



CONDITIONING COMFORT:

The co-evolution of cooling technologies and practices

Dr Heather Chappells
Saint Mary's University, Canada

Concepts of comfort

- **Multiple connotations of comfort:**
 - sympathy, warmth, complacency, ambience, cosiness
- **History of comfort:**
 - Culturally relative notion associated with changing ideas about privacy, efficiency, domesticity and austerity
- **Broadly conceived comfort:**
 - a state of total physical and spiritual well-being
- **Narrowly conceived ‘thermal’ comfort:**
 - a satisfactory level of heat or cold
- **Key point:**
 - *Different definitions of comfort lead to different conjunctions of technology and practice (more and less sustainable ones)*

Parameters of thermal comfort

- **Biological limits are important:**
 - people can die if they get too hot or too cold
- **But, cultural perceptions of comfort vary widely:**
 - People of different cultures have reported being comfortable at temperatures ranging from 6 to 30 degrees centigrade



Multiple strategies of thermal adaptation



Changing ideas of how to achieve comfort

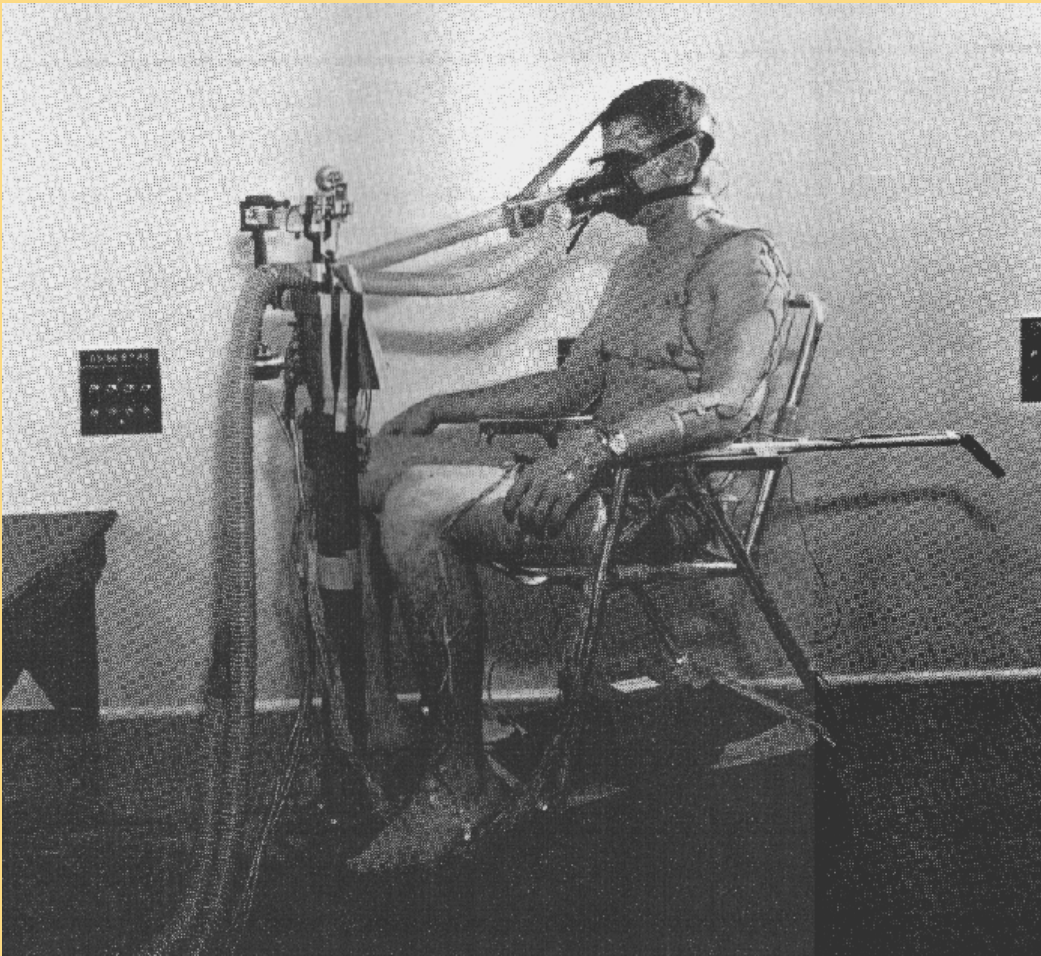


‘Open-air’ school, USA, 1900



Air-conditioned office, circa 2000

Thermal comfort research: the quantifying quest



- Early experiments on human subjects to assess physical responses to heat stress and other parameters

