding contributions in the field of colour vision.

We are also pleased to announce a line-up of distinguished Invited Speakers that includes Dr. Deniz Dalkara (Institut de la Vision, Paris, France), Professor Tom Baden (University of Sussex, UK), Dr. Jenny Bosten (University of Sussex, UK) and Dr. Tessa Dekker (University College London, UK).

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The International Colour Vision Society meetings bring together physiologists, psychologists, physicists, geneticists, optometrists, ophthalmologists, and visual scientists who have a research interest in the many aspects of colour vision and colour vision deficiencies. We invite you to submit an abstract in any of the following topics: Acquired deficiencies of colour vision, chromatic mechanisms, colour cognition, colour in occupational environments, colour induction and constancy, colour in mesopic conditions, colour naming, colour vision assessment, comparative colour vision, congenital colour vision deficiencies, digital reproduction of colour information, ecology of colour vision, effects of aging on colour vision, electrophysiology of colour processing, functional imaging and colour vision, genetics of colour vision, object-surface properties, material perception, peripheral colour vision, physiology of colour vision, unique hues, and variability in colour vision. Other topics of interest to the Society are, of course, welcome.

Call for abstracts (up to 400 words) is open until March 19<sup>th</sup>, 2024. There will be no extension to this deadline. All applicants will receive acceptance notifications on April 18<sup>th</sup>, 2024. Abstracts will only be published for authors who settle their registration fee by May 9, 2024. Accompanying persons are also welcome to join us in Ljubljana! More information on the specific programme is available on our website. We offer an early-bird rate for registrations made before May 9<sup>th</sup>, 2024. The registration fee includes access to the scientific and social programme of the conference – more detail on both will shortly be available on our website. Early bird registration is 600 € (450 € for students and 550 € for accompanying person). The standard registration rate is 670 € (510 € for students and 600 € for accompanying person). We offer full registration fee refunds (50 € administration fee deducted) for requests submitted by May 25<sup>th</sup>, 2024. We are regularly updating the conference website ([www.icvs2024.com](http://www.icvs2024.com)) with information about the programme, arrangements for travel and accommodation, and other details.



On behalf of the ICVS 2024 Organizing Committee, Manca Tekavčič Pompe

#### Organising committee members

- Manca Tekavčič Pompe, MD, PhD, *Paediatric Ophthalmology University Eye Clinic Ljubljana*
- Marko Hawlina, MD, PhD, *Neuro-ophthalmology & Retinal dystrophies, University Eye Clinic, Ljubljana*
- Gregor Belušič, PhD, *Animal physiology, University of Ljubljana*
- Maja Šuštar Habjan, PhD, *Laboratory for visual electrodiagnostics, University Eye Clinic, Ljubljana*
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- Neil Parry, PhD, *Manchester Royal Eye Hospital, UK*

# ICVS Summer School, 30<sup>th</sup> July - 4<sup>th</sup> August 2023



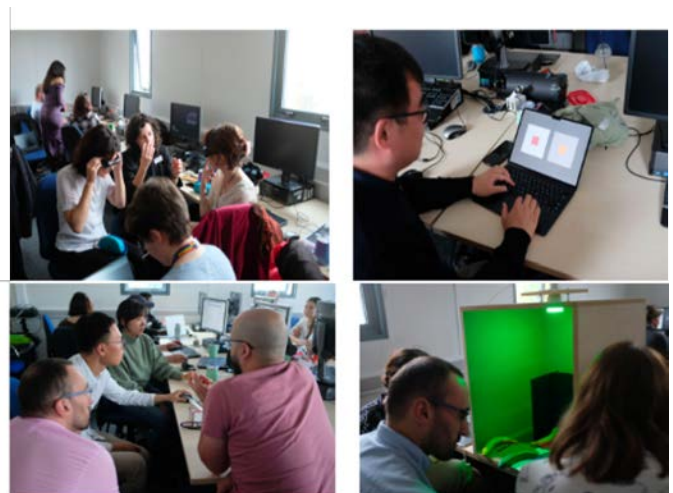
*The faculty and students of the ICVS Summer School 2023*

In August 2023, ICVS hosted its fourth Summer School, organized by Hannah Smithson, Neil Parry, David Brainard, Allie Hexley, and Rebekah White, along with five local helpers. Thirteen faculty members taught in the school and a total of 33 students spanning 10 countries attended the school. The 2023 school was sponsored by Optica, VPixx, Elsevier, Enchroma, The Colour Group (GB), Cambridge Research Systems, and ICVS.

