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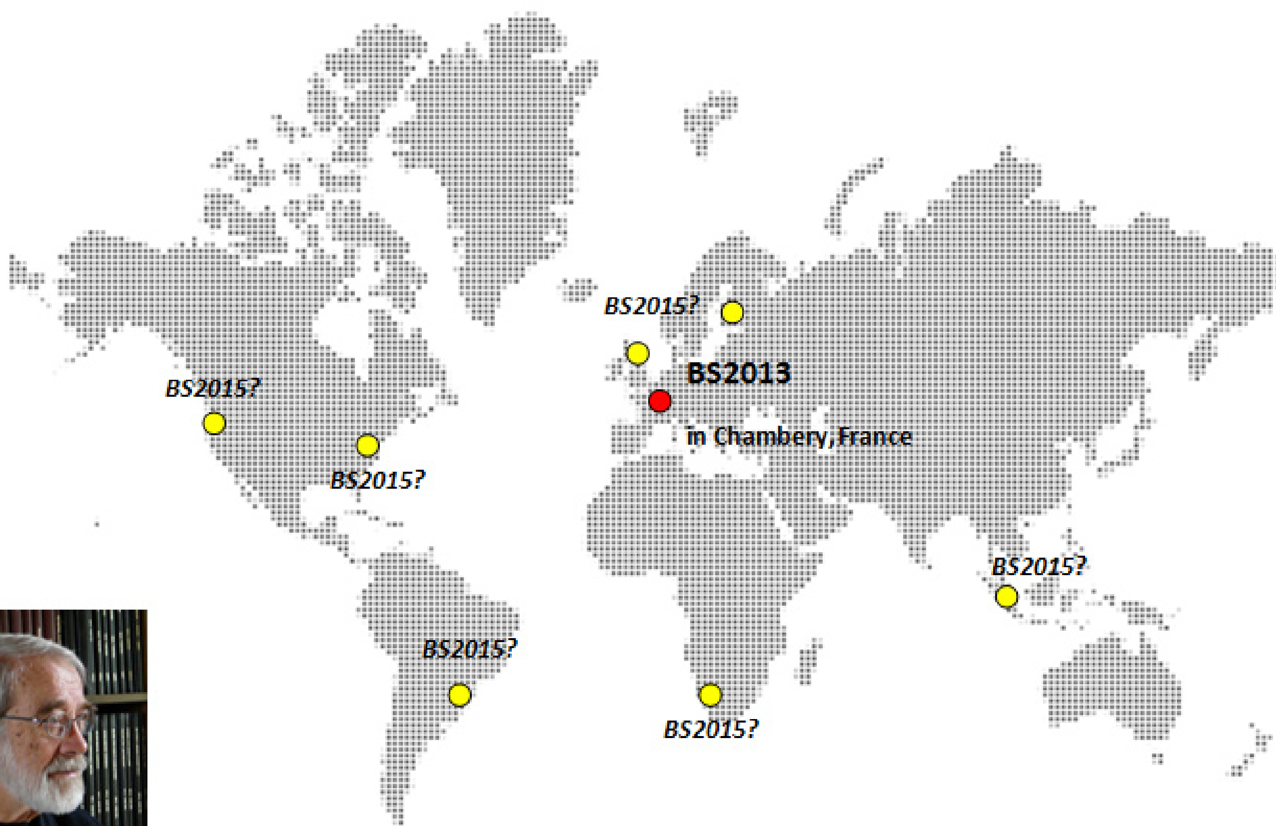
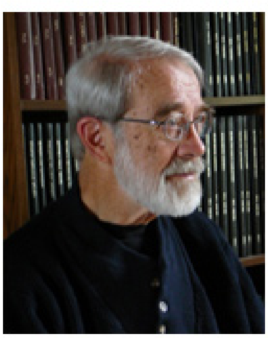




Dedicated in memory of Curtis O. Pedersen

GLOBAL COMMUNITY NEWS from IBPSA Australasia, Canada, China, Egypt, England, France, India, Italy, Korea, Nordic and USA — and 17 events for your diary from around the world

INTERVIEWS with Jonathan Wright of Loughborough University, UK and Hugo Hens of the University of Leuven, Belgium

FEATURE ARTICLE by Hugo Hens on the limitations of Heat, Air and Moisture (HAM) modelling and problems encountered in practice

ISSN 1993-8586

Contents

President's message

Dear IBPSA colleagues and friends,

I've just returned from a trip to the UK where I had the pleasure of attending IBPSA-England's inaugural conference, *Building Simulation and Optimization 2012*. The event was superbly organized, well attended, and had a flavour unlike other IBPSA regional conferences I have attended. That is a strength of our society: each affiliate organizes events pertinent to its local membership and each innovates in its own way; and there is a collegial and open sharing of experiences and ideas between affiliates that helps our society evolve in positive directions.

Besides England, many other IBPSA affiliates have held (or are about to hold) conferences this year, including France, Canada, USA, Germany, Czech Republic, and Italy. And three affiliates (China, Japan, Korea) are combining efforts to organize a joint conference, *ASim*. These events are normally announced on **www.IBPSA.org**; I strongly encourage you to actively participate in one or more of these regional conferences in the future.

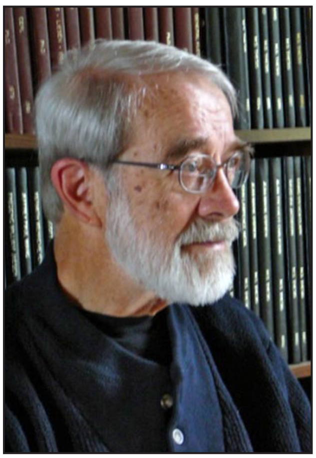
While on the subject of conferences, allow me to plug the *Building Simulation 2013* conference that will be held in Chambéry, France next August. I recently spent a week in the beautiful Savoie department where the conference will be held. I can guarantee that the Organizing Committee will be putting on an event that will impress and please us all, and that will create positive memories for years to come. By the time you read this newsletter, the conference's Scientific Committee will be hard at work reviewing the record number of abstracts that were submitted. Mark the dates on your calendar as you will not want to miss what will likely be the largest gathering ever dedicated to the topic of building performance simulation. (Not to mention a fabulous programme that will be filled with French culture and good food and wine!)

IBPSA's Board of Directors held its annual meeting in September in Loughborough. This meeting was hosted by IBPSA-England and was organized to coincide with their conference. Our society is growing rapidly—there are now over 4,700 members in 27 chapters. This is, of course, a positive development; but, such rapid growth also brings with it new challenges. Some important decisions were taken regarding the future directions for the society at the annual board meeting to ensure that IBPSA continues to evolve in ways that best serve the needs of its members and our community at large. The next annual board meeting will be held in conjunction with *Building Simulation 2013* on August 29. All members of the society are welcomed and encouraged to attend this meeting to learn more about how the society is governed. (And to loan a hand working on one of IBPSA's many committees!)

Happy simulating to all.

Tribute to Dr Curtis O. Pedersen
1934 - 2012

Jeffrey D. Spitler and Daniel E. Fisher



Dr. Curtis Oneal Pedersen, Professor Emeritus of Mechanical Engineering, passed away on July 10, 2012 at his home in Hastings, Minnesota. He is survived by his wife, Carolyn, his son Mark, daughter and son-in-law, Krista and Larry Betcher, and two grandsons, CJ and Kyle Betcher.

He was born on November 2, 1934 and grew up on the family farm near Tyler, Minnesota. After receiving his Bachelor's degree from South Dakota State University and Master's degree from University of Minnesota, he went to work for General Electric, then PPG Industries. After earning a Ph.D. in mechanical engineering from Carnegie-Mellon University in 1968, he served as a professor at the University of Illinois at Urbana-Champaign until retiring – mainly from teaching and university committee work, but not from research - in 1993. After his official retirement, he remained very active in the field, developing EnergyPlus and working on other projects. At the time of his death he was working on an ASHRAE research project on simulation of radiant systems with Chip Barnaby.

Curt's contributions to building simulation began in the late 70's with his involvement in the development of the Building Loads Analysis and System Thermodynamics (BLAST) program. BLAST was developed by a team at the US Army Construction Engineering Research Laboratory (CERL) led by one of his Ph.D. students, Doug Hittle. In 1983, Dr. Pedersen founded the BLAST Support Office, and over the next twelve years directed development of new models and features by a team of graduate students, research engineers and research programmers.

In 1995, the Department of Energy selected a research version of BLAST, developed by Russ Taylor, one of his Ph.D. students, as the basis for the next generation EnergyPlus program. Curt and his students were active in EnergyPlus development for another ten years. His contributions ranged from HVAC system component models, such as stratified thermal storage tanks, to fundamental heat transfer algorithms for building walls and slabs. His work in integrating quasi-steady state simulations with different characteristic time scales formed the basis of the EnergyPlus split-time step solution methodology.

Curt was a tireless proponent of the heat balance method that formed the basis of both BLAST and EnergyPlus and was instrumental in developing the heat balance based load calculation procedures currently used by ASHRAE. His contributions in this area include numerous archival journal and conference papers on the topic as well as the book, Load Calculation Principles, and the ASHRAE Loads Toolkit, a simulation workbench for both developers and students.

Curt was a founding member of IBPSA and later served as president of IBPSA-USA. As president of IBPSA-USA, Curt introduced the very successful dinner meeting format. He was also honored as a fellow of both societies and received the IBPSA Distinguished Service Award in 2003.

During his time at the University of Illinois, Curt was a well-liked and well-respected teacher, a leading researcher internationally recognized in the fields of building simulation and building heating /cooling systems, and an adviser and mentor to more than 50 graduate students. He introduced many graduate students to the field of building simulation. He was remarkably successful at passing the torch to his graduate students, many of whom are now leaders in industry or professors at universities throughout the U.S. ■

IBPSA-USA meeting in Boulder, Colorado (2004)

At the ASHRAE meeting, celebrating the 4th of Curt's students to become ASHRAE Fellows (2010)

Before dinner at the ASHRAE meeting (2012)

Journal of Building Performance Simulation's new Impact Factor

Joe d'Angelo, Managing Editor, Building, Construction, Civil Engineering & Energy, Taylor & Francis

We are delighted to announce that the Journal of Building Performance Simulation, IBPSA's official journal, received its first Impact Factor of 0.718 in July this year.

At the simplest level, journal impact factors give the mean number of citations received by articles in a particular journal; essentially, the mean number of times that articles in a journal are referenced by other articles.

Calculating an impact factor requires a denominator (the total number of articles published) and a numerator (the total number of citations received by those articles). A time period, or 'window,' needs to be defined for both these variables.

The impact factors published by Thomson Scientific each year in the Science and Social Editions of the Journal Citation Reports (JCR) are often referred to as two-year impact factors and use very specific publication and citation windows. The citation window here is the Impact Factor year and the publication window refers to the two previous years. Therefore, the Journal of Building Performance Simulation's first Impact Factor (released in 2011) was calculated as follows:

Cites in 2011 to items published in:	**2010 = 13**	**Number of items published in:**	**2010 = 20**
	2009 = 15		**2009 = 19**
	Sum: 28		**Sum: 39**

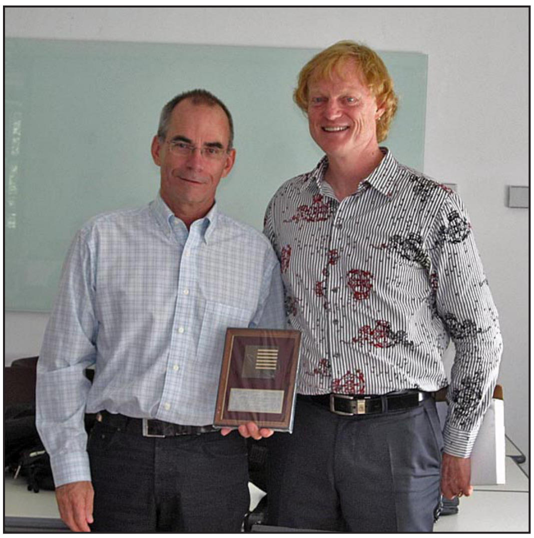
$$\text{Impact factor} = \frac{\text{Cites to recent items} \quad 28}{\text{Number of recent items} \quad 39} = 0.718$$

Each article published is included in the denominator for two impact factor years (the two years after the year of publication). Thus, an article published in 2010 will be included in both the 2011 and 2012 Impact Factors. Citations received in the year of publication or in the third year after publication or later will not count towards any impact factor calculation.

Six of the 28 citations used in the Impact Factor calculation come from articles published in the Journal of Building Simulation itself, with the remainder of citations coming from other journals in the field. These citations from the Journal of Building Performance Simulation are termed 'self-citations' in the JCR. Thomson Scientific will 'suppress' a journal's Impact Factor if the self-citation rate gets too high as they feel that it is indicative of a journal catering to a small, insular research community or a journal that artificially inflates its Impact Factor by asking authors to add in references during the review process. Self-citation at a low level is healthy, showing that authors are using previous papers in the journal in their research while the journal is still catering to a wide audience of researchers.

As it is, the Journal of Building Performance Simulation has an excellent first Impact Factor and, due to the value and quality of the research published in the Journal, is likely to keep on seeing improvements. ■

Congratulations, Jan!



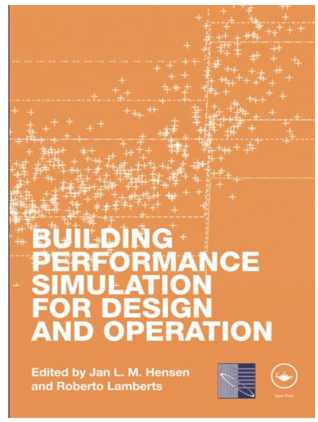
During the last IBPSA Board meeting in Loughborough, Jan Hensen was awarded a special honorary IBPSA plaque in recognition of his long-standing service to IBPSA.

