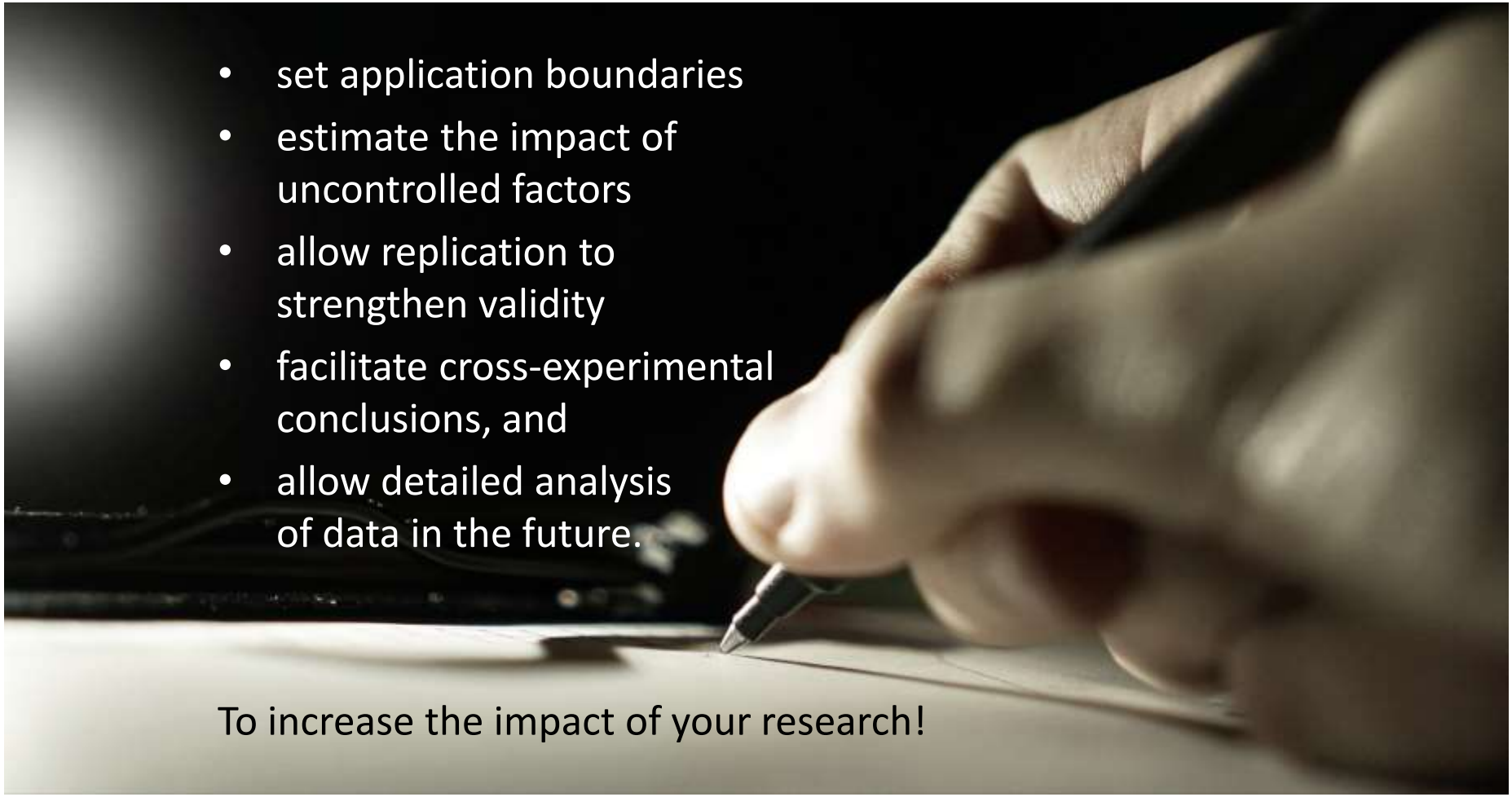
International Commission on Illumination
Commission Internationale de l'Eclairage
Internationale Beleuchtungskommission

WHAT TO REPORT?
Details of Experimental Apparatus and Procedure to Enable Repetition

Martine Knoop

Central Bureau
Babenbergerstraße 9/9A, A-1010 Vienna, Austria
T: +43 1 714 31 87
ZVR: 640982399
E-Mail: ciecb@cie.co.at

What to report? Why?



- set application boundaries
- estimate the impact of uncontrolled factors
- allow replication to strengthen validity
- facilitate cross-experimental conclusions, and
- allow detailed analysis of data in the future.

To increase the impact of your research!

Photo by Storyblocks from Pexels https://www.pexels.com/photo/close-up-hand-paper-pen-261470/

What to report?

