SOLAR ENERGY AND BUILDING PHYSICS LABORATORY

LABORATOIRE D'ENERGIE SOLAIRE ET DE PHYSIQUE DU BÂTIMENT

LESO-PB

Activity Report 2011

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Innovations for Renewable Energy Use in the Built Environment

Solar Energy and Building Physics Laboratory (LESO-PB)
Swiss Federal Institute of Technology Lausanne (EPFL)
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EPFL Solar Energy and Building Physics Laboratory (LESO-PB)

ACTIVITY REPORT 2011

The Solar Energy and Building Physics Laboratory (LESO-PB) works at the forefront of research and technological development in renewable energy, building science and urban physics. It is part of the Civil Engineering Institute (IIC) of the School of Architecture, Civil and Environmental Engineering (ENAC) of the Swiss Federal Institute of Technology (EPFL) in Lausanne, Switzerland. Placed under the responsibility of Prof. Dr Jean-Louis Scartezzini and four group leaders, the laboratory counts about 40 scientists, engineers and technicians. This report presents the teaching, research and dissemination activities for 2011.

LIST OF CONTENTS

RESEARCH

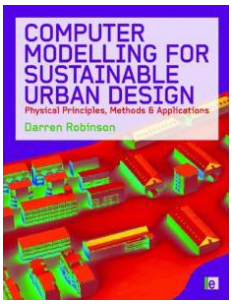
INTRODUCTION

The research activities of the Solar Energy and Building Physics Laboratory focus on the development and implementation of energy efficient and renewable energy technologies in the built environment:

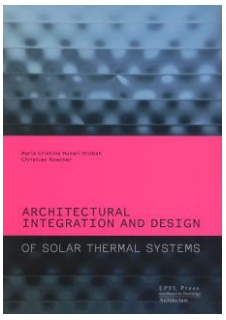
Intensive use and perception of daylight
Sustainable urban development
Bio-mimetic building control
Renewables integration in the built environment
Nanotechnology for solar energy conversion
Computer modelling of complex systems

Highlights 2011

- The inauguration of the **Nanotechnology for Solar Energy conversion Lab** and exciting new developments in the fields of solar absorber coatings and microstructured glass for daylighting under the direction of Dr Andreas Schüler
- A research study by Münch M. et al on the **effects of prior light exposure on early evening performance, subjective sleepiness, and hormonal secretion** published in "Behavioral Neuroscience"
- Several years of research published in two books authored by LESO-PB researchers:



"Computer modelling for sustainable urban design" edited by Darren Robinson with contributions by Jérôme Kaempf and other authors shows the state of the art in modelling of urban spaces.



"Architectural integration and design of solar thermal systems" by MC. Munari-Probst and C. Roecker shows new attractive and efficient ways of architecturally integrating solar thermal technology.

- The first version of **Geronimo, software wizard for the visualization of the impact of complex fenestration systems**, put at the disposal of architects and lighting designers.

Further research activities are presented in the following pages.

2011 AWARDS AND HONOURS

Name	Award, distinction	Year
MER Dr D. Robinson	Full Professor, University of Nottingham (UK)	2011
F. Haldi, MER Dr D. Robinson	Best Paper Award – Journal of Building Performance Simulation	2011

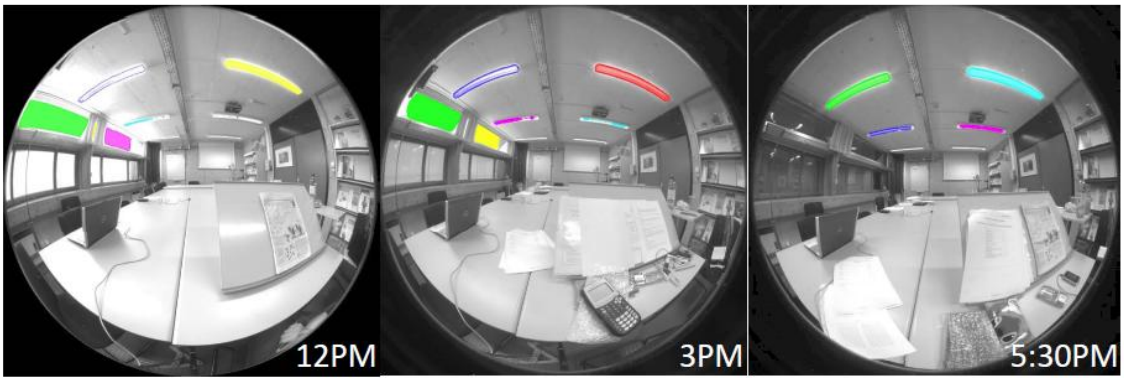
DAYLIGHTING AND PERCEPTION

Group leader: Prof. Jean-Louis Scartezzini
Research associate: Dr Mirjam Münch
Postdoctoral researcher: Dr Jérôme Kämpf
PhD students: Apiparn Borisuit, Chantal Basurto
Guest PhD student: Lenka Maierova, Czeck University Prague

The daylighting and perception research group works on advanced systems for optimal use of daylight in buildings with the aim to improve user comfort and health and reduce energy consumption.

The group has set up a sophisticated daylighting laboratory with, among other, a scanning sky simulator and an automated heliodon, which allow reproducing with very high precision all daylight conditions that exist around the world. Several anidolic (non-imaging) daylight systems have been developed and tested by the group. Furthermore, a bidirectional reflection and transmission goniophotometer based on digital imaging allows assessing the characteristics of complex fenestration systems.