Jan joins an elite list to have achieved such an honour including the likes of Jeff Spitler and Larry Degelman. ■

Jan Hensen and Ian Beausoleil-Morrison at the last IBPSA Board meeting in September 2012

Building Performance Simulation for Design and Operation

Jan L.M. Hensen and **Roberto Lamberts**



Effective building performance simulation can reduce the environmental impact of the built environment, improve indoor quality and productivity, and facilitate future innovation and technological progress in construction. It draws on many disciplines, including physics, mathematics, material science, biophysics and human behavioural, environmental and computational sciences. The discipline itself is continuously evolving and maturing, and improvements in model robustness and fidelity are constantly being made. This has sparked a new agenda focusing on the effectiveness of simulation in building life-cycle processes.

Building Performance Simulation for Design and Operation begins with an introduction to the concepts of performance indicators and targets, followed by a discussion on the role of building simulation in performance-based building design and operation. This sets the ground for in-depth discussion of performance prediction for energy demand, indoor environmental quality (including thermal, visual, indoor air quality and moisture phenomena), HVAC and renewable system performance, urban level modelling, building operational optimization and automation.

Produced in cooperation with the International Building Performance Simulation Association (IBPSA), and featuring contributions from fourteen internationally recognised experts in this field, this book provides a unique and comprehensive overview of building performance simulation for the complete building life-cycle from conception to demolition. It is primarily intended for advanced students in building services engineering, and in architectural, environmental or mechanical engineering; and will be useful for building and systems designers and operators.

Selected Table of Contents

January 2011 |536pp | Hb: 978-0-415-47414-6 | £65.00

About the Authors

Jan L. M. Hensen *(Ph.D. & M.S., Eindhoven University of Technology) has his background in building physics and mechanical engineering. His professional interest is performance-based design in the interdisciplinary area of building physics, indoor environment and building systems. His teaching and research focuses on the development and application of computational building performance modelling and simulation for high performance.*

Roberto Lamberts *is a Professor in Construction at the Department of Civil Engineering of the Federal University of Santa Catarina, Brazil. He is also currently a board member of the IBPSA, Vice-President of the Brazilian Session and Counsellor of the Brazilian Council for Sustainable Buildings.*

Interview with Jonathan Wright

at the first IBPSA-England conference

Christina J Hopfe, Editor-in-Chief of *ibpsa*NEWS, interviews Jonathan Wright after the first IBPSA-England conference on *Building Simulation and Optimization* (BSO 2012), in Loughborough.

The first IBPSA England conference was held in Loughborough from 10-11 September 2012. It was IBPSA-England's first national conference, organised in association with the Chartered Institution of Building Services Engineers (CIBSE) and hosted by Loughborough University.

The conference had three broad themes:

- New performance models and simulation methods
- Procedures for optimizing design and operation
- Real-world case studies

139 abstracts had been received, with 56 papers published in the end. 46% of these were submitted from outside the UK. The attendance for a local conference and the first IBPSA-England was very impressive as well: in total, more than 100 delegates from 17 countries, with 42% attending from outside the UK for the two days.

Two key note speakers from industry were invited, Judit Kimpian from AEDAS on day one and Giulio Antonutto from Arup in London on the second day; both showing their efforts in integrating optimization in daily projects. In the case of the second keynote speaker, the applied use of optimisation dated back to 2000!

Jonathan Wright announcing the Paper Award winners during the Conference dinner

Christina Hopfe (CJH): Jon, first of all, congratulations to you and Malcolm Cook for organizing such a fantastic conference on a very relevant topic. Now that the conference is over, how do you feel?

Jonathan Wright (JAW): Thank you. As anyone who has run a conference knows, it's a lot of work, but both Malcolm and I are very pleased with the conference. Personally, I'm also humbled by the support for the conference, particularly the numbers of papers and delegates from outside the UK.

CJH: The conference was clearly a success; how did the idea to dedicate it to optimization come up in the first place?

JAW: Well let's not forget that modelling and simulation were also key themes of the conference; but as you suggest, this was the first conference, at least the first that I am aware of, that gave some emphasis to building optimization as well as simulation.

The inclusion of optimization as a conference theme stems from my interest in the topic, and also a recognition that interest in the field has grown considerable over the last 10 years. We also wanted to give the conference an identity, something that would make it different from the other regional conferences and draw-in participants from outside the UK.

CJH: Both of the keynote speeches emphasised lighting design in their optimization studies. However during the conference itself, there was only one paper that similarly addressed lighting optimization. Do you think that is an area which still has significant research potential?

"If you get the daylight design right during the very early design, you will go a long way to producing a low-energy building"

JAW: Personally yes, although some people I have talked to are less convinced. I've just completed a collaborative research project on building optimization, the collaborators being architects as well as engineers. We spent more time talking about how to implement the window optimization than any other building element. One particular discussion gave rise to one of those rare occasions when the architects and engineers agreed, that if you get the daylight design right during the very early design, you will go a long way to producing a low-energy building.

CJH: To my knowledge your research in optimization goes back to the beginning of the '80s. In 1986 you completed your PhD thesis on The optimized design of HVAC systems *followed by your first paper on* The formulation, characteristics and solution of HVAC system optimized design problems *a year later.*

It seems that no one else has worked as consistently as you have on optimization in building simulation, and you are one of the pioneers in this area. To quote your final words at the conference: "Only a handful of people buried themselves in these pointless tasks" at that point in time. Are you pleased to see that the community has risen to a much more significant number and that the people involved seem less inclined to hide in the "basement" any more?

JAW: It's kind of you to say I've been some sort of pioneer in the field, but as you also say, that's just because very few people at the time were interested in optimization. Actually my first study on model-based optimization was for my undergraduate dissertation; I used a Fibonacci line search to minimize the life-cycle cost of heat recovery systems. I should say that the early inspiration for my research was a book called *Design of Thermal Systems* by Wil Stoecker; it's out of print now, but had all the concepts you needed to get started on model-based optimization.

Am I pleased with the increased interest in optimization, yes of course. If nothing else it's good see that I wasn't completely misguided in pursuing the topic for so long. It's also good to see so many different ideas emerging and the field now developing at a faster rate.

CJH: You have personally had a number of papers about optimization published at this conference. Could you please tell us briefly what your current efforts are in optimization?

JAW: The papers in the conference relate to the link between sensitivity analysis and optimization, and the need for concrete approaches to interpreting the output from multi-objective optimization. We are continuing to work on both of these and other related topics, although at a low level rather than through any major research programme. We are just about to start work on methods for optimizing the resource allocation in urban-scale domestic refurbishment projects. At present this looks to be a challenging problem due to the number of different buildings and range of building parameters optimized, although I wouldn't be surprised if we found a way to reduce the scale of the problem once we get started on the research.

CJH: And finally, how do you see the future of optimization in building simulation evolving in the coming years?

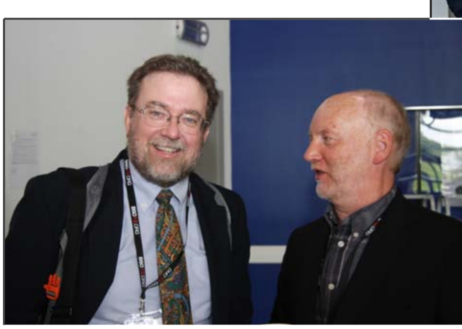
JAW: Well that's difficult to say, but it will, or at least should, be driven by the needs of designers, and building operators; let's not forget the role of optimization in model-based control. I think that there are three things that any designer or building operator wants to know: what are the optimized solutions; how robust are the solutions; and what are the most important or influential parameters? As you know, and we saw at the conference, this is one of the drivers for the increasing integration of optimization methods, uncertainty analysis, and sensitivity analysis. I should say that I include any approach that relies on the parametric exercising of the simulation model under the umbrella of optimization research.

"[In the future, building simulation] will, or at least should, be driven by the needs of designers"

As well as more work on the numerical methods, particularly on robustness, there's a lot more work to be done on the applications. Most of the research that we see at building simulation conferences is focused on the scheme or detailed design stages, that is, design stages in which the form of the building is pretty much fixed. Integrated modelling and optimization tools for use in designing the building form do exist, but I think there is a need for more work on how to use make the most of optimization in very early design.

CJH: Many thanks for a fantastic conference and your time in answering these questions! ■

Some scenes from the conference:



Top left: Main lecture theatre
Top right: Paul Strachan and Ian Beausoleil-Morrison
Bottom left: Jeff Spitler and Joe Clarke
Above: The conference team

IBPSA-ENGLAND Paper Awards

Two papers presented at BSO 2012 were given awards:

Prize paper on the theme of *Modelling and Simulation*

sponsored by Cham Limited:

Daylighting Metrics: Is There A Relation Between Useful Daylight Illuminance And Daylight Glare Probability?

J. Mardaljevic[1], M. Andersen[2], N. Roy[3] and J. Christoffersen[3]

[1] *IESD, De Montfort University, The Gateway, Leicester, LE1 9BH, UK*

[2] *EPFL ENAC IA LIPID, Lausanne, CH - 1015, Switzerland*

[3] *VELUX A/S, A° dalsvej 99, DK-2970, Hørsholm, Denmark*

The paper describes the development of metrics for evaluating the probability of glare, and in particular the relationship between daylight illuminance and glare.

Prize paper on the theme of *Building Optimization*

sponsored by DSSR Consulting Engineers:

Uncertainty-weighted Meta-model Optimization In Building Energy Models

Bryan Eisenhower[1], Vladimir Fonoberov[2], and Igor Mezi´c[1]

[1] *Department of Mechanical Engineering, University of California, Santa Barbara*

[2] *AIMdyn Inc., Santa Barbara, California*

The paper describes the integration of uncertainty analysis, meta-models and optimization methods for large-scale fast and robust optimization. ■

Forthcoming events

Date(s)	Event	Information
2012		
07-09 November 2012	**28th International PLEA Conference** Lima, Peru	www.plea2012.pe
25-27 November 2012	**ASim 2012: IBPSA-China, IBPSA-Japan and IBPSA-Korea joint conference** Shanghai, China	http://asim2012.tongji.edu.cn
10-13 December 2012	**CDC 2012: IEEE Annual Conference on Decision and Control** Maui, Hawaii, USA	http://www.ieee.org/conferences_events/conferences/conferencedetails/index.html?Conf_ID=16706
21-22 December 2012	**IBPSA-India 2nd National Conference** Jaipur, India	
2013		
22 January 2013	**GEOTABS symposium** Hanover, Germany	http://geotabs.eu/symposium-2013
26-30 January 2013	**ASHRAE 2013 Winter Conference** Dallas, Texas, USA	http://ashraem.confex.com/ashraem/w13/cfp.cgi
30 January - 01 February 2013	**Building Simulation Applications 2013** Bolzano, Italy	www.unibz.it/en/sciencetechnology/welcome/IBPSA.html
07-10 April 2013	**SimAUD 2013: 4th annual Symposium on Simulation for Architecture and Urban Design** San Diego, California, USA	www.simaud.org/2013
16-19 June 2013	**CLIMA 2013: REHVA World Congress** Prague, Czech Republic	www.clima2013.org
22-26 June 2013	**ASHRAE Annual Conference** Denver, Colorado, USA	www.ashrae.org
23-24 June 2013	**Building Simulation Cairo** Cairo, Egypt	
25-30 August 2013	**Building Simulation 2013** Chambery, France	www.bs2013.fr
09-11 September 2013	**Central European Symposium on Building Physics** Vienna, Austria	www.cesbp2013.org
22-27 September 2013	**Greensys 2013: New Technologies for Environment Control, Energy-saving & Crop Production in Greenhouse and Plant Factory** Jeju, South Korea	http://www.ishs.org/news/?p=1608
2014		
18-22 January 2014	**ASHRAE 2014 Winter Conference** New York, USA	www.ashrae.org

continues overleaf →

2014 (continued)		
10-11 June 2014	**Building Simulation and Optimization 2014** London, UK	
28 June -02 July 2014	**ASHRAE Annual Conference** Seattle, Washington, USA	**www.ashrae.org**

Note that the dates in this calendar may, but do not necessarily, include pre and/or post-conference workshop days

25-27 November 2012
Shanghai, China
http://asim2012.tongji.edu.cn

ASim 2012: IBPSA-China, IBPSA-Japan and IBPSA-Korea joint conference on Simulation for Real Performance

ASim2012
IBPSA Asia Conference
Simulation for Real Performance
Shanghai, China
November 25-27, 2012

Invitation

We sincerely invite you to attend the 1st Asia conference of International Building Performance Simulation Association. This biennial conference will provide a platform for professionals, designers, engineers and students exchanging ideas, knowledge and information about building performance simulation. The meeting will have keynote speeches, technical sessions and workshops discussing all aspects of building simulation around the theme of "Simulation for Real Performance". We are looking forward to seeing you in Shanghai!

Call for Abstract

Authors should submit abstracts (300~400 words) via online webpage http://asim2012.tongji.edu.cn.

Selected papers will be recommended to two prestigious journals: (1) Building Simulation: An International Journal; (2) Journal of Building Performance Simulation.