Photo by Storyblocks from Pexels https://www.pexels.com/photo/close-up-hand-paper-pen-261470/

Experimental Procedure and Experimental Apparatus

Focus in this presentation:

- Stimulus – in detail for replication purposes
- Temporal changes: variability of the light source
- Future assessment of results

Photo by Jonas Svidras from Pexels https://www.pexels.com/photo/photography-of-person-holding-black-camera-lens-759960/

Example Replication: Research on effect of colour on ‚productivity‘

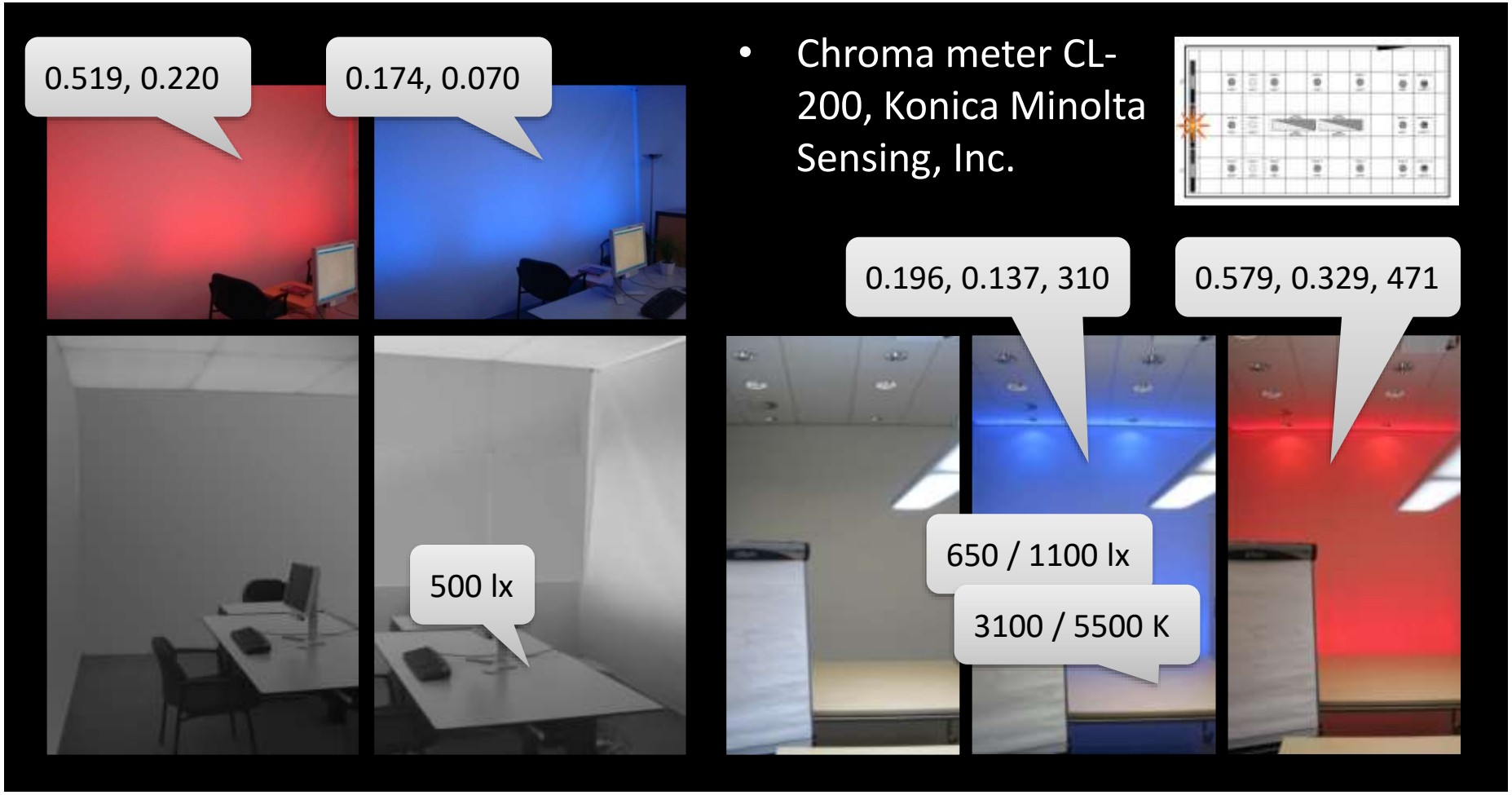
Metha and Zhu (2009) background screen colour

Photo by rawpixel.com from Pexels https://www.pexels.com/photo/person-in-front-of-computer-941550/ (modified)

Kwallek et al. (1997, 2007)
paint & 5000 K fluorescent light

Photo by Paula Schmidt from Pexels https://www.pexels.com/photo/green-wooden-chair-on-white-surface-963486/ (modified)