Research on the impact of natural and artificial light on circadian rhythms in humans (chronobiology) is combined with technological advances in a multidisciplinary approach.



Glare sources are indicated with different colors and quantified by using 'Evalglare' (Wienold & Christoffersen, 2006).

Published work relates to

- Circadian rhythms and impact of light in humans, visual comfort
- Daylighting computer design and analysis tools
- Integrated day- and electric lighting systems
- Bidirectional reflection and transmission goniophotometer
- Anidolic daylighting systems
- Scanning sky simulator and automated heliodon
- Experimental and ergonomical daylighting test modules

2011 Activities

Two new laboratory studies on day- and artificial lighting started and one major project with different office light conditions was completed last year. An intense laboratory study with extreme chronotypes was initiated to shed light on inter-individual lighting preferences in offices during work hours. Another project with patients suffering from ophthalmological diseases started in collaboration with MER Dr. A. Kawasaki of Hôpital Ophtalmique Jules Gonin, Lausanne. The impact of different wavelengths of light stimuli on EEG brains activity were tested on 16 healthy subjects in order to assess acute and short time changes of neuronal activity in response to different light stimuli.

Current Projects

Comparison of non-visual light-dependent functions in healthy subjects & patients with retinal ganglion cell loss

Funding: *Swiss National Science Foundation (SNSF) (project in collaboration with Hôpital Ophtalmique Jules-Gonin, Lausanne, PD MER Dr. med. Aki Kawasaki)*
Duration: *2011-2013*

This project aims to characterize alertness, cognitive performance and hormonal secretion in response to light exposure in patients with neuroretinal disease as well as healthy controls, and to correlate such changes to the pupil light reflex.

Circadian Light for Humans with Dementia

Funding: *Sonnweid Foundation (Switzerland), Age-Foundation (Switzerland)*
Duration: *2011-2012*

The study aims to demonstrate that the increase of circadian amplitude induced by efficient light with the right spectral composition serves not only psychological factors such as mood and well-being, but also influences important regulatory health functions in demented patients.

INTER – Individual Lighting Preferences of Office Occupants

Funding: *Scientific Exchange Prog. Switzerland-EU New Member States (Sciex-MMS), Velux Foundation (CH)*
Duration: *2011-2012*

This project aims to analyse subjective and objective visual and thermal comfort variables in young volunteers with known differences of their diurnal preference under varying (day-) lighting conditions.

Daylighting Design and Visualisation Tools

Funding: *Swiss Federal Office of Energy (SFOE)*
Duration: *2009-2012*

The project is aiming to set up a daylighting design tool for the visualisation of the light redirecting properties of complex fenestration systems, which will be complemented by an advanced ray-tracing computer simulation algorithm.

Integrated Multifunctional Glazing for Dynamical Daylighting

Funding: *Swiss Federal Office of Energy (SFOE)*
Duration: *2009-2012*

The project is aiming to set the bases for an integrated multi-functional glazing for dynamic daylighting using novel microstructures which will redirect sunlight into office rooms.

Postdoctoral Fellowship in Daylighting & Perception

Funding: *VELUX Foundation (Switzerland)*
Duration: *2008-2012*

This project is aiming to strengthen the education and research activities in the fields of building science and chronobiology. It is expected moreover to initiate innovating activities in relation to psycho-physiological aspects of daylight with an emphasis on human response factors, such as the perception of three-dimensional spaces and luminous environment.

PhD theses published in this domain at LESO-PB

- *Energetic, visual and non-visual aspects of office lighting,* Friedrich Linhart, EPFL PhD Thesis #4587, 2010
- *Comparing physical and virtual methods for daylight performance modelling including complex fenestration systems,* Anothaï Thanachareonkit, EPFL PhD Thesis #4130, 2008
- *Bayesian optimisation of visual comfort,* David Lindelof, EPFL PhD Thesis #3918, 2007
- *Innovative bidirectional video-goniophotometer for advanced fenestration systems,* Marilyne Andersen, EPFL PhD Thesis #2941, 2004

Awards in this domain

- Marilyne Andersen, EPFL PhD Thesis #2941 (2004), Chorafas Award 2005

SUSTAINABLE URBAN DEVELOPMENT

Group leader: MER Dr Darren Robinson (until 9.2011) / Dr Jérôme Kaempf (from 10.2011)
Postdoctoral researcher: Dr Wanjing Li
PhD students: Diane Perez, Urs Wilke, Olivier Pol
Visiting researchers: Maria Papadopoulou, Dapeng Li

Optimisation of the cooling energy demand of the district of Alt-Wiedikon/Zurich.

The principal mission of this group is, through the simulation of physical processes, to better understand how to optimise the sustainability of **urban systems**, predominantly from environmental but also from social and economic perspectives.

Specific research interests include:

- Simulation and evaluation of resource fluxes (energy and matter) in urban systems
- Demand and supply side control of urban energy flows
- Urban microclimatology
- External environmental comfort and social wellbeing
- Stochastic modelling of human behaviour

Published work relates to

- Modelling and optimisation of urban energy fluxes
- Occupant behaviour and comfort
- Sustainable urban design
- Thermodynamics in the city
- Radiosity algorithms and internal illumination prediction

2011 Activities

Our book "Computer modelling for sustainable urban design" was published in March 2011. It harmonises our work in urban modelling over the past decade and has become a reference in the domain of urban simulation.
From the first encouraging applications of our urban energy modelling tool CitySim at a neighbourhood scale, we proceeded to a larger scale. The city centre of Neuchâtel was simulated to evaluate cooling needs and the possible installation of a free cooling facility with lake water. In several districts of Zurich city a field survey was carried out to improve the predictions previously obtained with our modelling tool. A new project was submitted to the CCEM board to establish a link between atmospheric models and CitySim. This project will start in 2012.