Conference Topics

- Simulation and real performance
- Simulation in design practice
- Simulation for regulation/code compliance and certification
- Simulation for commissioning, controls and monitoring
- Software/interface development, test and validation
- Case studies of building simulation application
- Advanced building simulation

Scientific chair: Prof. *Yingxin ZHU*

Organizing Committee: *Yiqun PAN (chair)*
Peng XU (co-chair)
Zhengrong LI
Naiping GAO
Rui FAN

Hosted by

同濟大學 TONGJI UNIVERSITY

Co-hosted by

清華大學 Tsinghua University

IBPSA-China

IBPSA Japan

IBPSA KOREA

Important Dates

- April 1st — Online abstract submission opens
- May 13th — Abstract submission deadline
- June 3rd — Abstract acceptance notification
- July 15th — Draft paper submission deadline
- September 16th — Paper acceptance notification

Contact Information

Website：http://asim2012.tongji.edu.cn
E-mail：2012asim@tongji.edu.cn;
Chair：Yiqun PAN yiqunpan@tongji.edu.cn

Conference secretary：Naiping GAO gaonaiping@tongji.edu.cn

21-22 December 2012
Jaipur, India

Simulation of Buildings for Energy Efficiency and Better Built Environment: IBPSA-India's 2nd National Conference

Conference themes

IBPSA-India's 2nd National Conference will bring together researchers and professionals from a broad set of science and engineering disciplines with the aim of sharing the latest technology and innovations in the areas of:

- Thermal simulation
- Daylight simulation
- Simulation of natural ventilation
- Simulation of passive cooling systems
- Building Integrated Photovoltaic Systems
- Simulation for code compliance

Hands-on training workshops

Day long hands-on simulation training workshops will be led by experienced trainers from around the world, using IES-Virtual Environment. This is one of the most widely-used simulation tools worldwide, able to handle energy, ventilation, passive cooling, HVAC systems and CFD analysis. Activities will include hands-on exercises and examples.

An additional workshop is being planned on energy simulation for compliance with Energy Conservation Building Codes and allied topics.

Workshop participants must bring their own laptops, but short term software licences will be provided free of charge by the trainers.

Invited speakers

Prof. Godfried Augenbroe, Atlanta, USA
Prof. Augenbroe, Professor of Architecture at Georgia Institute of Technology, Atlanta, is one of the oldest warriors of building simulation worldwide. He has worked at several prestigious institutes working on building energy simulation, is the author of *Advanced Building Simulation*, and has supervised more than 25 PhD theses in building simulation over the years. His areas of work include risk analysis of energy investments, based on uncertainty analysis of building simulation models, new simulation based design models, intelligent building controls and fault diagnostics, and large scale retrofits.

Ar. TanmayTathagat, EDS Global, New Delhi
Ar. Tathagat is one of the most experienced building simulators in the country. He has worked on energy, daylight, artificial lighting of more than 150 green building projects. He is presently CEO of Environment Design Solutions, New Delhi. Prior to starting EDS, he graduated in Architecture from SPA, New Delhi and completed post-graduate study at Arizona State University, USA.

Shishir Gupta, Mechartes India, New Delhi
Shishir Gupta is a graduate in mechanical engineering from IIT Delhi and one of the founders of Mechartes India Pvt. Ltd., New Delhi which offers services in the field of engineering simulations. Mechartes India have been doing substantial work for building thermal comfort and smoke safety simulations using CFD, and have been involved in design verification of prestigious projects such as air flow and fire safety simulation for the Terminal-3 building at IGI Airport, New Delhi. Shishir Gupta has been involved in several projects of this scale in India, Europe, and elsewhere.

Registration fees

The registration fee for the conference is Rs. 2000/- for faculty members and professionals; and Rs. 500/- for the students. The fee includes free attendance at one workshop. Workshops have limited numbers of seats, which will be offered on a first come-first served basis when the registration fee is paid. Payments should be made by cheque/DD payable to 'Registrar, MNIT Jaipur', payable at Jaipur.

Accommodation

Some accommodation has been reserved for participants and will be offered at registration on a first come-first served basis. Please contact the organizers for details.

Jaipur

Jaipur is in Northern India, around 260 km south of Delhi. It offers many interesting places and attractions, including lush parks, several magnificent palaces and forts, and a wide variety of cuisine and entertainment. It is a city of fun, food and festivals. Vibrant colours, lively folk music and dance performances mark the celebrations of every religious occasion and every change of season. Jaipur, known as the Pink City, was founded in 1727 AD by one of the greatest ruler of the Kachhawaha clan, the astronomer king Sawai Jai Singh. This remarkable city was considered a marvel of town planning and drew the peace-loving merchants and craftsmen to its wide streets and mohallas, which were earmarked for them.

Contacts

convener.cee@gmail.com
Centre for Energy and Environment,
Malaviya National Institute of Technology
J.L.N. Marg, Jaipur (India) -302 017 ■

30 January - 01 February 2013
Bolzano, Italy
www.unibz.it/en/sciencetechnology/welcome/IBPSA.html

Building Simulation Applications 2013: 1st IBPSA-Italy conference

The Free University of Bolzano will host the first IBPSA-Italy Conference in the heart of the amazing Dolomite Mountains region. Delegates arriving in the afternoon of 30 January will be greeted with a welcome aperitif. The one-and-a-half day conference will open on the following morning with keynote speeches by Jan Hensen and Ardeshir Mahdavi. Technical sessions will proceed in parallel throughout the conference. A special session will be dedicated to the contributions of PhD students. The conference dinner will be held on the first evening, 30 January.

The event will close with a public Round Table about the role of building simulation. The local professional engineers association, AICARR (the Italian Association of Air conditioning, heating and refrigeration), and CTI (the National Thermotechnical Committee, in charge of technical standards development) will make contributions.

Some 60 abstracts have been received from universities, private firms and professionals from Italy and elsewhere since the Call for Papers was issued in July 2012. The conference language is English and the papers will be peer reviewed. The best papers selected by the Scientific Committee will be considered for publication in the Journal of Building Performance Simulation.

For further details or for sponsorships, please visit the conference website **www.unibz.it/en/sciencetechnology/welcome/IBPSA.html**, or contact the conference organizing board at **bsa2013.ibpsa-italy@unibz.it** or **bsa2013@ibpsa-italy.org**. ■

07-10 April 2013
San Diego, California, USA
www.simaud.org/2013

SimAUD 2013: 4th annual Symposium on Simulation for Architecture and Urban Design

Liam O'Brien, Conference Chair
Azam Khan, Conference Co-chair

We are pleased to welcome you to the **4th annual Symposium on Simulation for Architecture and Urban Design (SimAUD)**. This venue provides a fantastic opportunity for bringing together the brightest researchers and designers in the fields of architecture, building science, design, computer-aided design and simulation, and urban design. With the advent of high-performance computers and advanced design and simulation tools, we have the tools to predict how buildings and whole neighborhoods will perform long before they're built. SimAUD contributes to the growing knowledge pool that will allow society to reduce the environmental and economic impact of the built environment, through simulation and modeling.

In past years, attendees have included researchers in simulation, architecture, urban design and planning, visualization; engineers, architects, software developers, managers, educators, business professionals.

Past SimAUD symposia have attracted exceptionally high-quality submissions (papers, notes, works in progress, datasets, and videos) on a diverse range of topics. We encourage you to take advantage of the free downloads of previous years' proceedings. **We invite you to submit and present an original submission for SimAUD 2013 in San Diego, California, USA (April 7-10, 2013)**. All submissions are peer-reviewed and if accepted, will be published in the ACM Digital Library. Please observe the submissions types and deadlines on the Symposium website (www.simaud.org/2013). SimAUD is run collaboratively with ACM/SIGSIM and is sponsored by The Society for Modeling and Simulation International. ■

16-19 June 2013
Prague, Czech Republic
www.clima2013.org

CLIMA 2013: 11th REHVA World Congress and 8th International Conference on IAQVEC

The theme of this year's CLIMA 2013 is **Energy efficient, smart and healthy buildings.** Topics will include:

- Energy Efficient Heating, Cooling and Ventilation of Buildings
- Renewable and High-Efficient Energy Sources
- Advanced Heating, Cooling, Ventilation and Air- Conditioning Systems for Buildings
- Energy Efficient Domestic Hot Water Supply Systems
- Sanitary Systems
- Advanced Technologies for Building Acoustics
- Artificial and Day Lighting
- Technologies for Intelligent Buildings
- Quality of Indoor Environment
- Building Certification Schemes
- Integrated Building Design
- Commissioning and Facility Management
- HVAC Best Practice Examples
- Directive on Energy Performance of Buildings Implementation
- Zero Energy Buildings
- HVAC in Historic Buildings
- Fire Safety of Buildings

The deadline for submission of abstracts is **30 June 2012**.

Further information about the conference, registration and the venue (Prague Congress Centre, near the city centre with a panoramic view of Prague Castle) is available on the CLIMA 2013 website, www.clima2013.org. ■

23-24 June 2013
Cairo, Egypt

BS Cairo 2013: IBPSA-Egypt conference on Building Simulation

Towards Sustainable & Green Life

BS CAIRO

Conference of the Egyptian Affiliate of International Building Performance Simulation Association in Cairo, 23-24 June 2013

Above is the Best picture gallery; bestpicturegallery.com - Pyramids of Giza, Egypt, by Christopher Chan.

In Egypt, dreams about sustainable, green and high standards of built environment that reflects quality of life have faced many obstacles among them is the limited knowledge and awareness of the importance of designing on these bases. Therefore, EEER has worked since established to support spreading these concepts and outlines them also as it represents IBPSA affiliate in Egypt. You are then invited to publish in the Building Simulation Cairo Conference, BSCairo2013 Towards Sustainable & Green Life organized in co-operation with the Arabian Group for Development, AGD within the proceeding of InterBuild2013 at Cairo International Conference Centre 21-25 June. BSCairo2013 is the first conference in Egypt to gather such themes that covers our dreams for specialized venue.

Conference themes:

1- Energy in buildings.
2- Indoor environmental quality.
3– Climate change and architecture.
4– Sustainable development.
5- Renewable energy.
6- Green architecture.
7- Environmental design education.

Conference Board:

Reviewers of the conference are internationally recognized and famous experts;

1- Professor *Morad Abdel-Kader*
2- Professor *Ahmad Abdin*
3- Professor *Essam Khalil*
4- Professor *Adel Yaseen*
5- Professor *Ayman Hassan*
6- Professor *George Basilli*
7- Professor *Stephen Sharples*
8- Professor *Marialena Nikouloupolo*

Abstracts deadline; Thursday 24th of January 2013.
Full paper deadline; Thursday 18th of April 2013.
Note for acceptance; Thursday 16th of May 2013.
Organizing committee members also includes:
1- Dr. *Mohammad Fahmy*.
2- Dr. *Amr Gira*.
3- Dr. *Asmaa Hassan*.
4– Dr. *Marwa Da'biah*.
5- Eng, *Akmal Nadeem*.
6- Mr. *Mohammad Farouk*.
7- Eng, *Moataz Zidan*.
8- Eng, *Hala Nabil*.

Registration fees:

Egyptian publishers, 500LE.
Foreign publishers, 500$.
Non student Egyptian Attendee, 100LE
Non student Foreign Attendee, 100$.
CD for Conference papers, 50LE.

Contacts & Registration:

Secretary; md.fahmy@live.com
Registration; info@agd-exhibitions.net
More details will be available soon.

To know more about EEER;
http://eeer-society.wikispaces.com/Introduction
To join EEER email list; http://eepurl.com/i yEW6

25-30 August 2013
Chambery, France
www.bs2013.fr

Building Simulation 2013: IBPSA World Congress

IBPSA France has the pleasure of welcoming the next IBPSA World congress to Chambery, in the French Alps, from 25-28 August 2013. The program and scientific information will be announced in the next *ibpsa*NEWS, in April.

Venue

The conference, organised jointly by the French National Solar Energy Institute (INES) and the National Institute of Applied Science of Lyon (INSA), will be held at the Savoie Technolac on the western edge of the Alps, where France, Switzerland and Italy meet. Savoie is one of the most outstanding natural settings in Europe, and the Savoie Technolac is less than an hour's drive from Mont Blanc and the cities of Lyon, Grenoble and Geneva. It is half way between Chambéry, the third largest city in the Alps, and the spa town of Aix-les-Bains.

Themes

The conference themes will be:

- How simulation can influence the design process
- The limitations of simulation in practice, and how these can be addressed
- Case studies of the use of simulation in practice, and the lessons learned
- Interoperability and co-simulation
- Simulation validation, calibration and testing
- Comparing simulation and real world outcomes
- Simulation to support commissioning, controls and monitoring
- Applications of simulation in regulatory processes
- Advances in building physics
- Human aspects of indoor environment: comfort and behavior
- Building services
- Solar building simulation
- Energy capture and operation
- New work in simulation development
- The building as an energy node.

Key dates

Abstracts accepted:	30 October 2012
Full papers due:	31 January 2013
First review:	15 March 2013
Full papers accepted:	30 April 2013
End of early registration:	30 June 2013

Fees, registration and other information

Details of abstract requirements, fees, registration, travel, accommodation, the student modelling competition and other aspects of the conference are available from the conference website, www.bs2013.fr. Registration will open shortly through the website. ■

10-11 June 2014 — London, UK

BSO14: Building Simulation and Optimization 2014 — 2nd IBPSA-England conference

LATE ENTRY: GEOTABS international symposium

22 January 2013
Hanover, Germany
http://geotabs.eu/symposium-2013

The partners in the GEOTABS project would like to invite you to participate in an international symposium to be held in Hanover on 22 January 2013. Speakers from research centers, industry and engineering companies will share their experiences in designing and operating the GEOTABS office buildings, which are heated by near-surface geothermal energy. Topics covered will include:

- basic concepts
- technologies
- system simulation
- design
- monitoring and control
- users´ comfort
- standards

Further information and registration is available through the symposium website, http://geotabs.eu/symposium-2013. We hope to welcome you in Hanover. ■

Heat, Air and Moisture modelling:
an overview from Hugo Hens

A workshop was held in Dartington, UK on 4-7 October last year (2011) to discuss heat and moisture problems. It covered a number of different topics including the history of UK Building regulations, problems in the field of English heritage properties, and — of particular interest to IBPSA members — limitations and challenges in the computer simulation of hygrothermal behaviour in buildings.