Experiments TU/e & Philips coloured wall washer

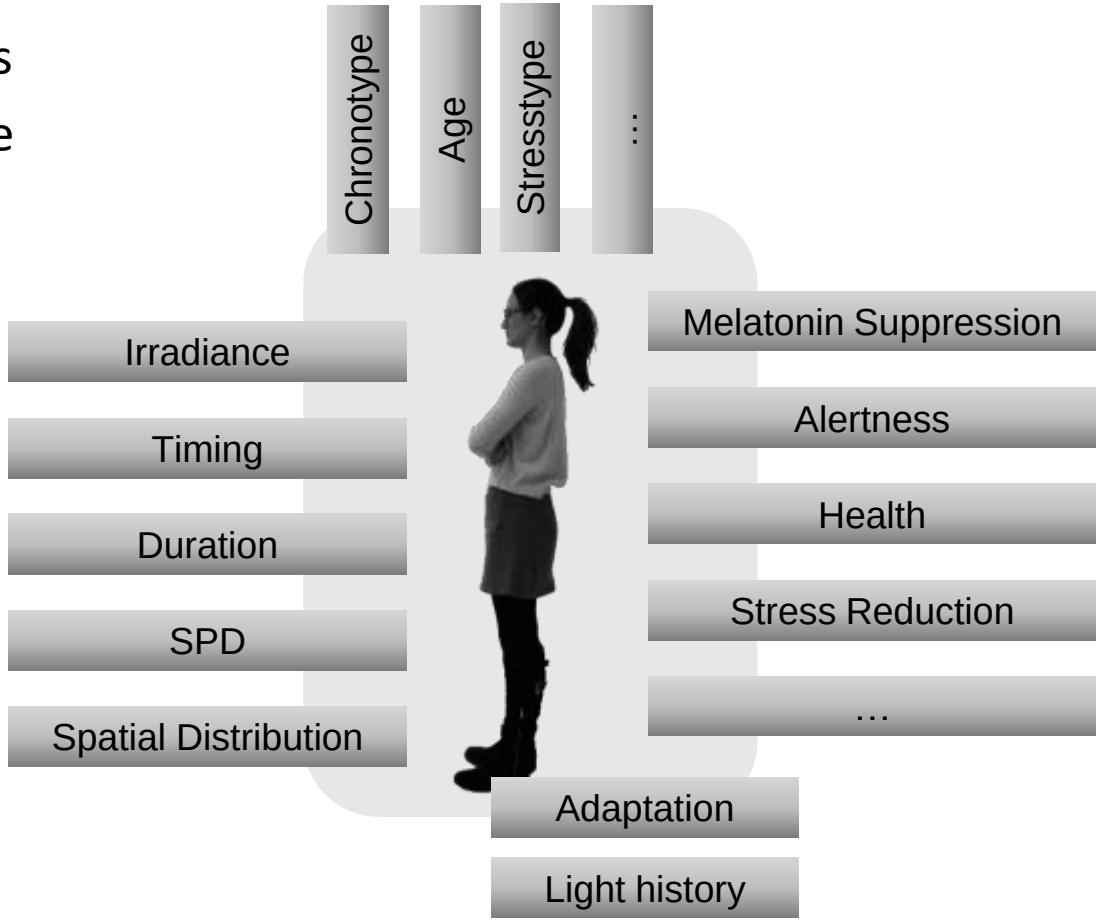


- Chroma meter CL-200, Konica Minolta Sensing, Inc.

Ensure to document information for replication

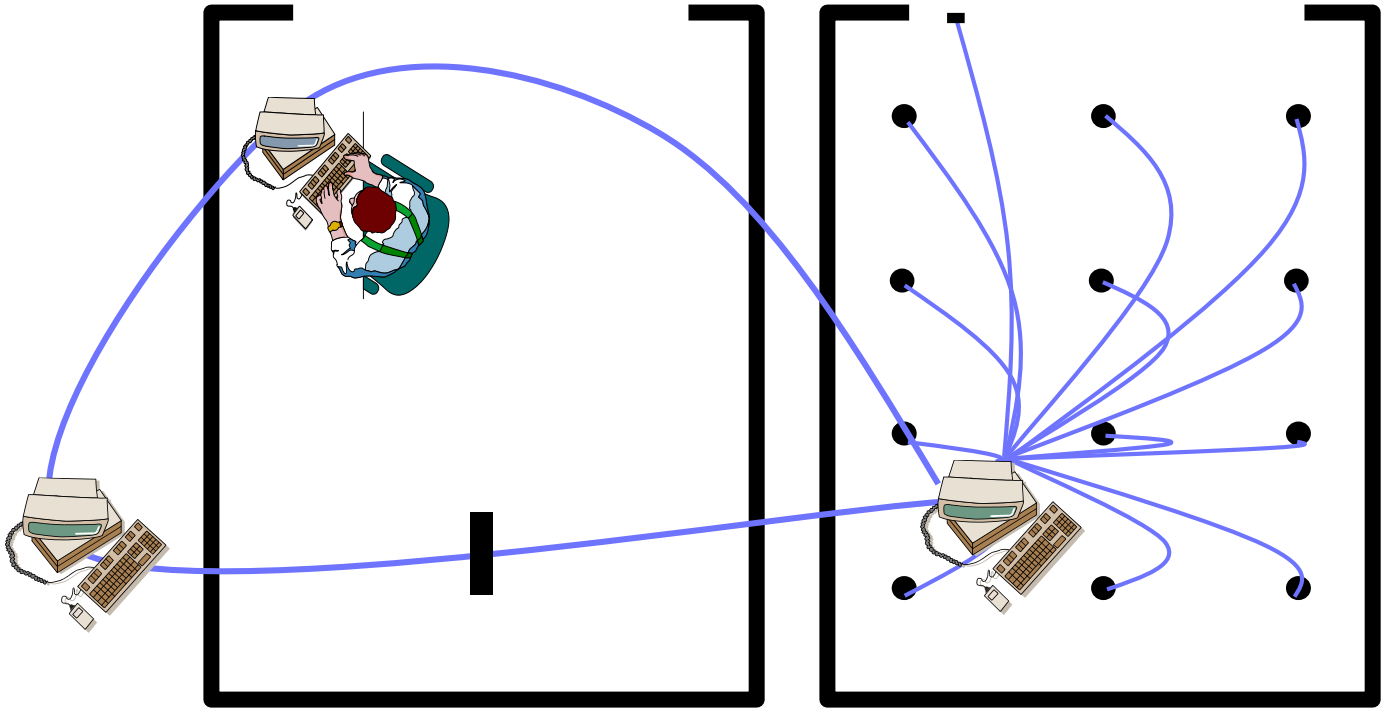
- Describe stimulus in detail, include all relevant parameters

  Note: „The more you know, the more you know you don't know.” Aristotle
- Use appropriate description
- Describe measurements: equipment and position

