



















## International Scientific Committee

Lidia Morawska	(Australia)	Shu									
Richard de Dear	(Australia)	Tak									
Franz Reinthaler	(Austria)	Dor									
Peter Wouters	(Belgium)	Dor									
Claudia Dos Santos	(Brazil)	Муι									
Faribroz Haghighat	(Canada)	Yoo									
Hans W. Schleibinger	(Canada)	Adr									
Yi Jiang	(China)	Atze									
Yinping Zhang	(China)	Jaa									
Zhiwei Lian	(China)	Har									
Yugo Li (Hongko	ong, China)	Jan									
Jelena Macan	( )										
Karel Kabele	(Cz. Rep.)	Edu									
Henrik Brohus	(Denmark)	Flor									
Henrik N. Knudsen	(Denmark)	Mar									
Jan Pejtersen	(Denmark)	Bra									
Lars Gunnarsen	(Denmark)	Kwo									
Per Axel Clausen	(Denmark)	Cha									
Peter V. Nielsen	(Denmark)	Dus									
Essam Khalil	(Egypt)	Pet									
Helena Rintala	(Finland)	Ing									
Jarek Kurnitski	(Finland)	Per									
Anne-Marie Bernard	(France)	Ger									
Francis Allard	(France)	Hue									
Birgit Müller	(Germany)	Ant									
Dirk Müller	(Germany)	Cla									
Klaus Breuer	(Germany)	Haz									
Tunga Salthammer	(Germany)	And									
Mats Santamouris	(Greece)	Buc									
László Kajtár	(Hungary)	Cha									
Ofeigur Freysson	(Iceland)	Edv									
James McLaughlin	(Ireland)	Hal									
Avraham Shitzer	(Israel)	Jele									
Francesca d'Ambrosio	(Italy)	Joh									
Marco Perino	(Italy)	Qin									
Michele De Carli	(Italy)	Ricl									
Hiroshi Yoshino	(Japan)	Will									
Koichi Ikeda	(Japan)	Will									
Shin-ichi Tanabe	(Japan)	Will									
Shinsuke Kato	(Japan)	Ricl									
		loh									

Shuzo Murakami	(Japan)
Takashi Akimoto	(Japan)
Dong-Chun Shin	(Korea)
Dong-Won Yoon	(Korea)
Myung-Do Oh	(Korea)
Yoon-Shin Kim	(Korea)
Adnan Husain	(Malaysia)
Atze Boerstra	(Netherlands)
Jaap Hogeling	(Netherlands)
Hans Martin Math	
Jan Vilhelm Bakke	e (Norway)
Zbigniew Popiolel	
Eduardo Fernand	des (Portugal)
Florea Chiriac	(Romania)
Marianna Brodato	h (Russia)
Branko Todorovic	(Serbia)
Kwok Wai Tham	(Singapore)
Chandra Sekhar	(Singapore)
Dusan Petras	(Slovakia)
Peter Novak	(Slovenia)
Ingvar Holmer	(Sweden)
Per Fahlén	(Sweden)
Gerhard Zweifel	(Switzerland)
Huey-Jen Jenny S	
Anthony Pickering	g (UK)
Claire Aizlewood	(UK)
Hazim Awbi	(UK)
Andrew Persily	(USA)
Bud Offermann	(USA)
Charles Weschler	( /
Edward Bogucz	(USA)
Hal Levin	(USA)
Jelena Srebric	(USA)
John Girman	(USA)
Qingyan Chen	(USA)
Richard Corsi	(USA)
William Bahnfleth	(USA)
William Fisk	(USA)
William Nazaroff	(USA)
Richard Shaughn	essy (USA)
John D. Spengler	(USA)

## **Protector of the Conference**



## **His Royal Highness The Crown Prince**

President: Bjarne W. Olesen Vice presidents: Pawel Wargocki, Peter Strøm-Tejsen

National Organizing Committee:

The Royal Danish Academy of Fine Arts, School of Architecture
Bo Andersen
Danish Building Research Institute: Henrik N. Knudsen
Danish Technological Institute: Søren Østergaard Jensen
National Research Centre for the Working Env.:
Peder Wolkoff, Finn Gyntelberg
Aalborg University:
Per Heiselberg
Aarhus University:

Lars Mølhave, Marianne Glasius Søren Kjærgaard, Torben Sigsgaard

Department of Civil Engineering, DTU: Carsten Rode
Int. Centre for Indoor Environment and Energy
Technical University of Denmark:
Arsen Melikov, Carl-Gustaf Bornehag, Lei Fang
Geo Clausen, Gunnar Langkilde, Jan Sundell
David P. Wyon, Jørn Toftum

Official Airline for Indoor Air 2008











Systemair





# Indoor Air 2008

The 11th International Conference on Indoor Air Quality and Climate

www.indoorair2008.org



17 - 22 August Copenhagen Denmark



















# **Indoor Air 2008**

## **Technical University of Denmark**

# Invitation

Welcome to Indoor Air 2008 – the leading international scientific conference on Indoor Air Quality and Climate.