One of the keynote speakers was Hugo Hens, professor emeritus from the University of Leuven (KULeuven) in Belgium, who has a long-standing reputation in this field and will be well known to anyone with a background in building physics. Hugo is (co)-author of 7 books on building engineering in Dutch, 4 in English, 68 articles in international journals, 51 articles in national journals, 167 papers in international conference proceedings, seminar proceedings and education readers, and 189 papers in national conference and symposium proceedings. He has been involved in some 500 practice cases.

Hugo's paper at Dartington summarized the problems we still face when using hygrothermal simulation, demonstrating their limitations with case studies illustrating a variety of real world problems.

We thought these first-hand lessons from someone as learned as Hugo too important not to share with the whole IBPSA community, so we are publishing his presentation in *ibpsa*NEWS. Part 1, a theoretical introduction to heat, air and moisture, is in this issue, and part 2, a selection of case studies, will appear in next April's issue, Volume 23 Number 1. Christina J Hopfe interviewed Hugo about his presentation:

Christina Hopfe (CJH): Hugo, could you please summarize briefly what this paper reflects?

Hugo Hens (HH): The paper reflects 42 years of activity in modelling, experimental work and building practice. I have written HAM-software, while simultaneously being heavily involved in testing and practice cases. The three cases in the paper were chosen out of some 500, ranging from breweries, textile factories, storehouses, apartment buildings, office buildings, swimming pools, hotels and the Haram al Sharif in Jerusalem through to private houses.

CJH: What sort of problems did these case studies actually face?

HH: Many had moisture problems, a lot had comfort problems and some had high energy bills. A lesson learned was that humid air ingress, not diffusion, acts as the main cause of interstitial condensation problems, although rain was the most important moisture source causing problems.

CJH: That is really interesting. Is there anything else that you would like to tell the reader at this point?

HH: One should warn building designers about the sometimes unexpected consequences in terms of durability when going for extremely low energy buildings. Today, I see governments promoting internal insulation, cavity wall post-fills, sloped roof insulation without any restriction! This might lead to unexpected service life problems in the years to come.

CJH: Thank you very much for sharing your experience and insights with us, Hugo!

Actual limits of HAM-modelling looking at problems encountered in practice

Part 1: A short history of Heat, Air and Moisture modelling

Hugo L. S. C. Hens, PhD, Prof. Em.

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Introduction

Moisture is a main cause of damage in buildings. Mould, mildew, rot, frost damage, salt attack, corrosion, cracking, blistering and swelling, all link to moisture, whereas air in- and exfiltration, wind washing, indoor air washing and air looping degrade thermal performance and may affect moisture tolerance. In the past, only testing allowed evaluating the moisture tolerance of newly developed assemblies [Rowley et al., 1939]. Although of importance to gain full understanding, experiments remain time consuming, expensive, and always limited to a few exemplary cases. That situation changed once increasingly powerful software tools for combined heat, air and moisture transport in building assemblies became available. Today, models look so complete and the software so nice that many practitioners believe they have the tools in hand now to predict, prevent and cure deficient heat, air and moisture responses of buildings and building assemblies.

The paper starts with a short history of heat, air, moisture modelling. Then the basic physics are reviewed, after which an overview is given of the weaknesses, the actual models still suffer from. This is then illustrated by four real world cases out of the many we were asked to cure[1].

A short history of heat, air and moisture modelling

Moisture modelling has its roots in soil science [Philip et al., 1957]. The continuum models used there were initially isothermal, as temperature gradients in soils are small. Later, models with temperature as additional driving force were advanced for combined heat and moisture transport in porous materials [Philip et al., 1957; Krischer, 1963; Luikov, 1966]. Aerated concrete was the first building material studied in depth [Van der Kooi, 1971; Nielsen, 1974]. End of the fifties, Glaser proposed a simple tool to evaluate interstitial condensation in freezer walls [Glaser, 1959]. Although developed for such walls, the method quickly gained popularity as a tool to evaluate the moisture response of building assemblies (Seiffert, 1967). In the USA, the tool got the name "the dew point method" [ASHRAE, 1993]. Vos et al 1967, Hens 1975, Hens 1978 and Hens et al, 1982 upgraded the Glaser method, among others by including capillary action thanks to the critical moisture content concept and by introducing more realistic monthly mean indoor and outdoor boundary conditions. These used the indoor climate class rationale and the equivalent outside temperature for condensation, which replaced the outdoor dry bulb temperature. Häupl et al, 1983 and 1984 also redressed Glaser to include capillary moisture transport. In the eighties and nineties, exploding computer capacity opened the way for models with the capability to simulate transient heat and moisture transport in composite one- and, later, two dimensional assemblies [Kießl, 1983; Kohonen, 1984; Pedersen, 1990; Duforestel, 1992; Karagiosis, 1993; Künzel, 1994; Grunewald, 1997; Burch et al, 1997; Arfvidsson, 1998; Janssen, 2002; Vinha, 2007]. Some of the software tools developed were finally marketed and became a reference for practitioners that way.

In the nineteen sixties long lasting field experiences in Canada showed air plays a dominant role in the hygrothermal response of roof assemblies [Orr, 1974]. However, of those listed above, only the model devel-

[1] *Editor's comment: The case studies will follow in part 2, to be published in ibpsaNEWS Vol 23 No 1, next April*

oped by Grunewald included air. An extended study at the laboratory of building physics of the University of Leuven on the causes of severe concealed condensation in pitched roofs confirmed the Canadian experience [Hens et al, 1996]. In Germany, Künzel et al, 1989, forwarded identical conclusions after a series of experiments on pitched roofs, as only air transport could explain the moisture response observed. Work of Cunningham, New Zealand, on cathedral ceilings gave further evidence [Cunningham et Al., 1994]. Other references also underlined the importance of air, although only a few contained experimental validation [Handegord, 1982; Rousseau, 1983; Ten Wolde, 1989]. Modelling air transport was first done by Kronvall, 1981, in his report on airflow in building assemblies. Cunningham, 1990 and 1994, described a heat and mass model, called SMAHT, which included air in- and exfiltration. In the IEA-Annex 24 report on modelling, six tools handling heat, air and moisture are mentioned [Hens, 1995]. Grunewald, 1997, explicitly added convective flows to the diffusive ones transporting heat and moisture in and across porous materials. Ojanen used a two-dimensional heat, air, moisture model to estimate the effects of airflow on the moisture response of timber framed walls [Trechsel ed., 1994]. Janssens, 1998, developed a two-dimensional tool to predict the heat, air, moisture response of lightweight roofs, while Ten Wolde, 1985, Hens et al, 1995 and Hens, 2007, extended the Glaser method by adding enthalpy and vapour flow induced by one dimensional air in- and exfiltration. Descamps, 1997, proved air even alters moisture flow at the micro-scale. When a porous material turns wet, capillary sucked water expels the air out of the pores until only enclosed air bubbles are left. These restrict capillary moisture uptake to a value sometimes far below saturation, which is called the capillary moisture content. When air outflow is not hindered, moisture uptake between dry and capillary develops as if air was absent with the capillary water absorption coefficient as a well-defined process constant. However, excluding air outflow turns that coefficient into a variable.

Models need material properties of which many are steep functions of the driving forces. Some anyhow looks easy to measure. We refer to density, dry thermal conductivity, the sorption isotherm, vapour permeability and air permeability. Others, such as moisture diffusivity and thermal moisture conductivity demand complex and time-consuming tests [Krus, 1995; Pel, 1995; Roels, 2000; Roels et al, 2008]. Extended lists with material properties and their dependence of some driving forces can be found in IEA, 1990; Kumaran, 1996; ASHRAE, 2009; Hens, 2010.

The physics of heat, air, moisture modelling

Conservation of mass, energy and momentum

Before commenting on the shortcomings that limit applicability of actual models, it looks beneficial to reiterate the physics combined heat, air, moisture modelling is based on. Things start with the conservation of mass, energy and momentum axioms, stating that per elementary volume of material the balance between in- and outflow rate (div(**Flux**)) plus the local rate of generation or absorption (Source) must equal the storage rate ($\partial(\mathrm{Storage})/\partial \mathrm{t}$):

$$\mathrm{div}(\mathbf{Flux}) + \mathrm{Source} = -\frac{\partial(\mathrm{Storage})}{\partial \mathrm{t}} \qquad [1]$$

In porous materials, conservation of momentum simplifies to flux equations. Not so in cavities and larger air gaps. There, the full axioms play. Mass flows, in the case being humid air and moisture, can only enter open-porous materials if the pore network is assessable for their molecules or molecule clusters. Since pores demand space and never form a fractal repetition of the same configuration, the concept of representative elementary volume (REV) was forwarded: the smallest material volume that has the same property values as the whole. Flows, sources, and storage are assumed to be distributed homogeneously in each REV, which of course is a simplification as energy flows differ between matrix and air-filled or fluid filled pores whereas mass flows only develop in open pores. In a continuum approach, REV's are considered infinitesimal small. The energy balances only have to consider heat and enthalpy flows as kinetic energy linked to the mass flows is too unimportant in porous materials to be accounted for, while potential energy mainly intervenes as a driving force. Sources finally depend on time and driving potentials.

Flux equations

Two types of flux equations intervene: diffusive and bulk. The term 'diffusive' applies to displacements at the atomic and molecular level, while 'bulk' relates to macroscopic transfer although for some mass components also a diffusion-like equation is used. For the diffusive and diffusive-like fluxes, deviation from thermodynamic equilibrium is assumed small enough to allow linearity between flux and driving force.

Individual fluxes

Heat

Fourier's law of conduction, which links the heat flux to the gradient in temperature (grad (θ) with thermal conductivity, describes diffusive heat transfer (λ) as proportionality coefficient and material property:

$$\mathbf{q} = -\lambda \mathbf{grad}(\theta) \qquad \text{(W/m²)} \qquad [2]$$

Thermal conductivity combines conduction across the matrix and the pore gas with radiation between pore surfaces, convection in macro-pores and latent heat exchanges within each moist pore. Radiation makes the property temperature and thickness dependent, while humidity links it to moisture content and temperature. In air layers, voids and cavities, radiation and convection overrun conduction. In anisotropic materials, the property is a tensor.

Bulk heat transfer is given by:

$$\mathbf{q} = \mathbf{m}\, \mathrm{h} \qquad \text{(W/m²)} \qquad [3]$$

with h the enthalpy per unit of mass flux **m**.

Water vapour

Diffusive water vapour transfer is quantified using Fick's law, which links water vapour flux to the gradient in (partial water) vapour pressure (**grad**(p)) with vapour permeability (δ) as proportionality coefficient and material property:

$$\mathbf{m_v} = -\delta \mathbf{grad}(\mathrm{p}) \qquad \text{(kg/(m².s))} \qquad [4]$$

Written the way done, the equation forms a simplification of the actual Fickian diffusion law, reason why it only holds for temperatures below 50°C. In porous materials, so-called diffusive movement in reality combine Fickian with Knudsen diffusion and adsorbed water layer transport. Pore-widths, diffusion path lengths, and local temperature gradients also change with the adsorbed water layer thicknesses and the presence of water-filled pores thanks to capillary condensation. As a result, vapour permeability depends on moisture content and temperature. Whether or not also thermal diffusion intervenes, could not be based on experimental evidence until now [Janssen, 2011].

Bulk flow is given by:

$$\mathbf{m_v} = \mathbf{m_a} \mathrm{x_v} = \mathbf{m_a} \left(\frac{0.62\mathrm{p}}{\mathrm{P_a} - \mathrm{p}} \right) \underset{\theta \le 50°\mathrm{C}}{\approx} 6.21\ 10^{-6} \mathbf{m_a} \mathrm{p} \qquad \text{(kg/(m².s))} \qquad [5]$$

where $\mathbf{m_a}$ **is** air flux (see equation [8] and [9]) and x_v is water vapour ratio in the air.

Liquid

Bulk flow is described by the diffusion-like Darcy law, which links water flux to gradients in water pressure (P) with water permeability (k_w) as proportionality coefficient and material property:

$$\mathbf{m_l} = -k_w \mathbf{grad}(P) \qquad (kg/(m^2.s)) \qquad [6]$$

The law applies for both saturated and unsaturated flow. For unsaturated flow, no unanimity exists about the driving force. Water heads do not apply but what does? Many used moisture content [Brocken, 1998], although this is not a potential but a moisture storage quantity, which is discontinuous at, interfaces. Real potentials must be single-valued in each point of space. Capillary suction (s) and relative humidity (ϕ) are, which allows rewriting equation [6] as:

$$\mathbf{m_l} = -k_w \mathbf{grad}(s) = -k_w \frac{ds}{d\phi} \mathrm{grad}(\phi) \qquad (kg/(m^2.s)) \qquad [7]$$

wherein the unsaturated moisture permeability (k_w) is a function of suction and temperature. For saturated flow, permeability (k_w) is a pore system defined constant.