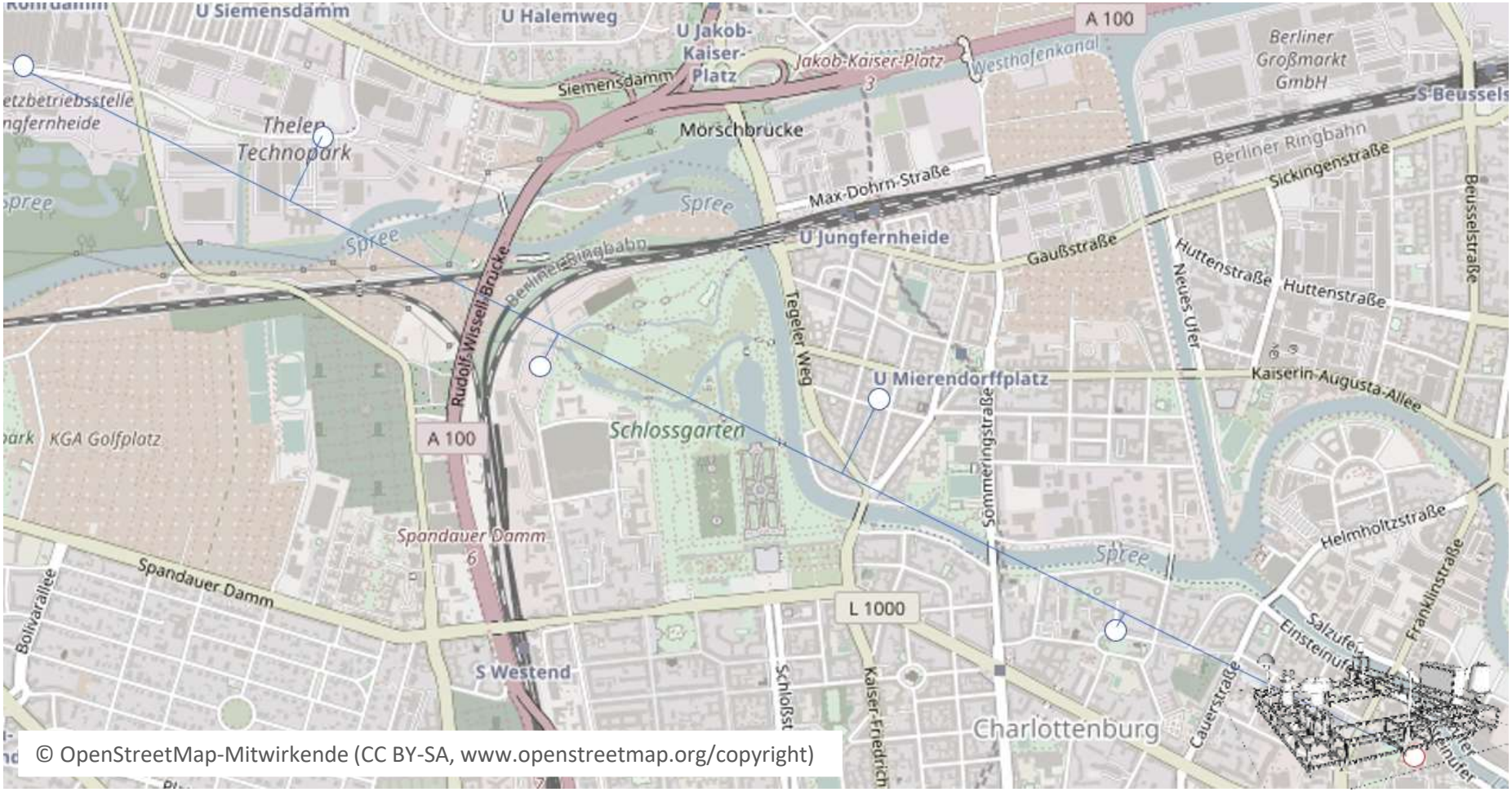


Example Temporal changes: Research including daylight

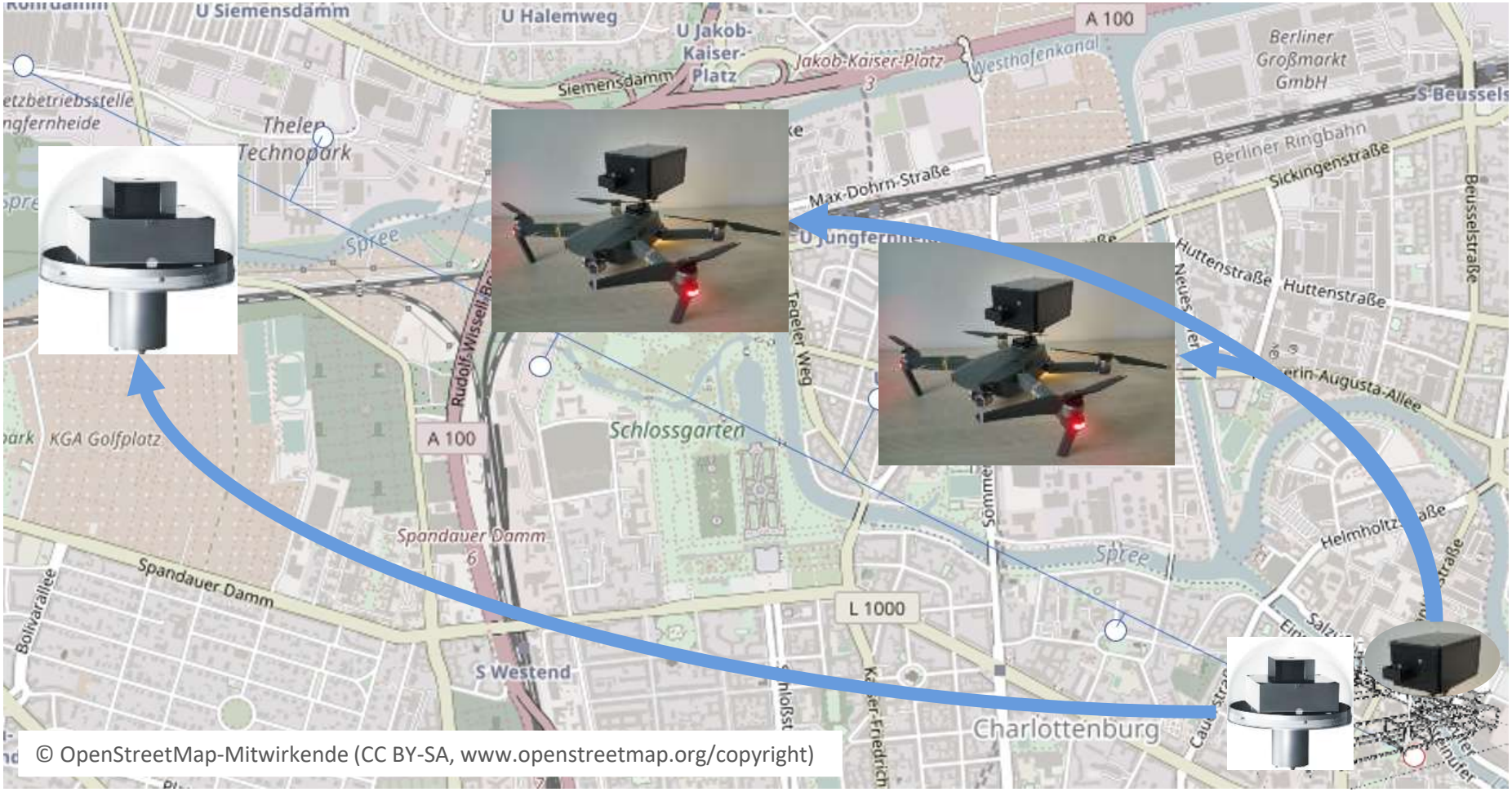