Current Projects

QUAD - Sustainable Districts

Funding: Research Center for Energy and Municipalities (CREM)
Duration: 2011-2011
Development of a prototype decision aid tool for architects, construction companies and city councils. This tool will allow urban design competition participants to define building specifications incorporating energy efficiency criteria.

IEA ECBCS Annex 51 – Energy Efficient Communities: Case Studies and Strategic Guidance for Urban decision Makers

Funding: Swiss Federal Office of Energy (SFOE)
Duration: 2009-2012
Participation in IEA ECBCS Annex 51 "Energy Efficient Communities: Case Studies and Strategic Guidance for Urban Decision makers". Contributions of case study material to the relevant sub-tasks. Preparation of a chapter on Urban Modelling for a book to be published by the members of this Annex.

Investigation of Strategies Leading to a 2kW City Using Bottom-Up Models of Urban Energy Flows

Funding: Swiss National Science Foundation (SNSF)
Duration: 2009-2012
Development of a detailed spatially explicit model of the dynamic flows of energy and matter within a city due to transportation, the operation of buildings and the activities accommodated by them, involving the further development and integration of CitySim -- for explicit simulation of building-related energy flows in urban settlements --and MATSIM --for transport micro-simulation. Application to the city of Zürich to produce new guidance for its development up until 2050, with a view to achieving a 2000W/capita city.

Innovative Planning and Management Instruments of Urban Energy Systems

Funding: EPFL Energy Center
Duration: 2009-2012
In this project we will work closely with municipalities, the EPFL Energy Centre as well as the Industrial Energy Systems Laboratory at EPFL to develop a new urban energy planning tool for use by municipalities. The purpose of this tool will be to support municipalities' urban energy planning and investment decisions.

HOLISTIC - Holistic Optimisation Leading to Integration of Sustainable Technologies in Communities

Funding: European Union (EU) 6th Framework Program
Duration: 2007-2012
The HOLISTIC project aims to stimulate a paradigm shift in the use of energy within communities to more sustainable patterns. It will demonstrate how this transformation can be initiated in three typical communities, in Dundalk (IRE) Mödling (AU) and Neuchâtel (CH), by acting on every aspect of community life. The role of the LESO-PB within this 32MEuro European RTD project is to develop new software for optimising the energy performance of urban districts.

PhD theses published at LESO-PB in this domain

- *Towards a unified model of occupants' behaviour and comfort for building energy simulation* F. Haldi, EPFL PhD Thesis #4587, 2010
- *On the Modelling and Optimization of Urban Energy Fluxes,* J. Kaempf, EPFL PhD Thesis #4548, 2009
- *Multiscale Modelling of Urban Climate,* A. Rasheed, EPFL PhD Thesis #4531, 2009
- *Simulating occupant presence and behaviour in buildings,* Jessen Page, EPFL PhD Thesis #3900, 2007

Awards in this domain

- Frédéric Haldi, Darren Robinson: Best Paper, *Journal of Building Performance Simulation*: 2011.
- Frédéric Haldi, Darren Robinson: Best Paper, *Building and Environment Journal*: 2009, 2010.
- Darren Robinson: Visiting Professorship, *Technical Research Centre of Finland.*
- Darren Robinson: *Ken Dale Travel Bursary, CIBSE*, 2008.
- Darren Robinson and Andrew Stone: *Napier-Shaw Medal, CIBSE*, 2007.

BIO-MIMETIC BUILDING CONTROL

Group leader: Dr Nicolas Morel
PhD students: David Daum, Nikos Zarkadis

Self-adaptive control system

Bio-mimetic control of building services (heating, cooling, ventilation, blinds, electric lighting) can simultaneously optimize energy use and indoor comfort (thermal, visual, air quality) through the use of advanced computer methodologies such as artificial neural networks, genetic algorithms, fuzzy logic, or advanced optimization algorithms. Our laboratory investigates control algorithms allowing at the same time:

- an optimal response to changing conditions (weather, building occupancy, lighting levels, thermal characteristics)
- a progressive adaptation to (possibly changing) building characteristics and to user preferences.

Research projects normally include two steps:

- development of innovative control algorithms and evaluation with computer simulation tools
- testing under real situations and evaluation of energy and comfort performances as well as acceptance by users.

Most bio-mimetic controllers are evaluated in the LESO building, which represents a powerful tool for our group.

Published work relates to

- Self-adaptive integrated building control systems
- Blind and electric lighting control algorithms
- Advanced control of electrochromic glazing
- Genetic algorithms for adaptation to user preferences
- Fuzzy logic for implementing building physics expert knowledge into the control algorithms
- Artificial neural networks for adaptive models and various control systems (for instance thermal model of the building or weather evolution).

Activities 2011

The LESO-PB contributed to the CCEM project on renovation of historical buildings (SuRHiB) with a study on the optimal use of heating, cooling and ventilation services in such buildings.
Furthermore, a smart algorithm for the project on predictive control of electrochromic glazings (ECControl) was elaborated, and the experimental setup for the validation of this algorithm was started.