Air

Bulk air transfer in a porous material is described using the same Darcy law as for moisture:

$$\mathbf{m_a} = -k_a \mathbf{grad}(P_a) \qquad (kg/(m^2.s)) \qquad [8]$$

with P_a wind, stack and fan-induced air pressure and the air permeability (k_a) more or less constant below capillary moisture content. Equation [8] does not fit for voids, cavities, leaks, overlaps, etc, for which CFD or the hydraulic network theory applies. In the last case, the flow equation becomes:

$$M_a = C[\Delta P_a]^n = \left(C\Delta P_a^{n-1}\right)\Delta P = K_a \Delta P \ \ (kg/s) \ \text{ with } \ K_a = C\Delta P_a^{n-1} \qquad [9]$$

C being the permeance coefficient and n-1 the permeance exponent, see **Table 1**. Permeances may characterize surfaces, linear cracks or overlaps and local leaks. When they do, the respective units are kg/(m².s). kg/(m.s) or kg/s.

Table 1: A selection of air permeability's ka and air permeance coefficients and exponents

Layer	**Thickness**	**Weight**	**Air perm.**	**Air Permeance** $K_a = C\Delta P_a^{n-1}$ **kg/(m².s.Pa)**	
	m	**kg/m²**	**s**	**C**	**n**
Mineral fibre (ρ: density)	-		$2\ 10^{-2}\rho^{-1.5}$		
Glass fibre (ρ: density)	-		$4.3\ 10^{-3}\rho^{-1.3}$		
Gypsum board	0.0125	8.6		$3.1\ 10^{-5}$	0.81
Lath ceiling	0.01	4.0		$4.1\ 10^{-4}$	0.68
Ceramic tiles, double lock	0.01	30.0		$9.6\ 10^{-3}$	0.68
Slates		30.0		$1.4\ 10^{-3}$	0.70
Fast brick leaf, head joints poorly filled	0.14			$2.8\ 10^{-3}$	0.59
Concrete block wall, head joints well filled	0.09			$2.4\ 10^{-4}$	0.86

4

Simultaneous fluxes

When energy and mass fluxes develop simultaneously, Onsager's principle of non-equilibrium thermodynamics applies, stating each flux is activated by as many driving forces (P_i) as there are simultaneous fluxes [Luikov, 1966; Duforestel, 1992; Hens, 1996]:

$$\mathbf{Flux_i} = -\sum_{i=1,i=1}^{n,n} C_{ii}\,\mathbf{grad}(P_i) \qquad [10]$$

This expands the number of permeability's to i² with i the different driving forces.

Storage

For a single flux, the storage term writes as:

$$\frac{\partial X}{\partial t} = \frac{\partial X}{\partial P}\frac{\partial P}{\partial t} = C\frac{\partial P}{\partial t} \qquad [11]$$

where C is the specific volumetric capacity for the driving force considered. For heat, P is temperature in degree centigrade or Kelvin while C equals ρc with ρ material density in kg/m^3 and c specific heat capacity in J/(kg.K). For water vapour, P is vapour pressure in Pa while C equals $\rho\xi_\phi/p_{sat}$ with ξ_p relative humidity related specific moisture ratio at the temperature considered in kg/kg and p_{sat} vapour saturation pressure at that temperature in Pa. For unsaturated liquid flow, P is suction in Pa while C is $\rho\xi_s$ with ξ_s suction related specific moisture ratio in kg/(kg.Pa). Finally, for air, P is air pressure in Pa while C equals $\Psi S_a/(R_a T)$ with Ψ open porosity of the material, S_a air saturation degree, R_a the gas constant for air in J/(kg.K) and T temperature in K.

For combined flow, the storage terms become:

$$\frac{\partial X_i}{\partial t} = \sum_{i=1,i=1}^{n,n} C_{ii}\frac{\partial P_i}{\partial t} \qquad [12]$$

defining i² specific volumetric capacities, with i the different driving forces.

Equations of state

Equations of state express the thermodynamic equilibrium between driving forces. The Kelvin equation for example links vapour saturation pressure to temperature and water meniscus curvature:

$$p_{sat} = p_{sat,ref}\exp\left[\frac{\sigma_w\cos\vartheta}{\rho_w R_v T}\left(\frac{1}{r_1}+\frac{1}{r_2}\right)\right] = p_{sat,ref}\exp\left(\frac{s}{\rho_w R_v T}\right) \qquad [13]$$

In this equation $p_{sat,ref}$ is water vapour saturation pressure above a flat surface, σ_w surface tension of water contacting air, ϑ the contact angle between water meniscus and pore wall, R_v the gas constant for vapour, ρ_w density of water and r_1 and r_2 the curving radii of the meniscus considered, all in SI-units. Writing [13] as $s=\rho_w R_v T\ln(\phi)$ links capillary suction to relative humidity.

Specific enthalpy is given by:

$$h = h_o + c_p(\theta - \theta_o) \qquad [14]$$

with h_o enthalpy at reference temperature (θ_o) and c_p specific heat capacity at constant pressure. With 0 °C as reference, h_o turns zero at that temperature. In case transformations from liquid to solid, liquid to gaseous or solid to gaseous intervene, specific enthalpy becomes:

$$h = c_p\theta - h_{ls} \qquad h = c_p\theta + h_{lv} \qquad h = c_p\theta + h_{lv} + h_{ls} \qquad [15]$$

h_{oe} being the heat of evaporation and h_{om} the melting heat of water, both at 0°C.

The sorption/desorption isotherm (**figure 1**) gives moisture equilibrium in a porous system at relative humidity below 95-98% [Hansen, 1996]. Between the two, a hysteresis exists, which complicates modelling. Many tools therefore accept some loss of accuracy by taking the sorption curve as representative with its slope defining the specific moisture content per unit of relative humidity:

$$\rho\xi_\varphi = \frac{dw}{d\phi} \qquad [16]$$

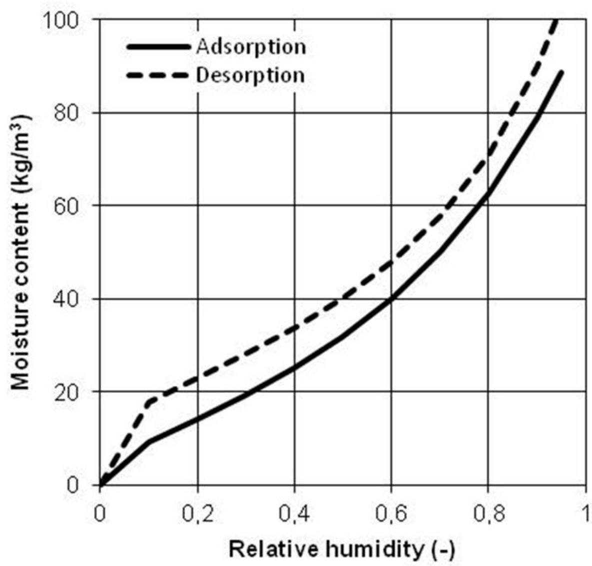

Figure 1: Sorption isotherm for pine

Above 95-98%, the sorption isotherm, now redrafted with the capillary suction as driving force, aligns with the moisture retention curve. Maximum moisture content in a capillary porous material in contact with water typically coincides with the capillary one. Above, secondary moisture uptake still intervenes, activated by the slow dissolution in the water present of the air bubbles left in the porous system. A substantial further increase in moisture content however presumes long lasting contact with or submersion in water. Drying of course may start from full saturation but mostly does from capillary moist.

Finally, air and vapour both obey to the ideal gas law quite well. Also, Dalton's law applies, stating that total air pressure equals the sum of partial dry air and partial vapour pressure.

Boundary conditions, initial conditions and contact conditions

Boundary conditions concern the value of the driving forces and surface fluxes at the assembly's boundaries during the time period considered. Initial conditions are set by the values temperature, air pressure and suction/relative humidity have across the assembly at time zero, be it that moisture content typically replaces suction and relative humidity. Contact conditions finally describe the situation at the interfaces between materials. A detailed overview and analysis of boundary conditions can be found in Sanders, 1996 and Kumaran et al, 2008.

Geometry

Solving a heat, air, moisture problem demands knowledge of geometry, the materials used and their properties. Wall, floor, roof, and partitions are often simplified to one-dimensional composite assemblies, though a few actual models also allow simulating two-dimensional, some even three-dimensional assemblies.

Solution

As all material properties are variable, solving the heat, air, moisture PDE's demand refined numerical methods, based on finite volume or finite element approaches. As numerical solutions are always an approximation, techniques, such as non-equidistant space meshing may be needed to minimize errors. Adaptive space meshing and time stepping is even a more advanced possibility [Roels, 2000].

Why actual tools only approach real behaviour

Too simple material modelling and uncertainty in material properties

As explained, the continuity approach assumes something as an infinitesimal REV exists. Most building materials, however, are too non-homogeneous and too randomly anisotropic to be replaced by a sum of identical REV's. This makes any assumption about single-valued properties and their relation with driving forces quite dubious. Through that, property values are uncertain. **Figure 2** shows the results of a series of dry cup vapour resistance factor measurements on 30 facing brick samples from a same lot.

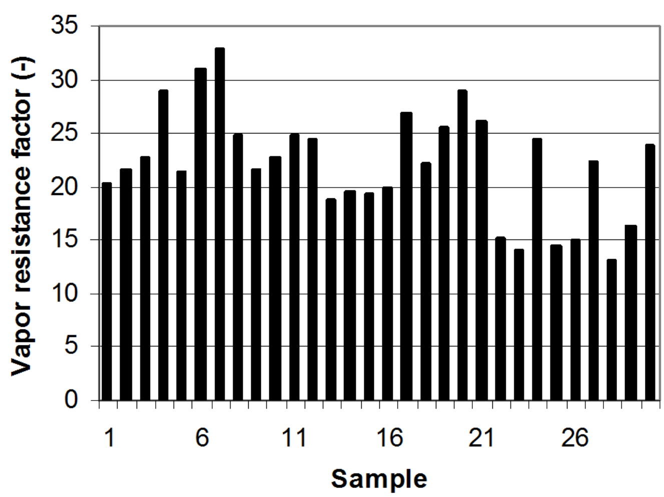

Figure 2: Dry cup vapour resistance value measured on 30 samples of bricks from a same production lot

The deviation between individual values is large. Question thus is: what value to use? The arithmetic average? The harmonic average? For a half-brick wall, the last seems the best choice, as water vapour diffusion across 1 m² of wall, brick-laid using 67 HxWxL=6x9x19 cm facing bricks, may be written as:

$$g = \sum_{i-1}^{67}\left(\frac{A_{brick}\Delta p}{\mu_i dN}\right) = \frac{\Delta p}{\mu_m Nd}$$

giving

$$\frac{1}{\mu_m} = \sum_{i=1}^{67} \frac{A_{brick}}{\mu_i} \tag{17}$$

For one and one and a half brick wall, things are less clear.

Brick properties are currently considered representative for the masonry they form. **Table 2** gives the harmonic average vapour resistance thickness as measured on the facing bricks from a same production lot and the vapour resistance thickness of a half-brick veneer, built using these facing bricks and measured using a non-conventional hot box-cold box interstitial condensation test. The difference is striking. **Table 3** lists their air permeances. Whereas the bricks are airtight, the half-brick veneer is not. Reasons for the lower vapour resistance thickness and the higher air permeability of the masonry compared to the bricks are the badly filled mortar joints and all thin cracks present between joints and bricks.

Table 2: Bricks and masonry: vapour diffusion thickness

Material	**Thickness**	**Density**	**Vapour diffusion thickness μd in m**				
	m	**kg/m³**	ϕ=0.28	54	73	82	91
Brick		1900	2.89		2.31		
Half-brick veneer	0.09			1.20		0.51	

Table 3: Bricks and masonry: air permeance

Material	**Thickness m**	**Density kg/m³**	**Air permeance** $K_a = C\Delta P_a^{n-1}$ **kg/(m².s.Pa)**	
			C	**n**
Brick		1900	0	1
One-brick veneer	0.09	135	$0.4\ 10^{-4}$	0.81

Wood has been subjected to an analysis on the micro- and macro-scale. The material not only proved to be highly anisotropic but also large differences in properties between mid- and late wood were found (Zillig, 2009).

Liquid response of an open-porous material in turn is described using specific moisture content and moisture permeability. The first is the derivative of a spot wise measured water retention curve. Differentiating is done by first fitting an analytical curve to the data and then calculating the derivative. Curve fitting is already approximate. What to say about the derivative, which is by definition mathematically even more uncertain? Moisture permeability is calculated based on measured diffusivity. That diffusivity follows from a position versus time scan using γ-ray, x-ray or NMR images of successive moisture profiles in a material sample during capillary suction or drying. Most profiles show a flat part at high moisture content, a steep front between high and low moisture content and a flat part again at low moisture content. The weak slope and scatter in measured values at low and high moisture content makes correct calculation of the diffusivity there troublesome. The steep part tells diffusivity increases quickly within a small interval of augmenting moisture content. Anyhow, as a precise relation between both is difficult to fix, a Boltzmann transform is used unifying all consecutive moisture profiles into one, mostly with a lot of scatter and thus, uncertainty.

Geometry

The real geometry of a building assembly, including all random cracks, voids, leaks, air spaces, etc. is never known, reason why all models start from a virtual dummy. That way important air and water flow components such as air in- and exfiltration, air looping, wind washing, indoor air washing, water ingress by gravity and pressure heads, water run-off and drainage between layers may be overlooked. A typical example of uncertain geometry is a cavity wall with a half-brick veneer where each joint stands for a random system of cracks and voids, a partial fill and an inside leaf in fast bricks, see **figure 3**. Settled soft insulation, random air voids between stiff insulation and timber beams; cracks in inside linings are also exemplary cases. Some phenomena, such as convection in thick glass and mineral wool layers, have been studied in detail [Hagentoft et al, 1995; Okland, 1998], though the results re only partially or even not transposed into most of the widely-used marketed HAM-software tools.