Velds (1998) - User acceptance studies under daylighting conditions



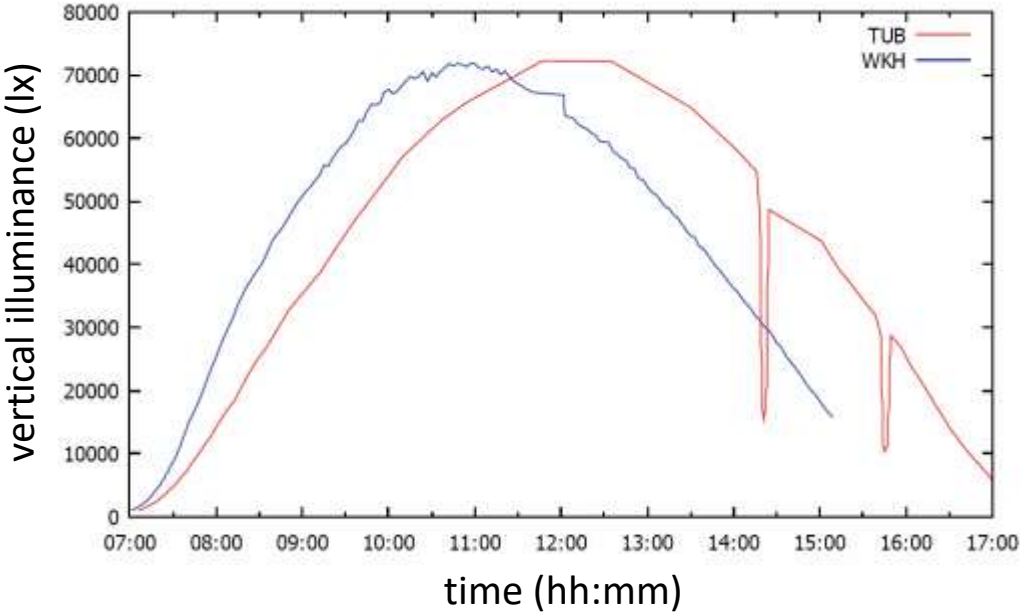
Weber et al. (2018) geographical area of application