The goal of the summer school was, as it has been since the school's conception, to introduce students to the science of colour vision, including presentation of the fundamentals of the field as well as discussion of current frontiers of knowledge. This year's lectures were delivered by *Jenny Bosten, David Brainard, Karl Gegenfurtner, Anya Hurlbert, John Mollon, Sérgio Nascimento, Neil Parry, Sara Patterson, Steven Shevell, Hannah Smithson, Andrew Stockman and Mike Webster*. The school also included practical activities to help students think about psychophysical experimental design and calibration, and an Outreach activity designed to give students a chance to reflect on fundamental concepts in colour vision and experience presenting research to the public. Finally, there were demonstrations of ongoing research projects in the Oxford Perception Group available for the students.

It was delightful for the school to return to an in-person format in Oxford last year, following the online version run in 2020. A big change from the last in-person school in 2018 was that, this year, the Summer School moved between two main sites – Pembroke College and the Department of Experimental Psychology. This enabled attendees to not

only enjoy the traditional Oxford college charm through their accommodation, social activities, and Outreach activities at Pembroke, but also to take full advantage of the teaching lab and lecture space uniquely offered by making use of department facilities. As in 2018, the school ran parallel to Pembroke's Access Week, which enables overheads to be kept relatively low. This year there was also an Outreach event where ICVS Summer School students presented a short (<5 min) demonstration to the Access Students (16-17 year olds who will be applying to university in the following year). The ICVS Summer School students were very creative with their demonstrations, with demos including colour deficiency simulations, "The Dress" and colour constancy. The event received excellent feedback



*Faculty and students working on their outreach presentations and research projects.*

*ICVS Summer School, continued from page 3*

from the Access Students, with 90% of students saying they would recommend the activity be offered for future Access Students.

There were more organized social activities offered this year than in previous years, including a Networking Pizza evening in Pembroke Bar (sponsored by the Optica Colour Technical Group), a Professional Skills Session, a private viewing at the Museum of Natural History, and a Banquet Dinner, where the Summer School photograph was taken. The week cumulated with presentations from the students in Pembroke College on the Friday morning, reporting on

their results from lab-based experimental research projects they had worked on in groups of 4-5 during the afternoons of the week. The projects involved using an inexpensive Arduino-based LED stimulator kit (designed for the courses with support from Optica). The topics chosen by the student groups included diagnosing colour deficiency via Rayleigh matches, studying the additivity of brightness matching, studying the locus of adaptation of unique yellow, and making flicker photometric measurements. The organizers were impressed by the engagement the students had with the projects, as well as the school as a whole.

*Allie Hexley on Behalf of the Organisers*

## Membership Matters

*Don't forget to renew*

May I just remind you to renew your membership of the society, if you haven't already done so? If you have, I'll have already emailed your 2024-25 certificate. If you aren't sure, please check with me first, since refunds cost the society several euros.

The rates are unchanged at €150 for regular membership and €32 for both retired and student members. For anyone presenting at the Ljubljana meeting, it is mandatory to be a member, so if you plan to submit an abstract, now's a good time to renew. Post-docs can apply for student membership as long as their award was made on or after 1<sup>st</sup> Jan 2022. All members will also be sent a hard copy of the meeting proceedings.

*Ljubljana student travel awards*

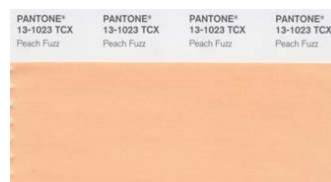
The society will, as usual, be offering some limited travel assistance to presenting student members in Ljubljana. Right now, I cannot say what the value of these will be, as it partly depends on how many applications we get. However, we have always striven to apply a fair process to the awards. If we've already given you two meeting travel awards, you cannot apply for a third. We do not count any funding to attend one of our summer schools. So, as long as you are eligible to be a student member, you are submitting an abstract, and have had fewer than two ICVS travel grants in your lifetime, you can apply via the abstract submission form. We'll require you to send a CV and a brief letter of justification, which should include details of other travel support you have applied for or have received for this meeting, either from your institution or externally.

*Neil Parry, Treasurer*

[Neil.Parry@manchester.ac.uk](mailto:Neil.Parry@manchester.ac.uk)

## Pantone Colour of the Year

This is the 25<sup>th</sup> anniversary of Pantone's colour of the year. For 2024 it is **Peach Fuzz** (Pantone 13-1023), a colour intended to sit between pink and orange. "In seeking a hue that echoes our innate yearning for closeness and connection, we chose a color radiant with warmth and modern elegance. A shade that resonates with compassion, offers a tactile embrace, and effortlessly bridges the youthful with the timeless," adds Leatrice Eiseman, Executive Director, Pantone Color Institute. Much like the timeless membership of ICVS!