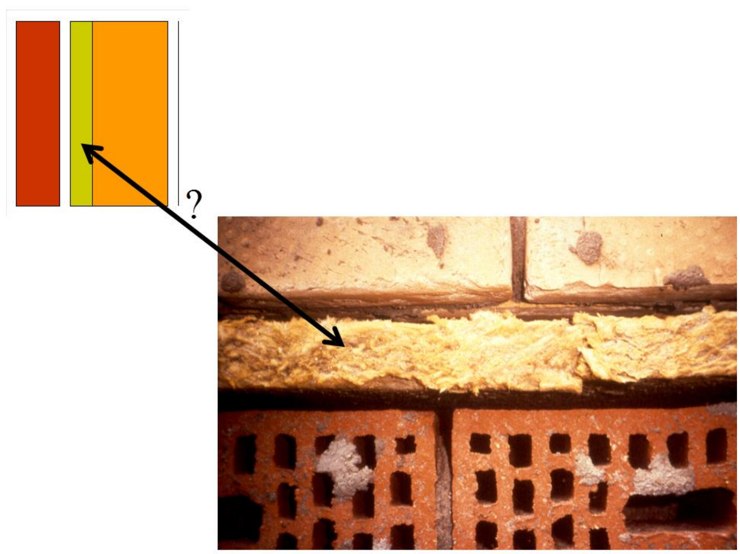

Figure 3: Filled cavity walls: real assembly versus virtual geometry used in modelling

Contact conditions

Most models assume perfect hydraulic contact between layers. In reality, four contact typologies exist:

(1) The perfect hydraulic contact just mentioned, characterized by continuity in suction and moisture flux. Although handled as the reference, it is the exception

(2) A thin airspace between layers. A much more probable situation than perfect hydraulic contact! Only air and vapour are transferred, except if condensation or water ingress from outside succeeds in filling the thin airspace. Then, gravity can activate water run-off and drainage. The airspace might also belong to a network of cracks, joints, voids and spaces crossing the assembly and activating air flow that way, sometimes with detrimental effects for moisture response and thermal integrity

(3) Natural contact characterized by a random distribution of air voids and locations of perfect hydraulic contact. All inconveniences of (2) may be active here

(4) Real contact with inter-penetration of materials. That typically happens when different materials are moulded together with bricklaying and rendering as two examples. In that case, the contact creates an additional layer with own but unknown properties

De Freitas et al, 1996, Brocken, 1998 and Qiu, 2003 showed real contacts are difficult to model, but may truly impact time evolution of moisture transport taking place.

Boundary condition

Wind driven rain

Wind driven rain is a subject of research since decades [Lacy, 1965; Couper, 1974; Künzel, 1976; Straube, 1998; Straube et al, 1999; Van Mook, 2002; Hagentoft et al, 2002; Blocken 2004]. Though, as validation using test results showed, predicting steady state rain patterns on building enclosures using CFD and rain droplet tracing is quite successful, even today it remains practically impossible to predict transient patterns. However, even if one succeeded in doing so, major questions remain. What precisely happens when rain droplets hit a surface? What part splashes away? How important is evaporation? Does a capillary active surface really reacts as predicted by the suction model with complete suction first, followed by a water film formed once the surface turned capillary wet and ending with runoff and moistening lower parts of the enclosure? The answer is no, as Masaru, 2009, concluded. Also, why does runoff on concrete finger [Küntz et Al, 1997]? These questions are important, as wind-driven rain is the main moisture load in many climates.

Some wind-driven rain related phenomena are even too random to be captured in models. Take a veneer wall. As soon as run-off along the outside surface starts, head joints start seeping to the cavity side. However, predicting at which joints seeping will start and how the number of joints seeping will evolve over time is not doable. Only testing gives an answer, as **figure 4** shows [Hens et Al, 2005; Anon, 2006].

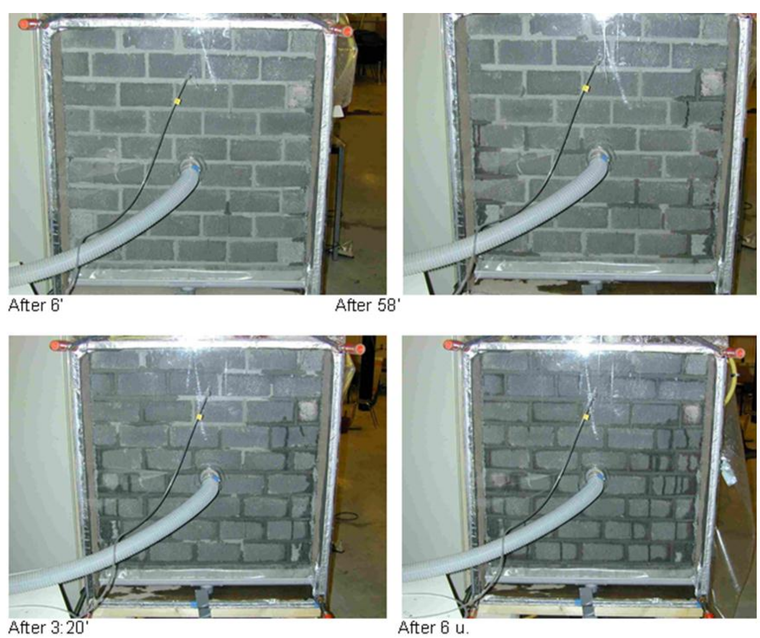

Figure 4: Wind-driven rain test on a concrete block veneer wall: seeping of the head joints

Such tests ran already in the sixties and early seventies. They gave birth to a run-off formula that contains some information in case a facing brick veneer is used [Vos et Al, 1976]:

$$G_{r,cav} = 2.15 + 0.196 G_{wdr} + 0.0308 \Delta P_a + 0.0017 G_{wdr} \Delta P_a \qquad [18]$$

with $G_{r,cav}$ run-off at the cavity side, G_{wdr} wind-driven rain intensity and ΔP_a mean wind pressure difference across the veneer wall. The formula holds for wind-driven rain intensities between 10 and 40 kg/(m².h). It should however not be taken as a law of Medians and Persians. Spread on measured run-off results in fact is large as **figure 5** proves for a cavity wall with concrete block veneer and a mineral wool full fill in the cavity [Anon, 2006]. Anyhow, the formula shows gravity is more important than wind pressure differences.

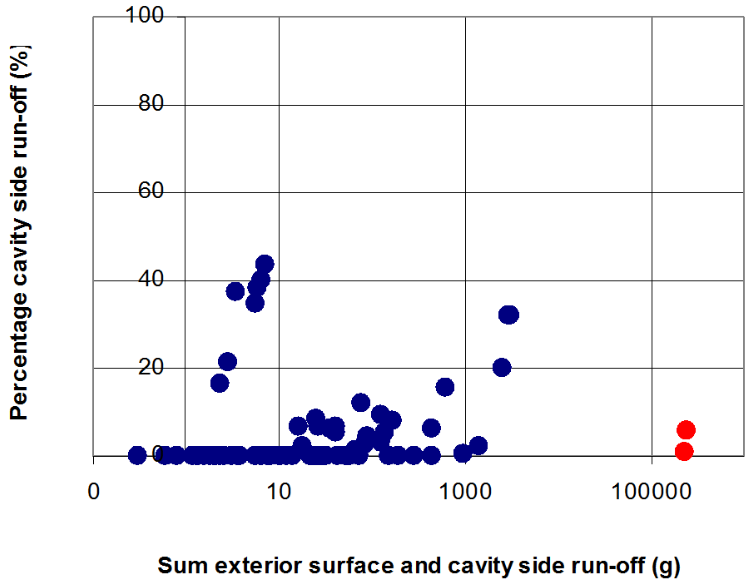

Figure 5: Cavity run-off as measured on site for a cavity wall with concrete block veneer and a mineral wool full fill in the cavity

Spatial and time dependencies

In most actual software tools the in- and outside boundary values are considered time dependent only. This of course is not true. Temperatures change with height. Surface film coefficients differ from spot to spot; see Defraeye et al, 2011. Parts of the enclosure receive shadowing from parapets and overhangs, other get full solar radiation during large parts of the day. Wind driven rain preferentially hits the upper parts and corners of a building, etc. These variations affect the local and overall hygrothermal response of an enclosure. Even flat assemblies react three-dimensionally that way.

Indoors/building fabric interactions

Many tools simplify the inside boundary conditions to a constant or monthly varying temperature and water vapour concentration excess, and, if air transport is considered, to a constant or monthly varying inside/outside air pressure difference. This again is far from reality. Night setback, solar and internal gains subject the inside temperature to daily periodicity (Woloszyn et al, 2008). Local inside water vapour pressure excess, although dampened by all sorption-active internal surfaces, oscillates with changes in vapour release, ventilation rate and air exchanges between rooms. Inside/outside air pressure differences depend not only on wind velocity, wind direction and inside/outside temperature differences but also on wind gusting, the overall layout of the building, the random distribution of air leaks in the enclosure and the fabric, and, the way the ventilation system functions. Especially air mitigation couples the hygrothermal reaction of each assembly in an enclosure to the whole building response and stochastic behaviour of the users. This and the variations in outside weather between years turns any heat, air, moisture performance evaluation of an envelope into a risk assessment exercise.

Gravity and pressure flows

As already mentioned when discussing wind-driven rain, gravity and pressure gradients are the main driving forces behind water flow across cracks, voids, open joints, etc. Activation demands a water film or a water head. Wind driven rain hitting a facade for example may give a water film running of. That film can penetrate randomly across cracks in the rain screen as was shown in figure 4 for a concrete block veneer. Once the head joints weep, capillary suction and run-off starts at the cavity side. That way, the facing bricks turn wet from all sides, leading to faster and more moisture storage than calculated with the many actual models that consider masonry to be a homogeneous layer. When the film sticks on horizontal mouldings, water heads develop that even facilitate weeping. Again, most models cannot predict this from happening. The consequences of such leakages, however, may be problematic. Precisely the non-predictability of rainwater ingress necessitates control and design strategies, of which practice proved the effectiveness (**figure 6**) [Straube et al., 1999].

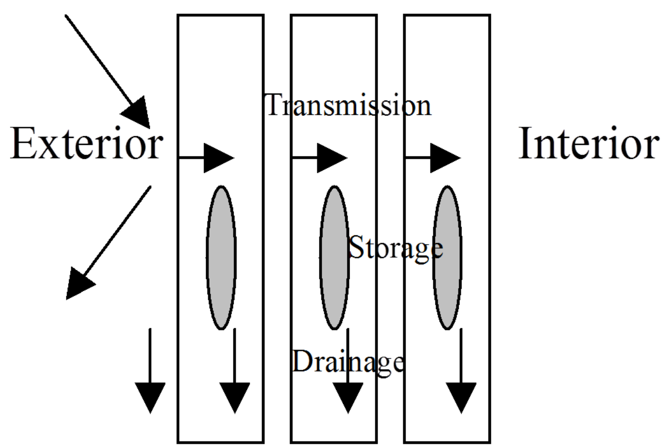

Figure 6: Wind-driven rain: the drainage/storage/transmission series

Water heads also play a role below the water table. Despite no heat, air, moisture model is able to correctly assess such situation, very effective techniques for water-tightening basements based on experience have been developed.

Moisture and indoor air quality, health and durability

It is well known that moisture can cause severe IAQ, health and durability problems, see Hagentoft, 1996 and Holm, 2008. Nevertheless, tools are still lacking to judge if a situation is tolerable or not. Much for example is known about mould [IEA, 1990; Adan, 1994; Hens, 1999; Sedlbauer, 2001; Viitanen et al, 2008; Lähdesmäki et al, 2008]. However, still, judgement on mould risk in a given situation remains loaded with uncertainty.

In general, durability depends on the limit state properties of a construction and the severity of the loads. The last are always transient. Limit state properties in turn may degrade over time, meaning that for a same load, safety decreases. That decrease is stochastic, because the properties of a composite assembly can vary considerably from spot to spot and degrade differently over time. Consequently, decay is only quantifiable as a risk and service life as a stochastic reality [Carmeliet, 1992; Geving, 1997].

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Top right: Hugo Hens

Above: Hugo speaking during the workshop at Dartington, UK

Bottom right: Hugo during a site visit to Dartington Estate, pointing out problems in the UK building stock

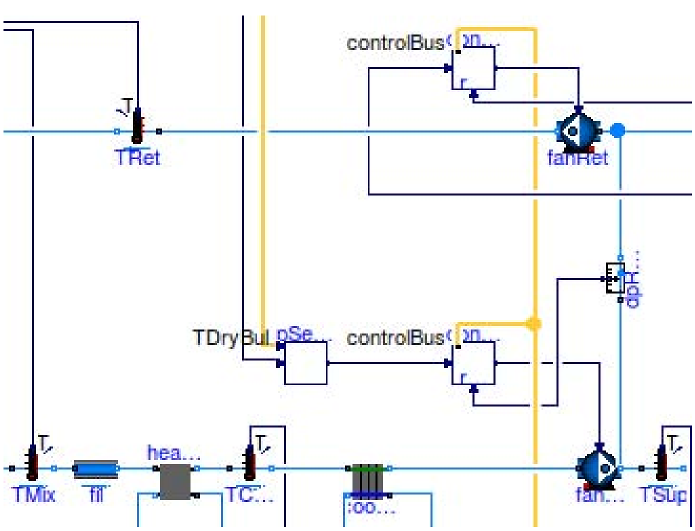
Software news

International Energy Agency approves 5-year proposal for design and operation of building and community energy systems based on Modelica and Functional Mockup Interface

The International Energy Agency, under the implementing agreement on Energy Conservation in Buildings and Community Systems, has approved the five-year Annex 60 proposal "New generation computational tools for building and community energy systems based on the Modelica and Functional Mockup Interface standards."