A new research project was successfully submitted to the Hasler Fundation for financial support. The project Green-Mod will start in January 2012. It aims at the elaboration of an information system able to optimize energy consumption in buildings while preserving human comfort. The main innovation of the project is the use of state-based stochastic modelling applied to temporal signals acquired from heterogeneous sources such as distributed sensors and user wishes and preferences.

Current Projects in Biomimetic Building Control

Advanced Control of Electrochromic Glazing

Funding: Swiss Federal Office of Energy (SFOE)

Duration: 2009-2012

Electrochromic (EC) glazings might be used as an alternative to conventional mobile solar shadings or solar protection glazings, which are not well suited to most weather conditions and as a rule not efficient enough against overheating. EC glazings have until now essentially been actuated manually by the users. Some elementary control schemes have also been proposed, but the time characteristics of these glazings have not been considered. Therefore, a predictive algorithm, like those used for controlling building services, taking into account the thermal inertia, may bring some advantages with regard to user comfort (both thermal and visual). The project includes the development of an adequate control strategy, and the experimentation of this strategy in an office room of the LESO building, with real persons.

CCEM-SuRHiB: Sustainable Renovation of Historical Buildings

Funding: Swiss Competence Center for Energy and Mobility (CCEM)

Duration: 2009-2012

Historical buildings, if normally heated, cause relatively high energy consumption. As their façades need to be conserved, the thermal insulation of such buildings is difficult and risky. The moisture balance of walls has to be carefully considered besides the energy balance. Internal insulation that could effectively reduce thermal losses would hinder the drying process of walls. A careful risk assessment and robust guidelines have to be developed. A highly insulating light weight plaster finish based on aerogel particles, which insulates like polystyrene – inside or outside - but is open for moisture diffusion, is developed and tested in this project. Furthermore, appropriate heating systems and optimal solar integration are studied by LESO-PB.

PhD theses published in this domain at LESO-PB

- *On the adaptation of building controls to the envelope and the occupants*, David Daum, EPFL PhD Thesis #4935 (2010)
- *Bayesian optimisation of visual comfort,* David Lindelöf, EPFL PhD Thesis #3918 (2007)
- *Simulating occupant presence and behaviour in buildings, Jessen Page, EPFL PhD Thesis #3900 (2007)*
- *Using Genetic Algorithms to Take into Account User Wishes in an Advanced Building Control System,* Antoine Guillemin, EPFL PhD Thesis #2778 (2003)

Awards in this domain

- Antoine Guillemin, EPFL PhD Thesis #2778 (2003), Chorafas Award 2004

BUILDING INTEGRATION OF RENEWABLE ENERGIES

Group leader: Ing. EPFL Christian Roecker
Postdoctoral researcher: Dr Maria Cristina Munari Probst
PhD student: Raquel Peres Gagliano
Research assistants: Marja Edelmann, Gregor Stoll

Façade integrated evacuated solar collectors (Sunny Woods, arch. Beat Kämpfen)

Many building surfaces are ideally suited for the use of solar energy, but high costs, technical and aesthetic considerations have long kept building owners and architects from using even a small part of this potential. This is why the research group "Renewables Integration into the Built Environment" addresses the issue of optimal architectural integration of photovoltaic and thermal solar systems.

Major progress has been made in photovoltaics integration in the framework of several international projects over the last years. Currently, the group focuses on the integration of solar thermal technology and is co-leading the new IEA Task 41 "Solar Energy and Architecture".

Published work relates to

- Façade integration of solar thermal systems
- Criteria for successful architectural integration of active solar systems (PV & ST)
- Façade and roof integration systems for photovoltaics (pilot installations /development of new systems)
- Ergonomic interface for simulation software and "wizard" expert system
- Criteria and recommendations for solar installations authorisation

2011 Activities

One main activity of the group was the lead of Subtask A "Criteria for Architectural Integration" in the IEA SHCP Task "Solar Energy and Architecture" (Task 41).
Specific teaching on architectural integration of active solar systems continued through a dedicated ENAC Teaching Unit (UEE 04, "Intégration architecturale de l'Energie Solaire") and participation in Architects courses.
Work on a new architect specific interface for LESOSAI (building physics and solar thermal simulation software) was pursued, implementing a "wizard" concept for data entry.
Collaboration with EDF led to the financing of a PhD thesis in "Architectural Solar Design for Collective Residential Buildings".
Architectural integration research work continued in collaboration with several Swiss institutions (SUPSI, HSLU, Swissolar).
A project for the implementation of coloured glasses for solar collectors is on the way, in collaboration with an industrial partner.

Current Projects

ECLEER – Architectural Solar Design for Collective Residential Buildings

Funding: Electricité de France (EDF)
Duration: 2009-2012

The goal of this project is to study the possibilities and propose solutions to use solar thermal energy in the field of collective residential buildings. One important option is to take the opportunity offered by retrofit work on existing buildings to combine it with the installation of a proposed innovative product.

Solar Energy and Architecture - IEA SHC Task 41

Funding: Swiss Federal Office of Energy (SFOE)
Duration: 2009-2012

The main goal of the Task is to help achieving high quality architecture for buildings integrating solar energy systems, mainly by improving architects' qualifications and enhancing solar thermal manufacturers' awareness of building integration issues.