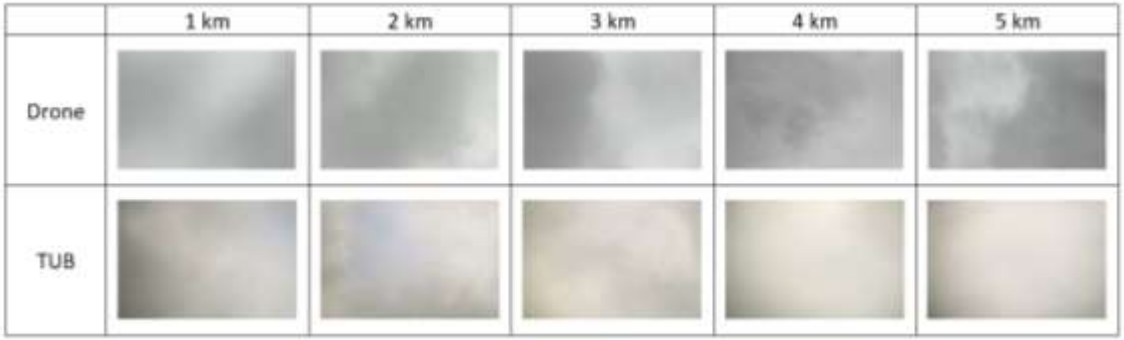


Weber et al. (2018) geographical area of application

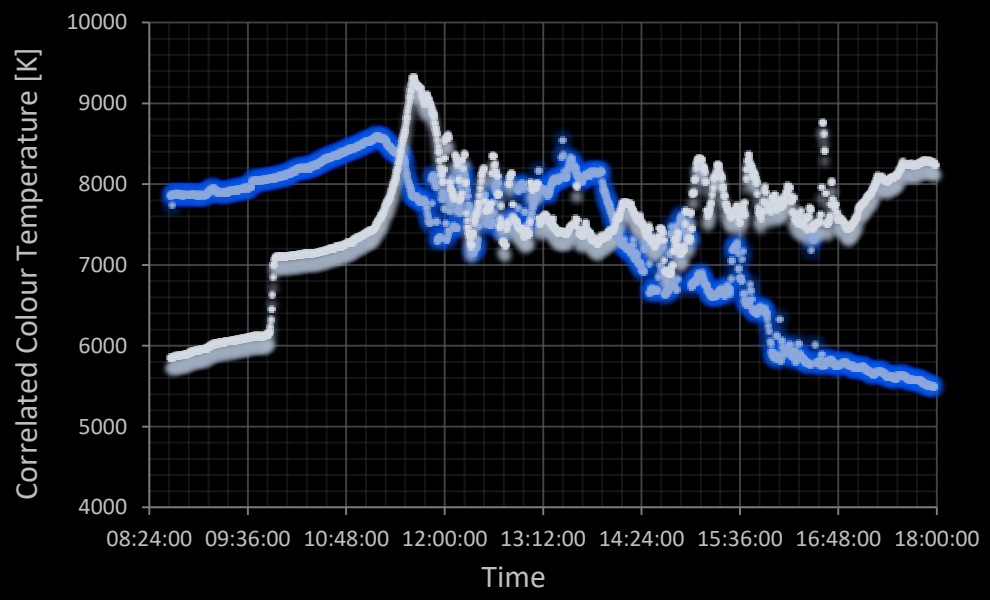


Weber et al. (2018) geographical area of application





Diakite et al. (2018) spectral sky models for NIF effects



May 25 2018, Berlin

Ensure to document information on uncontrollable (temporal) variables

For daylight:

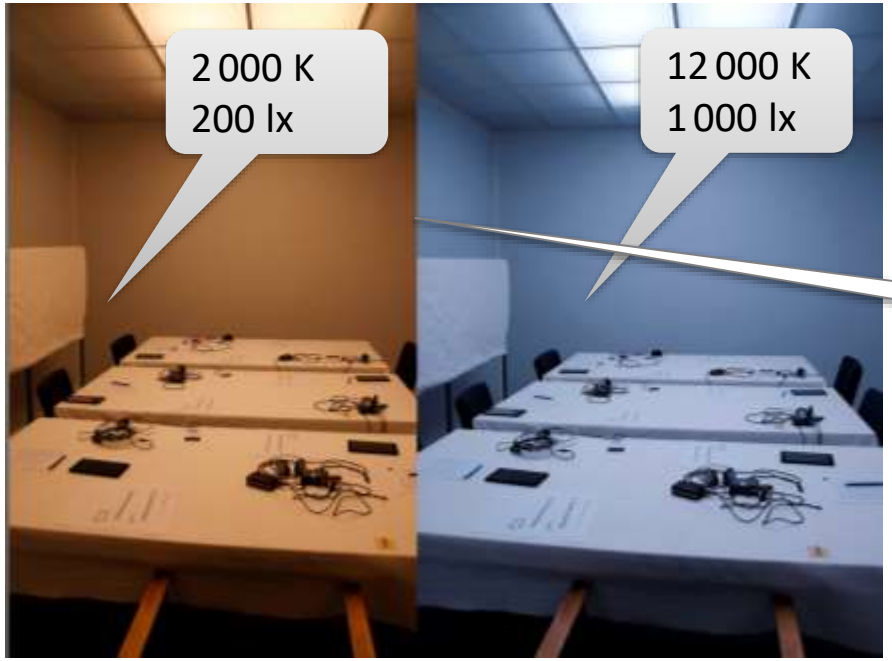
As daylight conditions are said to impact human responses, these cannot be ignored

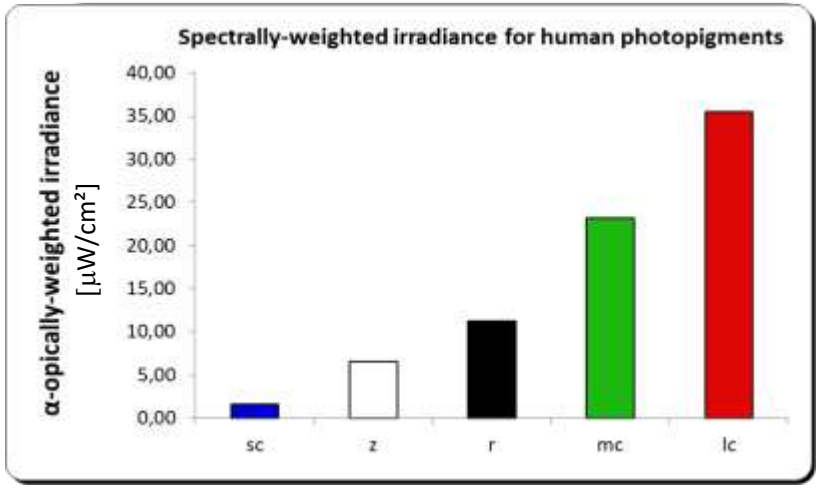
- Make pictures
- Use log books
- Measure illuminances, SPDs when relevant
- Make luminance pictures
- Use measurements of a weather station
- Obtain (descriptive) weather conditions from provider for weather and climate services
- …