Standardising comfort:

The comfort zone

Findings of experiments built into technical guidelines for buildings: **temperature be held constant in the range 21-23°C (based on ASHRAE Standard 55) ****



** Canadian office environment specification

Manufacturing comfort: the co-evolution of climate control



Yes! now you

A New Refreshing Comfort - Appeal

Of all of the fine quality features you build into your homes, none will create more "buy appeal" in the minds of your prospects than being able to tell them your homes have cooling. Think of the comfort, modern living and "pride of ownership" advantages cooling offers. The value of cooling has already been demonstrated in the commercial field — in stores, restaurants and theaters. Until recently, summer air conditioning has been a luxury for the home. Right now, it is best termed a "necessary luxury for modern living." Soon — perhaps even this year, summer air conditioning will be a plain necessity if you want to sell your homes at a profit.

Keep in mind that at least a part of the cost for cooling equipment may be offset by good planning. As an example, with cooling it would not be necessary to provide screens for those rooms that are cooled, or to provide a screened-in porch.

More important to you from a good business standpoint, cooling will help you sell your homes. Because the Mueller Climatrol Type 910 recessed summer conditioner maintains a balance between equipment costs and the total cost of a low-cost home, it is your best buy.

Mueller Climatrol

“When it was shown that no natural climate could consistently deliver perfect comfort conditions, air-conditioning broke free of its geographic limits. When no town could deliver an ideal climate, all towns became potential markets for air-conditioning”
(Cooper 1998: 78)

The normalisation of comfort:

Mutually reinforcing science and technology

If a building is set, regularly at, say, 22 °C the occupants will choose their clothing so that they are comfortable at that temperature. If enough buildings are controlled at this temperature, it becomes a norm for that society at that period of its history, and anything different is regarded as 'uncomfortable'.

(Humphreys 1995: 10)

The paradox of our times

The same mechanical systems which give us clean, conditioned air inside the building are simultaneously polluting the outside environment (Fitch 1972: 36)



Future comforts research

UK ESRC project:

1. To explore the link between outdoor climatic change & changing technologies and practices of indoor environmental management
2. To evaluate the meanings & baselines of comfort in academic debate and building practice
3. To examine the agendas & interests of those involved in constructing 'comfortable' indoor environments

Further information:

Project website: <http://www.lancs.ac.uk/fass/projects/futcom/>

Paper: Chappells and Shove (2005) Debating the Future of Comfort, Building Research & Information, 33(1): 32-40.

Three comfort philosophies

1. **Comfort as a physiological condition**
2. **Comfort as a process of behavioural adaptation**
3. **Comfort as a shifting social convention**



1. Comfort as a physiological condition

**Natural climate
as the enemy of
human
productivity - a
threat to be
kept at bay**



Protected indoor environments

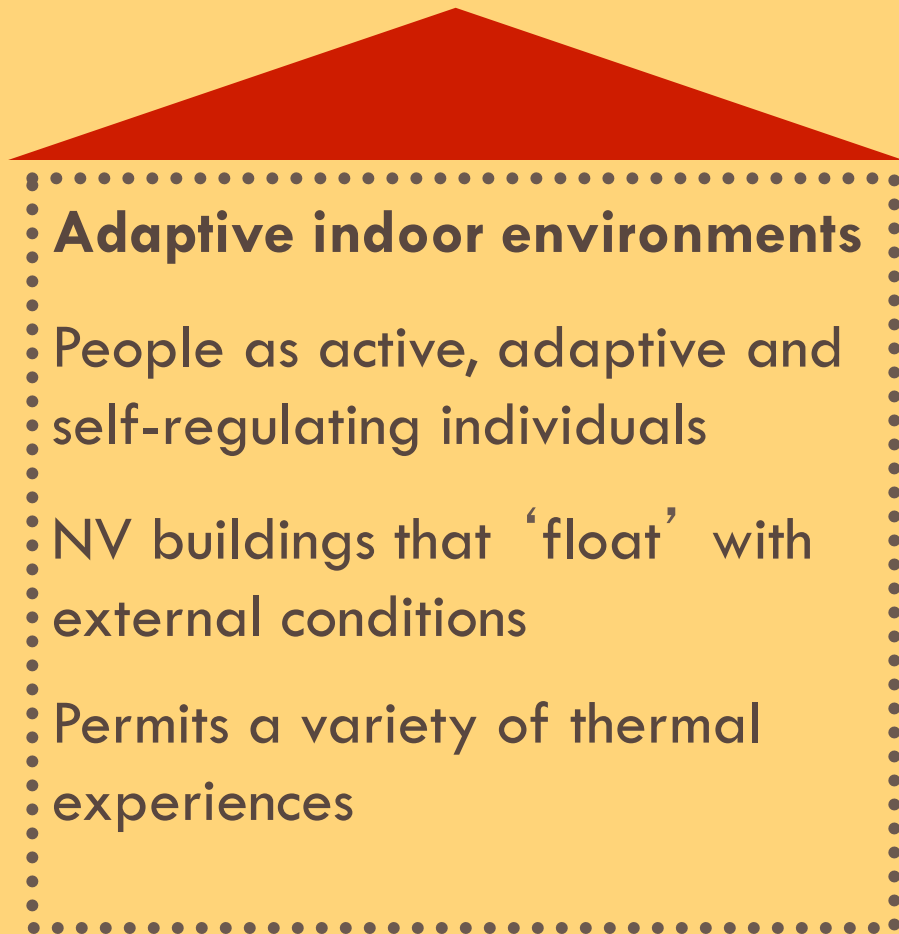
People as having fixed and definable thermal needs