Unique and Innovative Solution for Building Integration of Thin Film Silicon PV modules

ARCHINSOLAR

Funding: Competence Center Energy and Mobility CCEM-CH
Duration: 2009-2012

The Archinsolar project aims at the development of a new generation of photovoltaic elements based on thin film silicon technology (single amorphous and tandem amorphous/microcrystalline cells). Specific issues to ensure a good "integrability" of the developed products are central focus for the group.

LESO QSV method

Funding: Swiss Federal Office of Energy (SFOE)
Duration 2011-2012

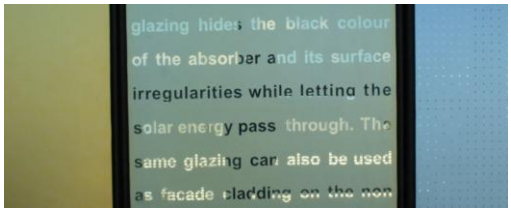
The goal of the project is to propose a method to help improving the architectural quality of the active solar installation projects. The method offers a way to assess the quality of a proposed integration, and helps define required quality levels function of site sensitivity and system visibility.

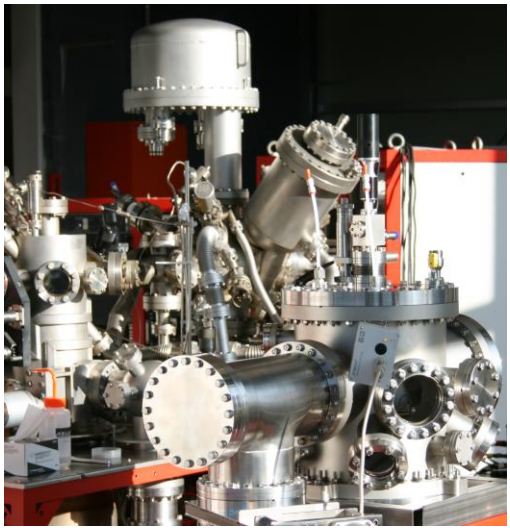
Book published in this domain at LESO-PB

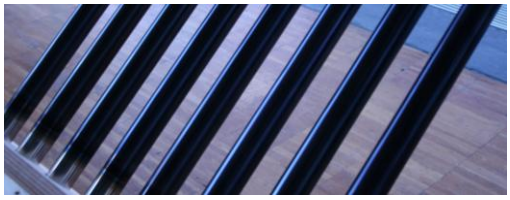
Architectural integration and design of solar thermal systems, Maria Cristina Munari Probst, Ch. Roecker, PPUR Routledge, 2011, ISBN 978-0-415-66791-3

NANOTECHNOLOGY FOR SOLAR ENERGY CONVERSION

Group leader: Dr Andreas Schueler
Postdoctoral researchers: Dr Virginie Hody Le Caër
PhD students: Martin Joly, Antonio Paone, Stefan Mertin, André Kostro







Due to their fascinating optical and electronical properties, nanometric scaled structures play an important role in solar energy conversion. The research group "Nanotechnology for Solar Energy Conversions", develops and characterizes novel nanostructured materials for solar energy applications. The nanocomposite coatings consist typically of dielectrics, semiconductors or metal nanocrystals embedded in a dielectric matrix. Applications include antireflection coatings on solar collector glazing, colored coatings with high solar transmittance for novel glazing of solar thermal façades, photoluminescent quantum dot solar concentrators for photovoltaic energy conversion and optical selective absorber coatings for thermal solar collectors and thermoelectric power generation.

The research group carries out fundamental research on novel nanocomposite materials and thin film materials and promotes the introduction of novel solar technologies through upscaling of the corresponding innovative manufacturing processes.

Published work relates to

- Colored glazed solar collectors, active solar thermal façades
- Quantum dot solar concentrators
- Highly durable selective solar absorber coatings
- Novel thermochromic solar absorber coatings for overheating protection

Activities 2011

Major highlights from our activities include:

- Construction of technical infrastructure, installation of equipment and inauguration of a new Laboratory for Nanotechnology for Solar Energy Conversion
- Large scale prototype production of novel solar glazing
- Scientific findings which might give raise to several patents in the fields of
  - highly durable selective solar absorber coatings
  - colored solar glazing for photovoltaic modules / solar thermal collectors
  - novel microstructured glazing for daylighting

Current Projects

Technology Transfer of Coloured Solar Thermal Collectors

Funding: *SwissINSO Trade & Invest Ltd*

Duration: *2009-2012*

At LESO, novel nanocomposite coatings on architectural glazing for solar active thermal façades have been developed. The electronic and optical properties of the novel nanocomposite materials are thoroughly characterized. LESO-PB provides the transfer of the developed technology from science to market - including the upscaling of the processes to industrial production. The novel glazing will allow a perfect architectural integration of solar thermal collectors into the building envelope, thereby creating new possibilites for water and space heating as well as for solar cooling.

Integrated Multifunctional Glazing for Dynamical Daylighting

Funding: *Swiss Federal Office of Energy (SFOE)*

Duration: *2009-2012*

The project is aiming to set the bases for an integrated multi-functional glazing for dynamic daylighting using novel microstructures which will redirect sunlight into office rooms.

Unique and Innovative Solution for Building Integration of Thin Film Silicon PV modules

ARCHINSOLAR

Funding: *SwissElectric Research, Swiss Federal Office of Energy (SFOE), Competence Center Energy and Mobility CCEM-CH, Services Industriels de Genève*

Duration: *2009-2012*

The Archinsolar project aims at the development of a new generation of photovoltaic elements based on thin film silicon technology (single amorphous and tandem amorph/microcrystalline cells). These new elements will be ultra-reliable. They will make possible very low manufacturing costs and unique architectural integration, and be respectful of the environment, landscape, buildings and traditions.