Austria, Belgium, France, Germany, Ireland, the Netherlands and the USA are already expected to participate. Italy, Sweden, Switzerland and the UK are currently in the process of forming a team.

The project aims to share, further develop and deploy free open-source contributions of currently uncoordinated activities in modeling and simulation of energy systems of buildings and communities, based on the Modelica and Functional Mockup Interface standard. The project will create and validate tool-chains that link Building Information Models to energy modeling, building simulation to controls design tools, and design tools to operational tools. Invention and deployment of integrated energy-related systems and performance-based solutions for buildings and communities will be accelerated by extending, unifying and documenting existing Modelica libraries, by providing technical capabilities to link existing building performance simulation tools with such libraries and other tools through the Functional Mockup Interface standard. The technology will allow optimized design, analysis and operation of multi-domain systems as posed by building and community energy systems. It will also allow using models across the whole building life cycle to ensure realization and persistence of design intent.



Partial view of an implementation of a variable air volume flow system in Modelica

In the first phase from June 2012 to June 2013, a work plan will be created. Upon approval of the work plan there will be a three year R&D phase, followed by a one year reporting phase.

For further questions, please contact the operating agents, Michael Wetter (**MWetter@lbl.gov**) and Christoph van Treeck (**treeck@e3d.rwth-aachen.de**). ■

News from IBPSA affiliates

IBPSA affiliates are asked to submit a report to the IBPSA Board each year to keep Board members informed about their activities and membership. These are too detailed to include in *ibpsa*NEWS, so affiliates have been asked to make their latest annual report available through their web sites, and this section includes only selected, recent news. Other news from affiliates may be available from their websites; the URLs for these are available on the IBPSA Central web site at **www.ibpsa.org/m_affiliates.asp**.

IBPSA-Australasia

Harmonisation Committee

IBPSA Australasia has been contributing to a voluntary committee that includes representatives of relevant government bodies (Department of Climate Change and Energy Efficiency, NSW Office of Environment and Heritage, and the Australian Building Codes Board) and industry bodies (the Green Building Council of Australia and the Australian Institute of Refrigeration, Air-conditioning, and Heating (AIRAH)) that is working on reducing needless differences between simulation requirements for various rating schemes and the Building Code. This committee was formed following from a workshop held at BS2011 in Sydney.

Key areas being addressed include schedules, default equipment and occupant densities, representation of fan and pump turn-down, representation of metabolic rate and permitted reference climate data. Progress is being made on all fronts although the incorporation of changes into the Building Code is a relatively slow process due to necessary consultative requirements. The end result is intended to be a minimisation of unnecessary minor modifications between models used to meet the needs of the different regulations and rating tools. Excellent cooperation is being obtained from all parties.

IBPSA/AIRAH Simulation Seminar February 2013

After the success of BS2011, which was a joint IBPSA/AIRAH conference, we are working with AIRAH to set up a one-day simulation seminar in Melbourne in 2013. The theme of the workshop is "New Frontiers in Commercial Building Simulation Practice" and will involve a number of invited speakers across a range of topics aimed towards educating and extending the skills of simulators in the commercial market as well as bridging the gap between academic and commercial practice in simulation. More information will be available for the next newsletter. ■

IBPSA-Canada


(Destination Halifax / novascotia.com)

eSim 2012

The 7th biennial eSim Building Simulation Conference (May 2012) was hosted in Halifax NS by Dalhousie University in collaboration with Natural Resources Canada. The successful conference presented 42 peer-reviewed technical papers, was attended by 130 delegates, and received lots of sunshine from the beautiful harbour-front view. The four day event consisted of 9 workshops held at Dalhousie University and 2 full technical session days held at the Pier 21 Immigration Museum. Keynote speakers Christoph Reinhart of MIT, Mark Riley formerly of NRCan, and Andreas Athienitis of SNEBRN/Concordia, presented their unique work and insights into advanced building performance simulation techniques, applications, and the impact it has on policy.

Conference co-chairs Dr. Lukas Swan and Prof. Richard Kroeker of Dalhousie University showcased Halifax with technical and social events at 5 different locations, all within walking distance of one another. Of particular note were the evening reception/tour at the new Seaport Farmers Market, a LEED platinum building, and the technical tour led by Dr. Alain Joseph at the NSCC Centre for the Built Environment, a LEED gold teaching facility. Both faced the George's Island in the Halifax Harbour and were accessed by the boardwalk or ferry system. Delegates were delighted and entertained to experience a true Atlantic lobster banquet, complete with bagpipes.

Seven awards were distributed for top technical papers. The 52 person international eSim scientific committee, led by Alex Ferguson of NRCan, gave 3 outstanding contributions awards to lead authors: Patrice Pinel, Parham Eslami Nejad, and Caroline Hachem. IBPSA-Canada, led by Stephen Kemp of Enermodal Engineering, awarded four $1000 travel grants for outstanding student paper lead authors: Annie-Claude Lachapelle, Jason Ng, Neetha Vasa, and Patrice Pinel. Dr. Lukas Swan was unexpectedly awarded the title "Halifax Ambassador" by Destination Halifax for his efforts in utilizing several unique venues for the eSim 2012 Conference.

The conference was well supported by contributing sponsors: Efficiency Nova Scotia Corporation, NSERC Smart Net-Zero Energy Buildings Strategic Research Network (SNEBRN), CBCL Consulting Engineers Limited, Integrated Environmental Solutions Limited, and Lydon Lynch Architecture. Their participation greatly enhanced the overall quality and experience of the eSim Conference. The next eSim Conference will be held in 2014 in a location to be decided by IBPSA-Canada. We hope you enjoyed the Halifax eSim experience and look forward to seeing you again at the next conference. ■

Conference chairs Lukas Swan, Richard Kroeker, Alain Joseph and Alex Ferguson


Mark Riley giving the keynote address


During the Technical Tour of the Center for the Built Environment

IBPSA-China: see the ASim 2012 flyer in *Forthcoming events*, page 14

IBPSA-Egypt: see the BS Cairo 2013 flyer in *Forthcoming events*, page 20

IBPSA-England

IBPSA-England held an event on CFD in Simulation for the Built Environment at UCL in June. This was very well attended by an audience from around the UK ranging from practitioners to academics and postgraduate students. Seminars focused on both indoor and outdoor built environment applications where CFD had been used extensively, and showcased both academic research and industrial case studies of best practice.

The presentations highlighted the need for verification of results of CFD models, to ensure the development of good quality models. Examples were shown of experimentally verified models using salt bath modelling, wind tunnel and water channel models as well as field measurements. The picture emerging from these projects was that simulations now attempted are more complex than ever before and require significant modelling expertise and physical understanding as well as higher computer power. Examples were shown of coupled CFD and thermal comfort models for indoor auditoria and an outdoor stadium, of complex urban atmospheric boundary layer modelling, and of developments in the modelling of airborne disease transmission pathways.

The event was followed by a general membership meeting of IBPSA-England. The Board reported its activities over the past two years, ideas for future events were put forward by the members, and the relationship with CIBSE Building Simulation group was discussed.

A fuller description of the event written by an MRes student from the London-Loughborough Centre for Doctoral Research in Energy Demand (LoLo) can be found at **www.lolo.ac.uk/newsandevents/page/id/40**.

IBPSA-England is planning to hold another Building Simulation and Optimization conference, BSO14, at UCL in London on 10-11 June 2014, in association with CIBSE. There is a flyer in *Forthcoming events*, **page 22**. ■

IBPSA-France

SIMUREX Summer School

The 2012 SIMUREX scientific school, held on 10-16 April 2012 at Cargèse in Corsica, was devoted to the reliability of simulation and the verification of building energy performance predictions. More than 100 people attended, and the event provided a great opportunity for young scientists to meet international members of the community such as Joe Clarke, Jan Hensen, Godfried Augenbroe, Darren Robinson, Douglas Black, Elena Palomo del Barrio and others.

Etienne Wurtz (President of IBPSA France) introduces speaker Jan Hensen to the audience

The following topics were discussed:

- The reliability of building energy performance prediction models
- Analysis of uncertainties associated with parameters and the use of models
- Uncertainty propagation through complex system models
- Decision making process in uncertain processes
- Experimental methods to record building energy consumption.

IBPSA-France conference 2012

The last biennial IBPSA France congress took place between 6-8 June 2012, at Chambery. The congress was organised in cooperation with the French Academic Civil Engineering Association (AUGC). More than 300 participants attended, and it was a great success. Papers are available from **www.polytech.univ-savoie.fr/index.php?id=2129** .

BS2013

IBPSA-France will host the next IBPSA World Congress, Building Simulation 2013, at Chambery on 25-28 August 2013. There is further information in the *Forthcoming events* section of this ibpsaNEWS, on **page 21**, and more details are avaiable from the conference website **www.bs2013.fr**. ■

IBPSA-India: see information about IBPSA-India's 2nd National Conference on Simulation of Buildings for Energy Efficiency and Better Built Environment in *Forthcoming events*, page 15

IBPSA-Italy: see the Building Simulation Applications flyer in *Forthcoming events*, page 17

IBPSA-Korea

IBPSA-Korea, in close collaboration with the Korean Institute of Architectural Sustainable Environment and Building Systems (KIAEBS), has held special sessions on building simulation at all the biannual national KIAEBS conferences since it was formed in 2010. These sessions have been designed to increase awareness of both advanced approaches to simulation and new developments in the field, and of IBPSA and its work.

Special session on building simulation at Ansan on 23 March 2012

The main topics discussed in the sessions in fall 2011 and spring 2012 were:

27 October 2011 (Seoul):	new trends in building simulation, prediction of downdraft in office spaces, state-of-art techniques in lighting simulation, a BIM-based stage-visibility analysis tool, real-time energy prediction using a virtual test bed
23 March 2012 (Ansan):	stochastic simulation and comparison between normative vs. dynamic simulation, thermal and daylight simulation of an atrium, optimal design for free-form buildings, prediction of surface condensation for radiant floor cooling systems

Topics for the next meeting, at Pusan on 20 October 2012, had not been chosen when *ibpsa*NEWS went to press.

IBPSA-China, IBPSA-Japan and IBPSA-Korea will hold the first ASim conference (IBPSA-Asia conference) in Tongji University, Shanghai, China on 25-27 November 2012. The main topic of the conference is *Simulation for real performance*. ASim will be an opportunity to promote better and active use of building simulation in East Asia, and for building simulation users in the region to get together for further international collaboration and exchange of scientific knowledge. For more information please refer to the conference website at **www.asim2012.tongji.edu.cn**. ■

IBPSA-Nordic

BuildSim-Nordic 2012 Conference, Lillestrøm-Norway, 17th - 18th October 2012

At the beginning of the second year of its initiation, IBPSA-Nordic is holding its 1st biennial conference, BuildSim-Nordic 2012, on 17-18 October at the 15th HVAC Exhibition "VVS-dagene" that will be held at the Norwegian Trade Fairs Centre in Lillestrøm. The language of the first day is English and it is more scientifically oriented as the presentations are mainly by students and researchers from universities. The language of the second day is Norwegian and is arranged in cooperation with the Norwegian Society of HVAC Engineers (NORVAC) and will be devoted to practical applications, particularly focusing on simulation carried out by consulting and constructing engineers with some illustrative cases. More information is available from **http://ibpsa-nordic.org/conf/abstract.php**. ■

IBPSA-USA: see information about SimAUD 2013, the 4th annual Symposium on Simulation for Architecture and Urban Design, in *Forthcoming events*, page 18

Building Simulation 2015

Call for Proposals

The board of IBPSA is pleased to issue the following call for proposals from parties interested in hosting Building Simulation 2015. A complete proposal should be sent to the Conference Committee Chair, Michel Bernier (**michel.bernier@polymtl.ca**), no later than November 15, 2012. Discussions with Michel of potential proposals prior to the due date are strongly encouraged. The proposal should address the following items:

- proposed venue
- dates
- details of conference secretariat
- details of rooms for plenary sessions, parallel sessions and posters
- availability of free Wifi connections for particpants
- organization time line
- detailed budget in local currency and in US dollars
- discussion of possibilities for sponsorship
- details of the conference presentation schedule (e.g. number of parallel and plenary sessions), publication of proceedings etc.
- details of accommodation, including costs, for delegates and students
- social events
- options for pre and post conference tours, software demos and courses
- options for program for accompanying persons
- plans for organization of an IBPSA Regional Affiliate Organization, if applicable
- involvement of existing or planned IBPSA Regional Affiliate(s)
- experience of organizing committee with IBPSA and with organizing similar conferences

To assist your decision there are several documents available from Michel:

- The IBPSA Regionalization Guide (also available at **www.ibpsa.org/IBPSA-Regionalization-Guide.doc**) describes IBPSA's regionalization plans: we schedule all of the Building Simulation conferences in regions with existing affiliates or regions that are starting a new affiliate organization. In a region currently without an affiliate, we will only consider holding the conference there if a regional affiliate organization will be in place by the time of the conference.
- Final reports for the Building Simulation'03, '05, '07, '09 and '11 conferences, which include details of organization, finances (e.g. planned budget and actual expenses), post-conference surveys and other information useful to organizers of future Building Simulation conferences.
- A document on sponsorship contains suggestions regarding the exposure and benefits of Building Simulation sponsors.
- A recent memorandum of understanding serves as an example for the contract

which will be agreed between IBPSA and the organizers of Building Simulation '15.
- A budget template.