## Janusz Kulikowski (1935 - 2023)

Professor Janusz Kulikowski died peacefully at home on 19<sup>th</sup> November 2023 after a short illness. An honorary member of ICVS since 2005, Janusz was internationally renowned for his passion for all forms of scientific endeavour but in his later years he was particularly interested in understanding how higher primates process colour information. The fact that their exquisitely rich colour vision is simultaneously accompanied by high levels of visual acuity was always of particular interest for him. Having studied the contribution of different cortical regions to the visual percept in his early career, he was inevitably pre-occupied by the role of the visual cortex and how it stabilises perception of colours despite substantial differences in ambient illumination. Janusz's idiosyncratic approach to science was exemplified by highly original, sometimes rather inaccessible ideas, sharp discussion, uncompromising rigour and a dash of humour. As will become clear, his select band of PhD students have all pursued successful careers in vision science, in no small part thanks to the encouragement he gave them.



Born of a Lithuanian father and a German mother, Janusz was brought up in Poland and graduated from Warsaw Engineering University in 1956. He obtained his first PhD at the Polish Academy of Sciences in 1962, studying non-linearities in the Earth's magnetic field. He first came to the UK in 1964 as a British Council Scholar at the National Physical Laboratory in Teddington and the Physiological Laboratory, Downing Street, Cambridge. Whilst there, he came into contact with Horace Barlow, Matthew Alpern, Gerald Westheimer, and many other contemporary vision scientists. He had particularly fond memories of frequent rather animated discussions with John Robson. At St John's college, he met Paul Dirac who introduced him to the Uncertainty

Principle, and from these discussions emerged the seed of the notion of a compromise between space and spatial-frequency analysis in visual cortex. At that time, Fourier analysis was regarded as providing new insights into how visual systems process create and re-create the retinal image. This was the age of the sinusoidal grating and the work at the Physiological Laboratory stimulated a revolution in thinking, by applying linear-systems theory to the detectability and visibility of static and temporally modulated sinusoidal gratings. Janusz returned to Poland to continue his postgraduate education and, in 1970, obtained his second PhD in Physiology at the Nencki Institute of Experimental Biology.

Janusz had enjoyed Cambridge life and when, in 1970, Fergus Campbell invited him to return as a Wellcome Research Fellow, he readily accepted. This was an extremely fruitful and stimulating period for Janusz; apart from the daily discussions with Fergus Campbell, keen to appreciate the subtleties of Fourier theory, he interacted with Colin Blakemore, David Tolhurst and Daniel Green. Collaboration with David Tolhurst was particularly fruitful, leading to their seminal paper on sustained and transient detection mechanisms in human vision in *the Journal of Physiology* in 1973.

In 1973, Janusz moved to Manchester, where he established the Visual Sciences Laboratory at the University of Manchester Institute of Science and Technology (UMIST). His visitors book, diligently maintained by Janusz over six decades, is a comprehensive record of eminent vision scientists of the time. In Manchester he worked with Ewen King-Smith on a string of highly influential papers which combined his understanding of linear systems with Ewen's qualities of clarity, of mathematical thought, and meticulous experimentation skills. Also at this time, Janusz formed a firm friendship with Peter Bishop from the John Curtin School of Medical Research, Canberra, in Australia. As mentioned above, he had formed the

opinion, expressed in papers with King-Smith, that visual information must be coded optimally between space and spatial frequency and that using Gabor patches offered the most attractive method of exploring these issues. The ideas were distilled in a series of papers with Bishop, Kato, and Marcelja, published in *Experientia*, *Brain Research*, and *Experimental Brain Research* between 1979 and 1981. His first PhD students, Trichur Vidyasagar (orientation selectivity) and Richard Abadi (spatial processing) worked together in Manchester during this period and both enjoyed frequent, often heated discussions with Janusz on politics, military history, human rights, and many other topics in which Janusz was famously well-versed. Both went on to become professors of Optometry and Vision Science, Sagar in Melbourne and Richard in Manchester.

At the Visual Sciences Laboratory, Ewen had been performing colour psychophysics experiments which elegantly illustrated the existence of colour-opponent pathways and gave rise to the classical King-Smith and Carden paper in 1976 in the *Journal of the Optical Society of America*. His departure in 1982 was the catalyst for Janusz's interest in colour vision, partly because Ewen left behind a well-designed Maxwellian-view optical bench setup and partly because he was required to supervise Ewen's research student, Sara Alvarez. Soon after Ewen's departure, Janusz obtained a grant from the Wellcome Foundation to investigate colour constancy in macaques. He appointed Heather Wild as a PhD student and invited Stuart Butler, then at the University of Birmingham, to collaborate. The experiments were intricate, involving ablating cortical area V4, and conducting some tricky behavioural measures of colour vision before and after the ablations.