Advanced Switchable Selective Absorber Coating for Overheating Protection of Solar Thermal Collectors

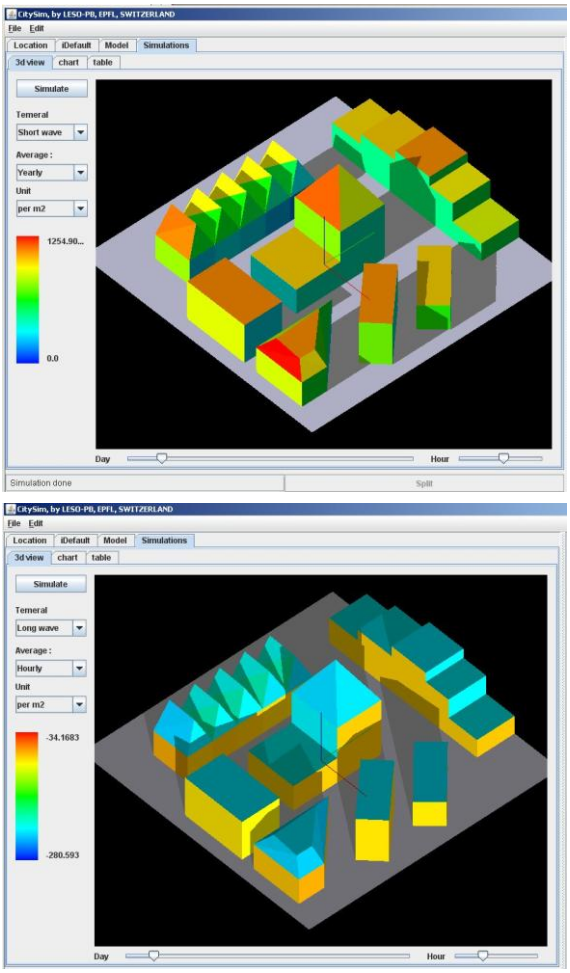
Funding: *Swiss Federal Office of Energy (SFOE)*

Duration: *2009-2011*

Overheating and the resulting stagnation of solar thermal collectors is a common problem even in central European latitudes. A promising way to protect solar thermal systems without any mechanical device (e.g. for shading or for pressure release) is to provide them with a coating which exhibits a change in optical properties at a critical temperature Tc. This project aims at the development of such coatings with thermochromic, "intelligent" properties.

COMPUTER MODELLING OF COMPLEX SYSTEMS

Group leaders: Dr Darren Robinson (until 9.2011) / Dr Jérôme Kaempf (from 10.2011)
PhD student: Urs Wilke



City Sim Model

By itself, building physics is concerned with rather elementary physics laws. But the construction, operation and demolishment of a building are connected with many different aspects, and their interactions makes the complete system complex. The complexity is even increased when dealing with a whole district or a city instead of only one building.

This research domain includes two different aspects:

- modelling of building behaviour where non-deterministic aspects must be considered, such as user behaviour (occupancy, individual preferences relative to comfort, etc) or the stochastic nature of weather conditions;
- modelling of large groups of elementary buildings, where the complexity arises from the numerous interactions between the individual objects (buildings).

This domain is closely linked with the domain Sustainable Urban Development: notably, both domains cover the study of similar objects (urban districts or a whole city), and they are concerned with the modelling of similar phenomena (eco-systemic modelling, interaction with the environment).

Published work relates to

- Urban sustainable planning tools with 3D models (Suntool)

Activities 2011

In 2011 a weak link was established between the SNSF project partner's multi-agent modelling tool MATSim and our urban energy flow modelling tool CitySim. The first case study was carried out on a small neighbourhood of Zurich city. Its scope is due to be extended in 2012.

Current Projects

An Investigation of Strategies leading to a 2000W City using Bottom-up Models of Urban Energy Flows

Funding: *Swiss National Science Foundation (SNSF)*

Duration: *2009-2012*

In this project we will develop a detailed spatially explicit model of the dynamic flows of energy and matter within a city due to transportation, the operation of buildings and the activities accommodated by them. This will involve the further development and integration of CitySim -- the most fully developed model available for explicit simulation of building-related energy flows in urban settlements --and MATSIM --a detailed transport micro-simulation model. The resulting platform should allow the simulation of all key physical urban resource flows. Once integrated, calibrated and validated, it will be applied to the city of Zürich to produce new guidance for its development up until 2050, with a view to achieving a 2000W/capita city.