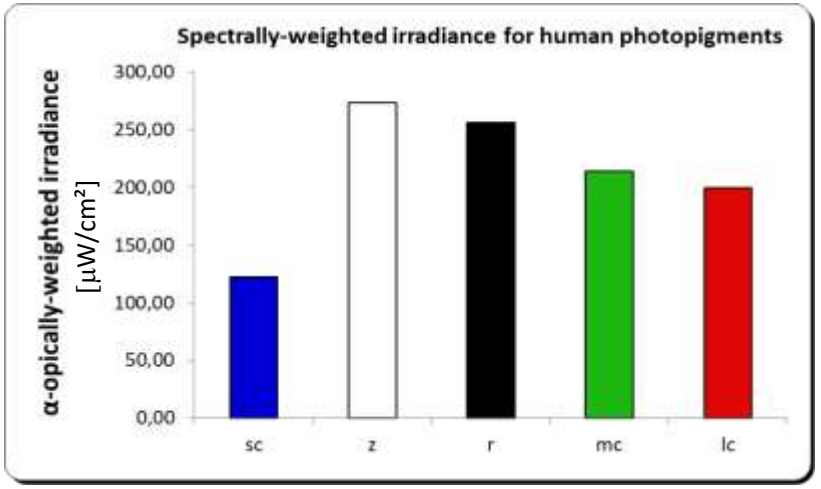
Example Future analysis: Research on non-image forming effects

Photo by Austin Guevara from Pexels https://www.pexels.com/photo/black-blue-eyes-facial-expression-1038166/

International Workshop on Circadian & Neurophysiological Photometry 2013

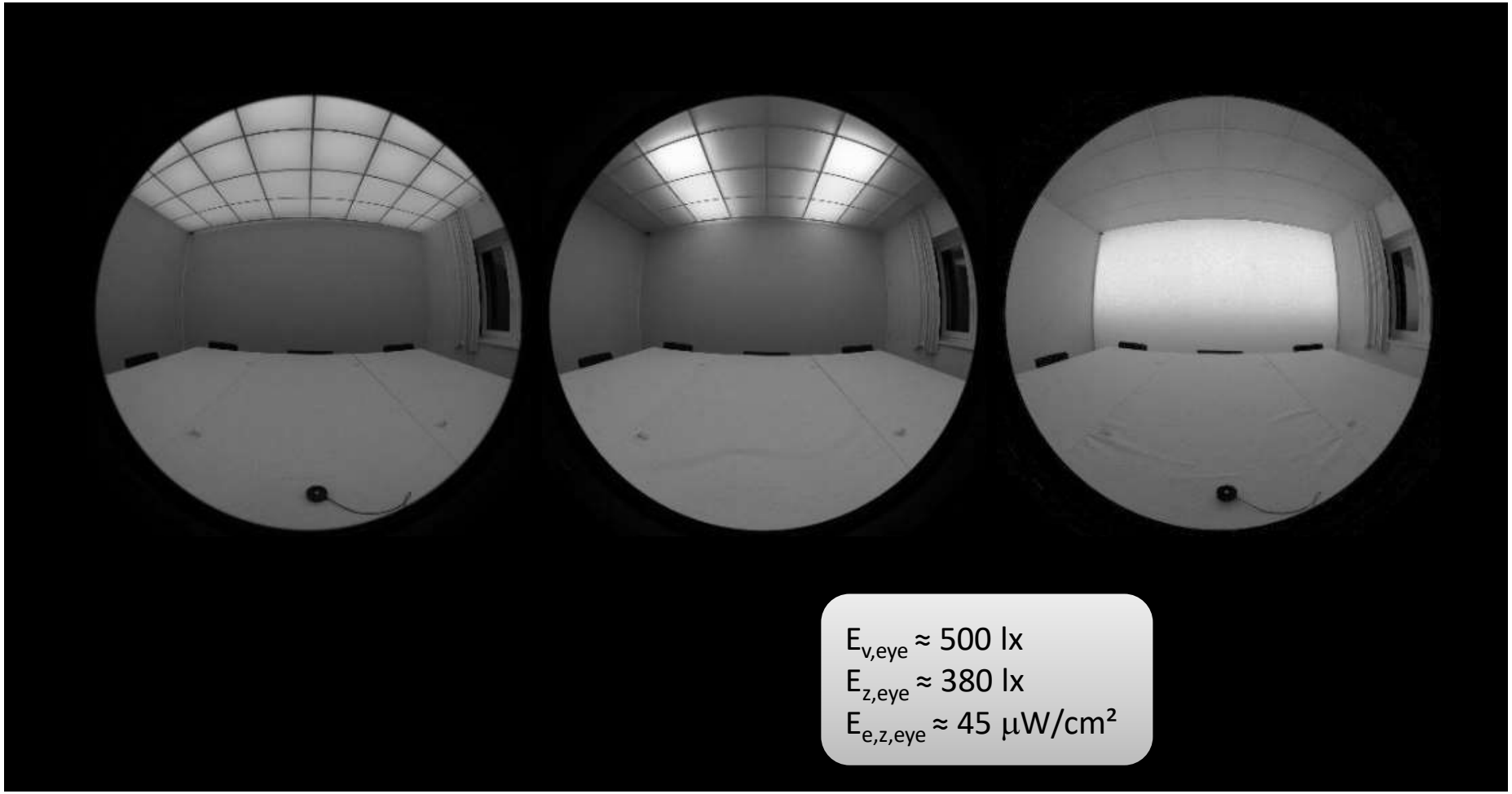






- SI-compliant version of a toolbox for calculation and conversions between units for light measurements (CIE 2015, Lucas et al. 2014)