As with most successful experiments, the hand of David Carden was never far away. The results were extremely exciting and controversial because they helped to establish the idea of V4 as a colour centre but, as can be seen in the paper published in *Nature* in 1985 with Wild as first author, the data were sufficiently equivocal to be open to wide interpretation. The animal work occupied many hours, but Janusz's fascination for the intricacies of primate and human electrophysiology, fostered in the Cambridge days, remained undiminished. He was regularly encountered around the Visual Sciences Laboratory wearing scalp electrodes. On one occasion, the electrodes remained in place for two days so he could perform a long series of experiments linking psychophysical thresholds with the smallest detectable signal from the visual cortex.

At this time the Visual Sciences Laboratory was a melting pot for ideas, with basic psychophysics and electrophysiology being conducted alongside some interesting applied and clinical work, particularly on the side effects of drugs and the visual defect associated with multiple sclerosis. The combination, in human studies, of visual evoked potentials (VEPs) and psychophysics, and an appreciation of the notion of parvocellular and magnocellular pathways was extremely fruitful for Janusz and his co-workers in the late 1980s and early 1990s. His PhD students, Ian Murray (by then a post-doc) and Neil Parry were prompted to investigate how chromatic and achromatic vision might be discriminated using VEPs and their experiments represented a real breakthrough in human electrophysiology, highlighting the existence of a cortical signal (the 'chromatic negativity') specific to chromatic (parvocellular) processing in humans which has become a well-established technique. Subsequently, Martyn Russell applied the method to the investigation of the visual defect in Multiple Sclerosis that was published in *Brain*. When Janusz retired, Ian took over the reins as head of the Visual Sciences Lab, and is a Manchester Professor. Neil Parry is now a consultant Clinical Scientist, running the Ophthalmic Electrophysiology service at Manchester Royal Eye Hospital (MREH). Martyn recently retired from a successful career in clinical optometry at MREH.

Numerous visitors were happy to take part in Janusz's insightful experiments and many of these gave rise to highly influential papers. Kathy Mullen's work is a good example. The experiments were challenging and lengthy but aimed at elucidating a fundamental idea, that of the role of categorical colours in wavelength discrimination. The resulting paper (Mullen and Kulikowski) was published in the *Journal of the Optical Society of America* in 1990. The atmosphere of uncompromising pursuit of ideas was firmly embraced by another generation of PhD students epitomised by Vince Walsh and Declan McKeefry. Vince managed to tie up the loose ends of the colour constancy and V4 story in a long series of well cited papers in the neuropsychology literature. He later worked with Alan Cowey and is now Professor of Human Brain Research and Royal Society Industry Research Fellow at the Institute of Cognitive Neuroscience, UCL. Declan worked with Janusz and Neil Parry to reveal the subtle spatiotemporal characteristics of the chromatic and achromatic systems using chromatic gratings and is now Professor of Visual Neuroscience at Bradford University.

*Janusz Kulikowski, continued from previous page*

Rigmor Baraas showed similar fortitude and resilience to highlight some characteristics of the VEP generated by moving chromatic gratings; her PhD was completed in 2002. She went on to do a post doc with David Foster and is now professor of Optometry and Visual Science in Kongsburg, Norway. In a similar way, Tony Robson benefited from interacting with Janusz to reinforce the chromatic VEP story, developing the concept by showing it to be useful for revealing the idiosyncrasies of the S-cone system. He went on to become head of Ophthalmic Electrophysiology at Moorfields Eye Hospital. At this time, Athanasios Panorgias (now at NECO, Boston) was investigating peripheral colour vision with Ian and Neil and, once again Janusz was extremely supportive, providing equipment, funding and space, but most importantly enthusiastic encouragement. Janusz always appreciated a rigorous mathematical approach to fundamental problems and it was inevitable that his meeting Henrikas Vaitkevicius, a biophysicist from the University of Vilnius, Lithuania would lead to some substantive work. The topic was colour constancy and Janusz and Henrikas held endless discussions on how to investigate this elusive problem and how it might be quantified. As ever, Janusz was attracted by what he regarded as fundamental issues and was not fazed by conducting extremely strenuous experiments that required dedicated observers and large-scale numerical analysis. As a result of this collaboration, Ausra Daugirdienne and Rytis Stanikunas were regular visitors to Manchester and the Visual Sciences Laboratory has an elaborate setup for testing colour constancy.