EDUCATION AND TEACHING

COURSES AND STUDENT NUMBERS 2011/2012

Bachelor/Master Programmes

Course title	Lecturer	Students	Students numbers
Building Physics I	Prof. J.-L. Scartezzini	AR BA SEM1	361
Building Physics II	Dr A. Schueler	AR BA SEM2	310
Building Physics III	Dr J. Kaempf	AR BA SEM3	134
Building Physics IV	Prof. J.-L. Scartezzini	AR BA SEM4	133
Building Physics V	Prof. J.-L. Scartezzini	AR BA SEM5	168
Building Physics VI	Prof. J.-L. Scartezzini, MSc J.-C. Hadorn	AR BA SEM6	139
Indoor Environment Quality	Prof. C.-A. Roulet Dr M.C. Munari Probst MSc C. Roecker	AR MA SEM1	98
Energy within Buildings	Dr N. Morel MER Dr E. Gnansounou	GC MA SEM1+3	75
Sustainable Urban Development, Infrastructures	Prof. J.-L. Scartezzini MER Dr D. Robinson	AR/GC/SIE BA SEM6 (ENAC Learning Units)	22
Building Integration of Renewable Energy	MSc C. Roecker Dr M.C. Munari Probst	AR/GC BA SEM6 (ENAC Learning Units)	20
Energy in the City	MER Dr D. Robinson MER Dr E. Gnansounou	AR/GC/SIE BA SEM4 (ENAC Weeks)	24
Monitoring within ENAC	Dr N. Morel	AR/GC/SIE BA SEM4 (ENAC Weeks)	26
Minor in Energy	Dr. N. Morel	AR/GC/SIE MA SEM1+3	28
Light and the Built Environment: Impact on Circadian Rhytms in Human	Dr M. Münch	EPFL PhD Students (Doctoral program Neuroscience)	11

PhD Theses 2011

Title	Name	Advisers	End	# EPFL-Thesis
Urban districts' energy performance	O. Pol	MER Dr D. Robinson	2014	N/A
Multifunctional microstructured glazing for seasonal thermal control and daylighting	A. Kostro	Prof. J.-L. Scartezzini Dr A. Schueler	2014	N/A
Automatic control of electrochromic Windows	N. Zarkadis	Prof. J.-L. Scartezzini Dr N. Morel	2014	N/A
Optimization of daylight in educational buildings in prevailing clear sky conditions and its consequent influence on energy efficiency	C. Basurto Davilla	Prof. J.-L. Scartezzini Dr J. Kaempf	2014	N/A
Nano-structured Multilayer Coatings on Architectural Glazing for active Solar Energy Facades	S. Mertin	Prof. J.-L. Scartezzini Dr A. Schueler	2013	N/A
Building integrated Solar Energy Solutions for the Residential and Tertiary Sector	R. Peres Gagliano	Prof. J.-L. Scartezzini Dr M.C. Munari Probst	2013	N/A
Thermochromic VO2 Films for “Smart” Solar Energy Applications	A. Paone	Prof. J.-L. Scartezzini Dr A. Schueler	2013	N/A
A Bottom-up Model of City Metabolism	U. Wilke	MER Dr D. Robinson Dr F. Haldi	2013	N/A
The impact of Light on Comfort including Non-Image-Forming Effects	A. Borisuit	Prof. J.-L. Scartezzini Dr M. Münch	2013	N/A
Urban resource Flow Modelling: from the Neighbourhood to the City	D. Perez	MER Dr D. Robinson Dr J. Kaempf	2013	N/A
Heat and Corrosion resistant Nano-composite selective Solar Absorber Coatings by Sol-Gel Processing	M. Joly	Prof. J.-L. Scartezzini Dr A. Schueler	2012	N/A
On the Adaptation of Building Controls to the Envelope and the Occupants	D. Daum	Prof. J.-L. Scartezzini Dr N. Morel	2010-2011	4935

PhD External Committees

Involvement	Name	University	Adviser	Year
PhD Candidacy exam	C.P. Agullo	EPFL CCLAB	Dr A. Schueler	2011
Co-supervisor PhD thesis	L. Maierova	Czeck Univ. Prague	Dr M. Münch	2011-2013
Co-supervisor PhD thesis	G. Caruso	University of Pisa	Dr J. Kaempf	2011-2012

Outside Teaching

Title	Institution	Year
Light and Rhythms, Lecture within optional Bachelor course "Sleep and circadian rhythms" led by MER Dr P. Franken – Dr M. Münch	Lausanne University	2011

Master Theses

Title	Student/Institution	Year	Programme
Architecture de montagne et écologie: un bâtiment public à Verbier (VS)	L. Berset (EPFL) S. Martin (EPFL)	2011-2012	MSc Architecture
Un bâtiment de logements comme réponse économique et sociale, à Mégève (F)	M. Chardon (EPFL)	2011-2012	MSc Architecture
Restructuration d'un site industriel	G. Cochand (EPFL) P. Gautschi (EPFL)	2011-2012	MSc Architecture
Centre sportif sur le site de la Tronchennaz à Villeneuve	M. Ruck (EPFL)	2011-2012	MSc Architecture
Masterplan EPFL Research Center in Ras al Khainah (UAE)	S. Coccolo (Politecnico di Torino)	2011-2012	M Architecture
Solar Photovoltaic Installation in Chaurikharka Secondary School & Energy Study for Lukla Primary School, Nepal	J. Waehlti (EPFL)	2011-2012	MSc Sciences et Ingénierie de l'Environnement
Standards Minergie dans les pays à climat tropical humide	F. Aabid (EPFL)	2010-2011	MSc Mech. Eng.