Standardised conditions (22°C)
- thermal neutrality or monotony

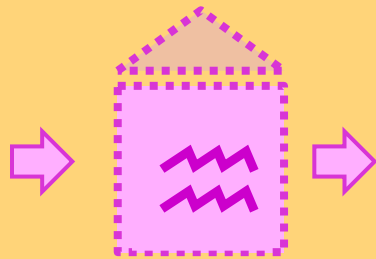
Supports mechanical systems,
controlled environments

2. Comfort as behavioural adaptation

**Modify the
external
climate;
mediate and
transform but
not exclude**



3. Comfort as socio-cultural convention

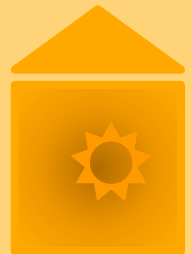
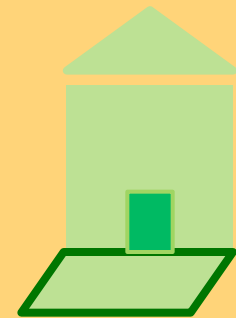


Socially constructed environments

Comfort defined by socio-cultural conventions and norms

Environments ranging from 6 to 30 degrees centigrade

Facilitate diversity in ways and structures of daily life



Summary of comfort paradigms

COMFORT PHILOSOPHY	DEFINING COMFORT	EVALUATING COMFORT	ACHIEVING COMFORT
<u>Physiological</u>	Biologically fixed condition	Laboratory experiments	Provide comfort zone
<u>Adaptive</u>	Variable and adjustable condition	Field studies of occupant behaviour	Provide adaptive opportunity
<u>Socio-cultural</u>	Social and cultural convention	Ethnographic enquiries	Facilitate diversity in ways of life

Comfort in practice: research approach

- **How are different understandings of comfort informing the construction of the built environment?**
 - ▣ Participation in meetings and workshops of UK Thermal Comfort Interest Group (UKTCIG)
 - ▣ Interviews with selected UK practitioners: building scientists, architects, engineers, air-conditioning manufacturers, regulators and policy-makers
 - ▣ Interactive workshop with social/building scientists and practitioners to promote debate about future of indoor environment

Defining comfort:

recognising multiple parameters

“We see comfort as being a broader issue than just thermal, that doesn't mean that we can assess all those other issues equally as well but at least it means that we recognise that it might mean more than air temperature or radiant temperature. We understand that there are a number of theories of comfort out there and that thermal comfort is just one of a number of parameters to be considered. We understand that comfort is physiological and psychological and we try wherever possible to be as adventurous with both or consider both”

Extract from interview with building engineer

Specifying comfort:

standardisation vs. adaptation in practice

“If you take an air-conditioned building you would generally have a specification which would be following the British Council of Offices which is pretty rigid or CIBSE, so you would look at standards and I don't think there's a lot of debate about that. The debate comes when you say 'well we're not going to air condition' or 'we're going to do a mixed-mode building which will float', what will people put up with?”