Please request these by email to Michel Bernier.

Proposals will be evaluated using the following criteria:

- Attractiveness and accessibility of location – is this location likely to attract delegates from around the world? (10%)
- Affordability of venue – is the combination of registration fee and accommodation costs likely to not be a hurdle to potential delegates? (In this respect, a range of accommodation types including student dorms or the like is a benefit.) (10%)
- Quality of conference plan and facilities – are the facilities and conference plan conducive to a well-run conference? (10%)
- Likelihood of financial success – will the conference financial plan likely lead to breaking even (at least.)? A financial plan that does not rely on unconfirmed sponsorships to break even is strongly preferred. (30%)
- Support of IBPSA goals – will choosing this proposal help draw new members into IBPSA (in new regions) or support membership in existing regions? (10%)
- Diversity of location - is this location sufficiently distant from recent conferences? (10%)
- Regional participation – is the proposal well-supported by volunteer effort from the regional affiliate and/or nearby regional affiliates? (10%)
- Experience of members of the organizing committee with IBPSA and with organizing IBPSA affiliate conferences or conferences similar to Building Simulation. (10%)

The final decision regarding the location of Building Simulation 2015 resides with the IBPSA Board of Directors and will be made following a thorough evaluation of all submitted proposals. ■

IBPSA Fellow nominations

deadline extended to 2 November

J.D. Spitler

After recognizing six members with the grade of Fellow in 2011, the International Building Performance Simulation Association is pleased to call for nominations. This new membership grade will recognize individuals who have made outstanding contributions to the field of building performance simulation.

> "A member who has attained distinction in the field of building performance simulation, or in the allied arts or sciences, or in teaching of major courses in said arts and sciences, or who by way of research, simulation code development, original work, or application of building simulation on projects of a significant scope, has made substantial contribution to said arts and sciences, and has been active in the field for at least ten (10) years is eligible for election to the grade of Fellow by the Board of Directors."

At present, the IBPSA board plans to elect new Fellows on a two-year cycle, culminating with recognition at the biennial Building Simulation conferences. The board has decided to extend the deadline for nominations of the 2013 class of Fellows to November 2nd, 2012. Nominations may be made by IBPSA members other than the nominee. The application package will include details of the nominee's qualifications, a CV, supporting letters, and other relevant materials. The details of the nominee's qualifications shall include summaries of accomplishments in one or more of the following categories: industrial leadership, research, simulation code development, application of building simulation on projects of significant scope, educational leadership, and significant technical contributions to the allied arts and sciences. The application form and instructions are available at: **www.ibpsa.org/m_membership.asp.** ■

IBPSA Award nominations

The Board of IBPSA is seeking nominations for Awards to be presented at Building Simulation 2013, IBPSA's 13th biennial conference, in Chambery, France from August 25 to 28, 2013.

WHAT ARE IBPSA AWARDS?

The International Building Performance Simulation Association (IBPSA) makes three awards for outstanding work in the building performance simulation field. These awards are made on a biennial basis at each Building Simulation Conference, providing there is a qualified candidate. In order to allow the awardees time to plan to attend, it is time to consider nominations for the up-coming conference in 2013.

The three categories awarded are:

IBPSA Award for Distinguished Service to Building Simulation

This award recognizes an individual who has a distinguished record of contributions to the field of building performance simulation, over a long period. The award consists of a certificate and $500 (US).

IBPSA Outstanding Young Contributor Award

This award recognizes an individual at the beginning of their career who has demonstrated potential for significant contributions to the field of building simulation. The award consists of a certificate and $500 (US).

IBPSA Outstanding Practice Award

This award recognizes an individual, group or firm, who has made significant contributions to the effective application and/or advancement of building simulation in practice. The award consists of a certificate and $500 (US).

NOMINATIONS

Nominations for awards MUST be made by an INDEPENDENT third party.

Nominations for the **Distinguished Service Award** should include a brief CV which gives the history of involvement with building performance simulation, publications etc., and a summary of the nominee's specific contribution to the field of building performance simulation – e.g. in the development/ contribution to development of building performance simulation tools or in furthering knowledge in the field of application of building performance simulation, etc.

Nominations for the IBPSA **Outstanding Young Contributor Award** should include a brief CV, which gives a summary of the individual's contributions to the field of building performance simulation, their publications etc., and an assessment of the potential for future contributions arising from the individual.

Nominations for the **Outstanding Practice Award** should be accompanied by a summary of the individual's, group's or firm's contributions to the field of building performance simulation in practice and an assessment of the significance of these contributions.

SUBMISSION DEADLINE AND DETAILS

Deadline: 31 January 2013

Submit to: Nominations should be sent in the first instance to Lori McElroy, Chair of the Awards Committee **lori@sust.org** or Pieter De Wilde **pieter.dewilde@plymouth.ac.uk** by the closing date of the 31st January 2013.

The Awards Committee would like as many nominations as possible, so please contact Lori McElroy to discuss a possible nomination if required. ■

CONFERENCE

The simulation of building performance is increasingly embedded in the design process through green rating tools, regulation and as a general mean of optimizing design.

Building Simulation 2013 will explore current best practices and new horizons for the use of simulation to drive better building design, covering issues such as:

- How can simulation influence the design process
- The limitations of simulation in practice, and how can these be addressed
- Case studies of the use of simulation in practice, and the lessons learnt
- Interoperability and co-simulation
- Simulation validation, calibration and testing
- Comparing simulation and real world outcomes
- Simulation to support commissioning, controls and monitoring
- Applications of simulation in regulatory processes
- Advances in building physics
- Human aspects of indoor environment: comfort and behavior
- Building services
- Solar building simulation
- Energy capture and operation
- New work in simulation development
- Building as an energy node

Important dates

June 2012 :	call for papers
15th of September :	abstracts due
15th of October :	abstract accepted
31st of January :	full papers due
15th of March :	1st review
30th of April :	final papers accepted
31th of May :	early registration limit
25th to 28th of August :	conference

Chair: Etienne Wurtz / **Chair of the Scientific Committee**: Jean Jacques Roux

An event organized by :

With the support of :

BS2013 Student Competition and Travel Awards

STUDENT COMPETITION

It has become a tradition to run a student modelling competition during the year running up to each Building Simulation conference. Previous competitions have addressed the design and performance of hybrid ventilation solutions for non-domestic buildings located in the same climatic region as the conference venue. For BS13, IBPSA-England has teamed up with IBPSA-France to run a competition looking at the energy performance of domestic scale buildings. This will include consideration of ventilation systems, materials and solar protection. Details are still being finalised and will be published on the conference website in October. Undergraduate and postgraduate course directors may wish to consider using the competition brief to form part of the dissertation phase of their courses. In the meantime, to express an interest in taking part or for further details, please contact any one of the competition organisers: Timea Béjat (**timea.bejat@cea.fr**), Stephan Louis (**Louis.Stephan@cea.fr**), or Malcolm Cook (**malcolm.cook@lboro.ac.uk**).

STUDENT TRAVEL AWARDS

Travel to IBPSA Conferences can be an expensive business – especially for students. In order to assist as many students as possible to participate in BS 2013 in Chambery, France, IBPSA will grant a number of travel awards of up to 1000USD to students presenting papers. The number of places is limited to a maximum of 5 grants and as a result is highly competitive. The selection committee bases its decisions upon the following selection criteria:

- overall quality of the paper;
- relevance of contribution to the field of and/or furthering the effective application of building simulation;
- need for financial assistance, evidenced in a letter of recommendation from the student's supervisor/ advisor of studies (must be on university letterhead).

To be eligible, the student must be:

- enrolled in a graduate programme related to building simulation at the time of the conference; AND
- the thesis project must be directly related to building simulation.

Applications **MUST** be supported by a **letter of recommendation** from the student's supervisor/ advisor of studies.

Applications for awards must be made by 31 January, 2013 via e-mail to lori@sust.org or pieter.dewilde@plymouth.ac.uk. **The subject heading of the e-mail should be "Student Travel Award - paper XXX" where XXX is the three-digit reference number for your paper.**

The e-mail application **must** include the following:

- The student's name;
- The name of the programme, department, faculty, and university;
- The title of the PhD or Master's research;
- The name of the student's supervisor(s)/ advisor(s);
- A scanned version of the faculty recommendation letter on university letterhead in PDF format. (Note that the original letter must be presented to the Conference Secretariat at the conference).

The selection committee will base its decision upon a review of the final manuscripts. Therefore, to be eligible the student MUST submit the paper by the full paper deadline of 31 January, 2013.

Nominations should be sent in the first instance to Lori McElroy as representative of the Awards Committee lori@sust.org or Pieter De Wilde pieter.dewilde@plymouth.ac.uk by the closing date of the 31st January 2013.

The Awards Committee would like as many nominations as possible, so please contact Lori McElroy to discuss a possible nomination if required.

Payment will be made either to the academic department before the conference or directly to the student at the conference. ■

IBPSA affiliates

URLS for IBPSA affiliates' websites and email addresses for their contact persons are available on the IBPSA Central web site at www.ibpsa.org/m_affiliates.asp.

IBPSA Australasia
contact: **Paul Bannister**

IBPSA Brazil
contact: **Nathan Mendes**

IBPSA Canada
contact: **Stephen Kemp**

IBPSA Chile
contact: **José Guerra Ramirez**

IBPSA China
contact: **Da Yan**

IBPSA Czech Republic
contact: **Martin Bartak**

IBPSA Danube
contact: **Marja Todorović**

IBPSA Egypt
contact: **Mohammad Fahmy**

IBPSA England
contact: **Malcolm Cook**

IBPSA France
contact: **Etienne Wurtz**

IBPSA Germany
contact: **Christoph van Treeck**

IBPSA India
contact: **Rajan Rawal**

IBPSA Ireland
contact: **Marcus Keane**

IBPSA Italy
contact: **Vincenzo Corrado**

IBPSA Japan
contact: **Mitsuhiro Udagawa**

IBPSA Korea
contact: **Kwang-Woo Kim**

IBPSA Netherlands + Flanders
contact: **Wim Plokker**

IBPSA Nordic
contact: **Ala Hasan**

IBPSA Poland
contact: **Dariusz Heim**

IBPSA Scotland
contact: **Lori McElroy**

IBPSA Singapore
contact: **Majid Haji Sapar**

IBPSA Slovakia
contact: **Jozef Hraska**

IBPSA Spain
contact: **David Garcia**

IBPSA Switzerland
contact: **Gerhard Zweifel**

IBPSA Turkey
contact: **Zerrin Yilmaz**

IBPSA UAE
contact: **Khaled Al-Sallal**

IBPSA USA
contact: **Charles "Chip" Barnaby**

IBPSA committee chairs & contacts

Regional Affiliate Development Committee
Dru Crawley

Conferences Committee
Michel Bernier

Membership Development Committee
Jeff Spitler

Awards Committee
Pieter de Wilde

Website committee
Christoph van Treeck

IBPSA Fellows Committee
Pieter de Wilde

Publications Committee
Malcolm Cook

Public Relations Committee
Veronica Soebarto

IBPSA News
Christina Hopfe, Editor-in-Chief
Marion Bartholomew, Editor

To submit Newsletter articles and announcements:
Christina Hopfe (Newsletter Editor-in-Chief)
Cardiff University, Wales, UK
Email: **hopfec@cardiff.ac.uk**

IBPSA Corporate Address
148 Fanshaw Avenue
Ottawa, Ontario K1H 6C9
Canada

For additional information about IBPSA, please visit the Association's web site at **www.ibpsa.org**. For information on joining, contact your nearest regional affiliate.

IBPSA's mailing list has been consolidated into another listserver known as BLDG-SIM, which is a mailing list for users of building energy simulation programs worldwide, including weather data and other software support resources. To **subscribe** to BLDG-SIM, to unsubscribe or to change your subscriber details, use the online forms at **http://lists.onebuilding.org/listinfo.cgi/bldg-sim-onebuilding.org**.

To post a message to all members, send email to **bldg-sim@lists.onebuilding.org**.

The BLDG-SIM list is provided by GARD Analytics. If you have any questions, please contact the list owner Jason Glazer at **jglazer@gard.com** or +1 847 698 5686. ■

Journal of Building Performance Simulation special edition on Sport Venues and Infrastructure: Call for Papers

Guest editors: Pieter de Wilde, Dejan Mumovic and Malcolm Cook

This is a final call for contributions to a Special Issue of the Journal of Building Performance Simulation on sport venues and infrastructure, which is being brought together in the wake of the Olympic and Paralympic Games of London 2012. Olympic and Paralympic Games generate substantial construction projects in the host country, involving the development of flagship stadia, athlete and press accommodation, and many other spin-off projects. These projects will have worldwide attention during the games. It is therefore crucial for the host nation to ensure they are high performance, state-of-the-art facilities.

Following up on the London 2012 Games, this Special Issue of the Journal of Building Performance Simulation invites contributions which address the building performance of all sporting venues – across the different building simulation domains: thermal behaviour (energy and comfort), ventilation and air flow, lighting, fire and evacuation, acoustics, and integrated views that combine these domains. Papers are welcome that address different levels of spatial resolution, covering all sporting buildings and their components, sites, but also the urban level beyond these sites. Contributions need to pass the regular peer review process so should contribute to furthering the state of the art of building performance simulation knowledge.

Prospective authors are asked to submit a 300-500 word abstract describing the focus, research, results and conclusions of the paper they propose to submit. Abstracts and further enquiries should be emailed to Dr Pieter de Wilde, **pieter.dewilde@plymouth.ac.uk** by 30 November 2012. Full papers are due no later than March 2013 via Manuscript Central at **http://mc.manuscriptcentral.com/tbps**. ■