As all who worked with him will testify, Janusz created an environment which was unique; always generous with his time he allowed and encouraged creative research but insisted on rigorous methodology and tenacity in identifying and corroborating an observation. He managed to be at the same time a demanding task-master and benevolent father-figure, unfailingly supporting those who were prepared to try and match his work ethic and devotion to science.

*Ian Murray and Neil Parry*

## Sophie Wuerger (1960 - 2024)

The start of 2024 was marked with great sadness, as Sophie Wuerger, Professor of Vision Science at the University of Liverpool, passed away on 3<sup>rd</sup> January after a courageous battle with cancer.



Sophie graduated with a 1<sup>st</sup> class degree in Experimental Psychology from the University of Regensburg in 1986, and her fascination with experimental and mathematical psychology led her to New York University, where she completed a PhD with Michael Landy and John Krauskopf in 1991. At the start of their career, many budding researchers focus on a single topic and/or method, but that narrowness of specialisation was not for Sophie – the breadth of her interests and her energy and industry generated a set of early work that included original research as well as meticulous historical commentary and

translations on a broad range of topics in vision science, spanning stereovision, colour and motion perception. She maintained an active research programme in each of these areas throughout her career.

Her first major contribution to colour vision came from her postdoctoral work with John Krauskopf and Larry Maloney (1991-1993; published in *Vision Research*, 1995), demonstrating that the geometry of colour space does not conform to a simple, Euclidian model. Colour space models and their underlying neural representations and concepts remained a focal interest throughout Sophie's career, which continued in the United Kingdom: after a period of postdoctoral work at University College London (UCL) with Michael Morgan (1993-1994). Sophie took up a lectureship at the University of Keele, which at the time was home to the outstanding Centre for Communication & Neuroscience, and later in 2003 relocated her lab to the University of Liverpool. During this period, Sophie also embarked upon a very active and innovative research programme of multisensory perception, conducted collaboratively with her husband Georg Meyer.

Sophie's contributions to colour science are manifold. With Simon Cropper (*Vision Research*, 1995), she demonstrated convincingly that unique hue representations cannot be reduced to cone-opponent constituents, clarifying that these signals must undergo a non-linear transformation at cortical processing stages. The nature of these mechanisms remained an ongoing topic of research, which Sophie pursued using different methodologies (e.g., fMRI in Parkes et al., 2009, *Journal of Vision*; EEG in Chauhan et al., 2022, *Neuroimage*). Her subsequent work on unique hues addressed the important question of age-related changes, demonstrating a dissociation between low-level cone-opponent signals, susceptible to age-related decline, and unique hue representations, which were considerably more robust, implying an age-long recalibration of colour appearance mechanisms to compensate the lower-level losses (2013, *PLOS One*). Sophie also excelled in applied research – grounded in her own cutting-edge fundamental work on biological colour mechanisms and colour appearance, her masterful applications of this knowledge spanned fields as wide-ranging as colour remapping for advanced display technologies, skin imaging and 3D printing, and clinical applications of colour and light. The roots of many of these applications were in her 2002 project with Andrew Watson and Al Ahumada on the spatio-chromatic colour observer, which had already independently influenced much applied work and was held in the highest esteem in the graphic engineering field.

Sophie was not just an impeccable scientist but also an outstanding mentor and colleague and gave much to the colour vision community, serving on CIE committees for contrast sensitivity functions and unique hues, as well as on the Colour Group (GB) committee, organising several of its January vision meetings. Sophie also was the technical chair of the International Colour Association 2013 meeting and main co-organiser of the European Conference on Visual Perception 2015 with her great friend and collaborator Marco Bertamini. She delivered the Geoffrey J Burton memorial lecture at the Applied Vision Association (AVA) meeting in 2019 and the Palmer lecture at the Colour Group (GB) 2023 meeting

Despite being a vision science polymath, and although confident in her abilities, Sophie was of a modest nature and did not waste time on unnecessary academic posturing. She always had a keen eye on the limitations of our knowledge and methods, with excellent intuitions about malleable regions where these may be gainfully breached, which made her a great person to discuss research with. With her engaging personality and positive demeanour, she was an extremely well-liked colleague, always fun to be with and a great and dedicated friend. Her untimely death at the peak of her powers represents a huge personal and scientific loss to the colour vision community and vision science as a whole.

*Jasna Martinovic, Anya Hurlbert, Galina Paramei and Andrew Stockman*

All members are welcome to contribute to *Daltoniana*. Past issues can be accessed via [www.icvs.info](http://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.