Windsor 2018 Workshop Programme 2018

No.	Leaders		Subject
1	Marcel	Schweiker	**Usage and Interpretation of Comfort Scales**
	Giorgia	Chinazzo	
2	Runa	Hellwig	**Overheating of People and Buildings**
	Wouter	V M Lichtenbelt	
3	Stephano	Schiavon	**Personal Comfort Models**
	Christoph	van Treeck	
4	Bjarne	Olesen	**Indoor Thermal Comfort: Are We Missing the Diversity Factor?**
	Dolaana	Khovalyg	
5	Atze	Boerstra	**Measuring Comfort in the Real World**
	Adrian	Pitts	
6	Lyrian	Daniels	**Domestic Comfort and Health at Low Temperatures**
	David	Shipworth	
7	Wouter	V M Lichtenbelt	**Physiology, Health and Comfort: Implications for Real Life**
	Yingxin	Zhu	
8	Sally	Shazad	**Personal Comfort Systems**
	Gail	Brager	
9	Rex	Galbraith	**Using Statistics for Thermal Comfort Data**
	Jane	Galbraith	

1: The Usage and Interpretation of Comfort Scales
CHAIRS: Marcel Schweiker and Giorgia Chinazzo

Scales are a fundamental requirement of the assessment of an individual's perception of indoor environmental conditions in the built environment. The most widespread thermal comfort indices and the adaptive comfort equation are based on the 7-point thermal sensation scale that describes the one-dimensional relationship between thermal parameters and subjective thermal sensation. Thermal comfort perception is not necessarily equal to the perception of thermal sensation. For example, a feeling of warmth (+2 on the thermal sensation scale) can be evaluated as comfortable due to other influencing factors, such as a country of origin or season. Findings from studies confirming this assumption question the way data derived using these scales can and should best be analysed (statistically) and interpreted and whether new and multidimensional approaches need to be developed for thermal comfort assessments. This workshop will provide a forum for the discussion of current usages of scales in studies concerning the perception of indoor environmental conditions and future possible developments to tackle the aforementioned challenges.

2: Overheating of People and Buildings
CHAIRS: Rune Hellwig and Wouter van Marken Lichtenbelt

In recent years there have been an increasing number of complaints about overheating in buildings all over the world. On one hand, there is a growing agreement that based on the adaptive thermal comfort approach comfort perception depends not only on physiological but on psychological and behavioural factors including climatic and other contextual factors, and that the perception of comfort is dynamic in nature. Conversely overheating has been predominantly assessed based on a static understanding of overheating. Furthermore, today's overheating criteria have been used also to assess future temperature scenarios based on climate change predictions. The workshop aims to discuss existing overheating definitions and the need for more suitable and universal definitions of overheating. Rethinking existing approaches requires raising fundamental questions again: Is the fundamental concept of overheating defined in such a way as to avoid discomfort or to mitigate health problems in populations? What is the impact of the dynamics of temperature changes on the experience of overheating? To what extent is the perception of overheating perception driven by cultural or lifestyle norms or expectations?

3: Personal Comfort Models
CHAIRS: Stefano Schiavon and Christoph van Treeck

A personal comfort models provide a new approach to thermal comfort modelling that predicts an individual's thermal comfort response, instead of the average response of a large population these models are based on environmental parameters (e.g., air temperature, location, relative humidity), occupant feedback (e.g., online voting like Comfy), occupant behaviour (e.g., thermostat setpoints like Nest) and biomarkers (e.g., skin temperature, heart rate). Personal comfort models can be used for the control personal comfort systems but they can also be applied to general mechanical systems and provide a way to collect data to train personal comfort models. Personal comfort models showed significantly higher accuracy in predicting the comfort of an individual than general population models like those for PMV and the adaptive comfort, both in laboratory and field settings. Personal comfort models are not specific to an environment and can be applied to commercial and residential buildings and vehicles, being based on learning algorithms that can improve their performance when new data are collected. This new approach is facing many of the challenges including the large heterogeneity of input parameters, the machine learning algorithms used and thermal comfort metrics used as dependent variables. Problems arise like how can all of these be integrated within mechanical system controls and how can such a model be transported from one environment to another. These will be discussed in the workshop.

4: Indoor Thermal Comfort: Are We Missing the Diversity Factor?
CHAIRS: Bjarne W. Olesen and Dolaana Khovalyg

The built environment is currently undergoing a transformation towards human-centred design. As our society experiences significant changes relating to increased migration, social mobility and gender equality, our working spaces are becoming more and more diverse. The challenge is now, how to provide thermal comfort and satisfaction to diverse occupants of buildings with different thermal sensation levels? Generally, perception of thermal comfort is a result of physiological and psychological processes, and It is subject to individual differences due to demographics, geography and cognition. For instance, requirements for thermal comfort for adult males and females, children and elderly people differ due to different physiology, metabolic rate, activity level and clothing patterns. Geographic location creates a background for any categories considered – human physiology, climate, thermal management practices may differ in various parts of the world. Are we missing the diversity factor when specifying thermal comfort conditions? Join us to discuss this and related issues.