Extract from interview with building engineer

Client and user expectations

- **Clients like consistency**
 - Buildings that can be maintained at a specified temperature, rather than ones that ‘float’ with conditions outside
 - Contractual and legal issues reinforce the need for tight specifications
- **Symbolism and status are important**
 - air-conditioned buildings are currently associated with quality and prestige
- **Customs, conventions and taboos are also a part of the decision to go with air-conditioning**

Challenging conventions

Doing away with the business suit?

“The client said they wanted a non air-conditioned building, and so we talked to them about what conditions would be like and what temperature they might achieve... we advised them that must expect to make adjustments, to take jackets off or loosen ties, and they said ‘oh well we can't do that, we're solicitors, we have a dress code, which is waistcoat and tie’ ... And the engineer who was working on it said ‘well if you really mean that it actually means you'd better have an air-conditioned building because it would be uncomfortable otherwise’ ”

Extract from interview with building services engineer

Challenging conventions:

Unpacking norms, customs and taboos



Challenging conventions:

Restructuring the working day

“One way [of coping with climate change] would be to work at different times... temperatures in our offices peak at 3pm... I mean what’s the problem - siesta!”

UK architect



Air-conditioned comforts

Expansion and convergence

- Global convergence:
 - From China to Canada air-con is now an accepted part of life
- Extension to all realms of daily life:
 - Now a standard design feature for cars and luxury homes
- Legitimisation through promoting efficient models?



Energy efficiency rating B



Carrier
Experience freezing point in your home.

Conditioning comfort
the co-evolution of technologies and lifestyles

Future comfort scenarios

Physiological



Redesigning technologies

More sustainable technical fixes
(e.g. energy efficient or solar
powered air-conditioners)

Adaptive



Redefining standards

Naturally ventilated buildings that
are comfortable, sustainable and
desirable to clients & users

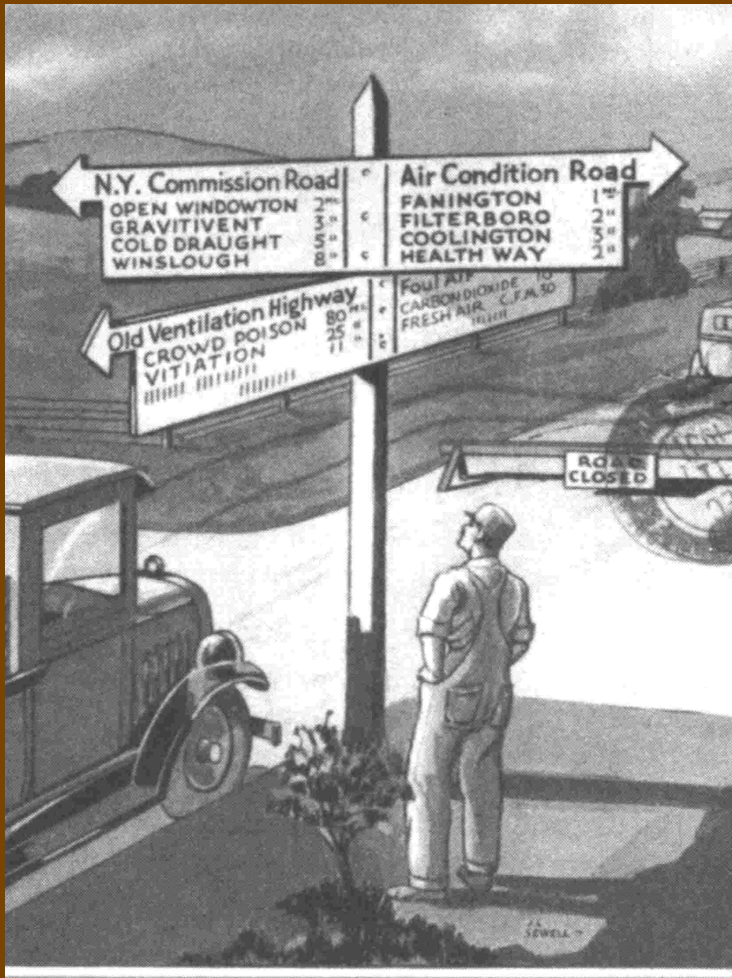
Cultural



Revaluing different ways of life

Importing sustainable expectations &
ways of coping (e.g. the siesta,
relaxing clothing standards, etc.)

Achieving comfort in a lower carbon society



- People are locked into comfort paradigms (technologies and practices)
- Improving efficiency is not the sole driver for change
- Reviewing temporal & social orderings of daily life
- Redefining boundaries of indoor/outdoor living

See special issue of *Building Research & Information*:
'Comfort in a Lower Carbon Society' (2008)