### 30th Anniversary

The Indoor Air series started in 1978 in Copenhagen, Denmark. At the 11<sup>th</sup> congress in 2008 we will celebrate the 30 year anniversary of the inaugural conference by revisiting Copenhagen.

## Multidisciplinary and Cutting-edge

The 11<sup>th</sup> Indoor Air conference is a multidisciplinary event involving participants from medicine, engineering, architecture and related fields.

The programme includes 11 keynote speakers, 800 technical presentations and 33 discussion forums.

The congress covers all aspects of Indoor Air and Climate and the effects on human health, comfort and productivity and addresses a variety of indoor environments – residential, office, school, industrial, commercial and transport.

# **Keynote speakers**

#### Ib Andersen, Director emeritus

Before the Big Bang of Indoor Climate Research

#### John Spengler, Harvard University

A Generation of Indoor Air Science: Have We Made a Difference?

## John Girman, US Environmental Protection Agency (EPA)

Impacts of Climate Change on Indoor Environments

## Michal Krzyzanowski, WHO Regional Office for Europe

Development of WHO Guidelines on Indoor Air Quality

### Hannu Komulainen, National Public Health Institute, Finland

The Opinion on Risk Assessment on Indoor Air Quality by SCHER

## Kjell Andersson, Örebro University Hospital

Indoor Climate and Health: What Do We Really Know?

### Uffe Juul Jensen, Aarhus University

Healthy Housing: Scientific Evidence and Cultural Values

## Hadi Teherani, Hadi Teherani AG

Modern Architecture

#### Matthias Schuler, Transsolar ClimateEngineering

Strategies for Energy Efficient Design and Indoor Environmental Quality in Buildings

#### David R. Space, Boeing

Indoor Environmental Quality in Air Cabins

## Yinping Zhang, Tsinghua University

Air Cleaning

## **Forums**

- Thermal Comfort or Health?
- Public Private Partnership and Indoor Environmental Quality
- Strategic IEQ Improvement for Schools
- The Healthy Eye in Offices How?
- What Is Indoor Air Quality?
- What Should (Can) Be Measured And Why?
- Modern Exposures And Modern Diseases
- Indoor Semi-Volatile Organic Compounds
- Why is the environment in buildings often mediocre?
- Energy Conservation in Buildings and Sustainability Compatible with Healthy Indoor Environment?
- Sensor System for Measuring Perceived Air Quality
- Source Characterization and Labeling
- Measurement of VOC Emissions from Building Materials: Uncertainty and Standardization
- Virtual CFD Manikins
- ETS in Multi-Family Housing: Exposures, Controls, and Legalities
- Particles in Indoor Air and Health Effects
- Contaminant Exposure via Indoor PM2.5 Carrier Particles
- Scaling of Material Emission Test Results
- Developments in Personalized Ventilation
- Ventilation Rate Measurements Based on Metabolic CO2
- Challenges Associated with Heterogeneous PCO Air-cleaning Techniques and Potential Solution Approaches
- Natural Ventilation for Infection Control in Hospitals Yes or No?
- Recent Advances on Interventions in Non-Industrial Working Environments
- EN 15251: How can we evaluate thermal comfort for low-energy cooling concepts?
- Evaluation of Performance of Advanced Ventilation Systems
- Need for Ventilation Guidelines and Standards in Europe
- Air Filtration for Good Indoor Climate and Energy Efficient HVAC Systems
- Development and Uses of WHO Indoor Air Quality Guidelines
- Can We Set Health-Protective Ventilation Standards for Buildings and Maintain Them in the Face of Pressure for Energy Conservation?
- Emerging IEQ Issues in Asian Countries
- Effects of IEQ on Performance The Need for Future Research
- IEQ in Transportation
- Development of a Standard for Moulds

# **Programme**

Friday						o ratales dessuns 6 TS (Oral + Poster) 2 Forums				Public session with summaries of the conference				Award	Next conference														
Thursday										Parallel Sessions	6 TS (Oral + Poster)	2 Forums	Break	Parallel Sessions	6 TS (Oral + Poster)	3 Forums	Break	Poster session	3 Forums			Conference Dinner	Downtown	Copenhagen					
Wednesday	Registration	Acionical discussion	reynotes with discussion	Break	8 Parallel Sessions		2 Forums	Lunch	5	Indoorers	go out							Town Hall	Reception				Visit	TIVOLI					
Tuesday												Parallel Sessions	6 TS (Oral + Poster)	2 Forums	Break	Parallel Sessions	6 TS (Oral + Poster)	3 Forums	Break	Poster session	3 Forums								
Monday											Parallel	6 TS (Ore	2 Fc	Ā	Parallel	6 TS (Ora	3 Fc	B	Poster	3 Fc	ISIAQ AGM		Students Night	at DTU					
Sunday		ISIAQ BOD						Indoor Air Journal	Editorial Meeting		IAIAS Meeting	(until 16:00)		Registration		Welcome.		Keynote	Welcome December			Dorformana							
Time	08:30	00:60	06:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	19:30	20:00	20:30	21:00	21:30		

www.indoorair2008.org