Broszio et al. (2017) spatial light distribution



Ensure to document information for the future

- Consider variables that might be relevant – apply appropriate equipment
- Data storage, use templates

Photo by Manuel Geissinger from Pexels https://www.pexels.com/photo/interior-of-office-building-325229/

Summary

- Allow replication to strengthen validity & facilitate cross-experimental conclusions
  - Describe all relevant parameters
  - Measuring equipment, conditions and position
  - Use guidelines
- Estimate the impact of uncontrolled factors
  - Consider and document temporal changes
- Collect for future analysis
  - Use templates & protocols

To increase the impact of your research!

Photo by Christina Morillo from Pexels https://www.pexels.com/photo/man-standing-infront-of-white-board-1181345/

My advice …

Get an overview of ‚all' relevant variables to document

- read literature
- talk to colleagues

} ‚interdisciplinary', conferences, PhD fora

Work together with colleagues if you do not have the equipment to measure relevant parameters

Use guidelines and toolboxes

Photo by rawpixel.com from Pexels https://www.pexels.com/photo/advice-business-colleagues-communication-1161465/

Guidelines

- CIE TR 213:2014 Guide to **Protocols** for **Describing Lighting**
  "providing a common basis for communication about the luminous conditions"
- Specifically for NIF studies: CIE **Toolbox** for calculation and conversions between units for light measurements

- New Reporterships within CIE Division 3
  - Guidelines for **Post-Occupancy Evaluation** of Lighting Installations
    "Summarise existing protocols described in literature and from other international agencies (both related to lighting and other indoor environment variables)"
  - Documentation **template** for studies on **non-image-forming effects**
    "a reporting template for lab studies and case studies investigating non-image forming effects"

References

- Broszio, K., Knoop, M., Niedling, M., & Völker, S. (2017). Effective radiant flux for non-image forming effects–is the illuminance and the melanopic irradiance at the eye really the right measure? In: *Proceedings of the Lux Europa 2017*, Ljubljana, Slovenia, 31-36.
- [CIE] Commission International de l'Éclairage. (2014). *Guide to Protocols for Describing Lighting*. CIE Technical Report 213:2014
- [CIE] Commission International de l'Éclairage. (2015). *Report on the First International Workshop on Circadian and Neurophysiological Photometry, 2013*. CIE Technical Note 003:2015. Online available: http://files.cie.co.at/785_CIE_TN_003-2015.pdf
  Toolbox: http://www.cie.co.at/publications/report-first-international-workshop-circadian-and-neurophysiological-photometry-2013) Mehta, R., & Zhu, R. J. (2009). Blue or red? Exploring the effect of color on cognitive task performances. *Science*, *323*(5918), 1226-1229.
- Diakite, A., Rudawski, F., Knoop, M. (2018). Simulating Circadian Effects.
  Characterising Daylight for NIF Simulations, Presentation at Workshop: "Simulating Circadian Effects", SimAUD 2018, Delft, The Netherlands
- Hoonhout, H. C. M., Knoop, M., & Vanpol, R. (2009). Colored lighting in offices the new caffeine? Looking into performance effects of colored lighting. In: *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 53*(8), 502-506.

References

- Knoop, M., Broszio, K., Diakite, A., Liedkte, C., Niedling, M., Rothert, I., Rudawski, F., Weber, N. (to be published). Methods to Describe and Measure Lighting Conditions in Experiments on Non-Image-Forming Aspects, *Leukos Special Issue: Lighting Research Methods*
- Kwallek, N., Woodson, H., Lewis, C. M., & Sales, C. (1997). Impact of three interior color schemes on worker mood and performance relative to individual environmental sensitivity. *Color Research & Application*, *22*(2), 121-132.
- Kwallek, N., Soon, K., & Lewis, C. M. (2007). Work week productivity, visual complexity, and individual environmental sensitivity in three offices of different color interiors. *Color Research & Application*, *32*(2), 130-143.
- Lucas, R.J., Peirson, S.N., Berson, D.M., Brown, T.M., Cooper, H.M., Czeisler, C.A., Figueiro, M.G., Gamlin, P.D., Lockley, S.W., O'Hagan, J.B., Price, L.L.A., Provencio, I., Skene, D.J., Brainard, G.C. (2014). Measuring and using light in the melanopsin age. Trends in neurosciences. 37(1):1-9.
- Mehta, R., & Zhu, R. J. (2009). Blue or red? Exploring the effect of color on cognitive task performances. *Science*, *323*(5918), 1226-1229.
- Steele, K. M. (2014). Failure to replicate the Mehta and Zhu (2009) color-priming effect on anagram solution times. *Psychonomic bulletin & review*, *21*(3), 771-776.
- Weber, N., Knoop, M., Völker, S. (to be published). Auslegung eines Tageslicht-Messrasters, In *Proceedings of Licht 2018*, Davos, Switzerland