5: Measuring Comfort in the Real World
CHAIRS: Atze Boerstra and Adrian Pitts

University researchers rely on advanced measurement systems when objectifying indoor thermal environments in lab settings or during field experiments. But practitioners such as HVAC system specialists and occupational health and safety professionals in reality often have more limited options available to measure thermal comfort in existing buildings. To deal with indoor climate complaints or when checking a building's performance in the context of a DBFMO contract for instance they may require different types of measurements of indoor climate environments. This workshop will explore a range of available methods used to objectively quantify thermal comfort as experienced in real buildings and discuss their efficacy and usefulness in practice. The intention is to look beyond the borders of official standards for thermal comfort measurements (as described e.g. in EN-ISO 7726) and not only address the pro's and con's of 'old school' temperature metering and indoor climate analysis but to also look at more innovative ways to measure thermal comfort, for instance by using internet based (temperature/humidity) sensor networks in conjunction with the use of automated occupant questionnaires.

6. Domestic Comfort and Health at Low Temperatures
CHAIRS: Lyrian Daniels and David Shipworth

It is well understood that low temperatures are associated with seasonal ill-health and mortality. Cold climate countries are often very experienced at designing houses (and buildings more generally) that protect occupants from cold conditions. In relatively milder climates, however, there exists an under-appreciation of the health impacts of exposure to cold indoor environments which is in many cases reflected in less stringent building performance standards. Cold housing is very much an emerging issue and research subject in Australia, and other countries like the UK, New Zealand and Japan and topically like to concerns of increasing weather extremes and growing incidences of fuel poverty is many regions. This workshop will explore domestic comfort and health at low temperatures potentially covering topics including the perception of [dis]comfort at low temperatures, cultural norms in heating practices, clothing customs and practices, and the roles and relationships of and between building performance standards and public health policy.

7: Physiology, Health and Comfort: Implications for Real Life Situations.
CHAIRS: Wouter van Marken Lichtenbelt and Yingxin Zhu

Research over the last decade has provided evidence of the importance of the impact our thermal environment on our physiology and metabolic health. In some cases environments just outside our thermal comfort zone are shown to provide healthier conditions, just as exercise is often healthier when compared to comfortable sedentary behaviour. On the other hand, during periods of cold and heat acclimation perceived comfort can increase, just as exercise increases our physical condition. Is such temperature training to promote health and well-being feasible in real life situations? During this workshop examples will be given of studies or projects that translate thermo-physiological and thermal-comfort knowledge into real recorded experiences in everyday situations. Papers are invited for this workshop that may encompass: combined laboratory/monitoring studies, monitoring physiological parameters in real life and/or modelling approaches.

8: Personal Comfort Systems
CHAIRS: Sally Shahzad and Gail Brager

Developments in the design of office furnishings and equipment have significantly enhanced ergonomics and energy efficiency in the workplace. However, several studies have shown that many find their indoor environments uncomfortable, although commercial buildings consume massive amounts of energy for heating, ventilation and cooling. Thermal control in an open plan office is challenging, due to individual differences experienced when perceiving the thermal environment. Personal decisions to adjust the room temperature or ventilation in the office, directly impacts the comfort of other occupants, who may not share the same preferences. Providing occupants with low powered devices to control their local thermal environment allows them to remain comfortable over a wider range of indoor ambient temperatures. In addition, allowing the indoor ambient temperature to vary by

even a few degrees can result in large energy savings. This workshop will explore advanced personal comfort systems used for the provision of local individual thermal comfort for occupant satisfaction and reduced energy consumption in the workplace. The workshop seeks to discuss challenges encountered in removing barriers to industry adoption of low-energy personal comfort systems and related assessment methods such as computational modelling, laboratory testing and field research.

9: Using Statistics for Thermal Comfort Data

CHAIRS: Jane and Rex Galbraith

The workshop will start with a general introduction to thermal comfort data and various types of statistical analyses that have been (or might be) used to help answer questions of interest. This will be followed by presentations and discussion of contributed papers in which statistics plays a substantive role. Participants will be invited to join in the discussion of these and related issues arising in applying statistics to comfort research. We request that participants send examples, with questions and comments, of issues that they have encountered in the analysis and interpretation of thermal comfort data to Jane Galbraith j.galbraith@ucl.ac.uk by 7th March. As well as using appropriate examples in the workshop we hope to provide statistical support to those who contribute examples.