STUDENTS FROM FOREIGN UNIVERSITIES, INTERNS AND GRANT HOLDERS

LESO-PB Research Group	Student/Institution	Year	Programme
Study of Passive Solar Energy in Social Housing in Bogota, Colombia	A. Cifuentes	2011-2012	Confederation grant holder
Nanostructured Materials for Renewable Energies	N. Jolissaint	2011-2012	Intern BNF
Variation Calculus Method for the Optimization of Building Form	G. Caruso, University of Pisa	2011-2012	PhD Student
Influence of Daylight on the Indoor Environment Quality	L. Maierova, Czeck Univ. Prague	2011	PhD Student Sciex-NMS
Sustainable Urban Development and Modelling	S. Pili, University of Cagliari	2011	PhD Student
Computer Simulations of Advanced Daylighting Systems	A. Jahveri, IIT Mumbay	2011	Post-grad Intern
Sustainable Urban Development and Modelling	S. Metha, IIT Madras - Chenai	2011	Post-grad Intern
Nanostructured Materials for Renewable Energies	M. Geiger	2011	Post-grad Intern
Sustainable Urban Development and Modelling	N. Gharbi, Ecole centrale de Lyon	2011	Masters Intern
IT Support	P. Roulin, ETML	2011	Trainee
IT Support	R. Mas, ETML	2011	Trainee
Modelling and Optimisation of Energy Flows	D. Li, China	2010-2011	PhD Grant holder
Sustainable Urban Development and Modelling	M. Papadopoulou	2010-2011	Confederation grant holder
IT Support	J. Ceppi	2010-2011	Civil Service
Building Integration of Renewable Energies	G. Stoll	2010-2011	Civil Service

PUBLICATIONS 2011

Details see http://infoscience.epfl.ch .

REFEREED SCIENTIFIC JOURNALS

S. Chellappa, M. Münch, V. Knoblauch and C. Cajochen. Age effects on spectral electroencephalogram activity prior to dream recall, in *Journal of Sleep Research*, 2011, Aug 18 [EPub ahead of print]

D. Daum, F. Haldi and N. Morel. A personalized measure of thermal comfort for building controls, in *Building and Environment*, vol. 46, num. 1, p. 3-11, 2011

J. Duffy, S. W. Cain, A.-M. Chang, A. J. K. Philipps and M. Münch et al. Sex difference in the near-24-hour intrinsic period of the human circadian timing system, in *Proc. Natl. Acad Sci USA*, vol. 108, num. Suppl. 3:15602-8, Epub 2011, May 2, 2011.

F. Haldi, D. Robinson, The impact of occupants' behaviour on building energy demand, *Journal of Building performance Simulation*, 4(4), 323-338, 2011

F. Haldi, D. Robinson, Modelling occupants' personal characteristics for thermal comfort prediction, *International Journal of Biometeorology*, 55(5), 681-694, 2011

M. Münch, K. D. Scheuermaier, R. Zhang, S. P. Dunne and A. M. Guzik et al. Effects on subjective and objective alertness, and sleep in response to evening light exposure in older subjects, in *Behavioral Brain Research*, vol. 224, p. 272-278, 2011

M. Münch, F. Linhart, A. Borisuit, S.M. Jaeggi, J.-L. Scartezzini, Effects of prior light exposure on cognitive performance, subjective sleepiness and hormonal secretion in the evening. *Journal of Behavioural Neuroscience* (in press; Epub 2011 Dec 26).

F. Linhart and J.-L. Scartezzini. Evening office lighting - visual comfort vs. energy efficiency vs. performance? in *Building And Environment*, vol. 46, p. 981-989, 2011

J. H. Kämpf and D. Robinson. Optimisation of Urban Sustainability, in *Computer Modelling for Sustainable Urban Design*, p. 203-258, 2011

D. Robinson, F. Haldi, J. H. Kämpf and D. Perez. Computer Modelling for Sustainable Urban Design, in *Computer Modelling for Sustainable Urban Design*, p. 113-147, 2011

D. Robinson, F. Haldi, Modelling Occupants' Presence and Behaviour – Part I, *Journal of Building Performance Simulation*, 4(4), 301-302, 2011

A. Rasheed, D. Robinson, A. Clappier, C. Narayanan, D. Lakehal, Representing complex urban geometries in mesoscale modelling, *International Journal of Climatology* 31: 289-301, 2011

Haldi F., Robinson D., Modelling occupants' personal characteristics for thermal comfort prediction, *International Journal of Biometeorology*, Volume 55, Issue 5, Pages 681-694, September 2011

CONFERENCE PROCEEDINGS

C. Basurto Dávila, A. Borisuit, J. H. Kämpf, M. Münch and J.-L. Scartezzini. Daylight optimization of buildings and application of advanced daylighting systems in central Mexico. In *Proc. of CISBAT 2011*, Lausanne, September 14-16, 2011.

A. Borisuit, F. Linhart, J. H. Kämpf, J.-L. Scartezzini and M. Münch. Comparison of objective and subjective visual comfort and associations with non-visual functions in young subjects. In *Proc. of CISBAT 2011*, Lausanne, September 14-16, 2011.

Conference proceedings [cont'd]

M. Edelman, C. Roecker, M.C. Munari Probst, A. Witzig, F. Foradini, Lesosai wizard: a new building energy tool for architects, in *Proc. of PLEA 2011*, Louvain La Neuve, Belgium, July 2011

J. H. Kämpf and J.-L. Scartezzini. Ray-tracing simulation of complex fenestration systems based on digitally processed BTDF data. In *Proc. of CISBAT 2011*, Lausanne, September 14-16, 2011

A. G. Kostro, M. Geiger, J.-L. Scartezzini and A. Schueler. Towards microstructured glazing for daylighting and thermal control. In *Proc. of CISBAT 2011*, Lausanne, September 14-16, 2011

R. Kriesi, F. Aabid, C.-A. Roulet, F. Vigliotti and J.-L. Scartezzini. Towards a Minergie-standard for tropical climates. In *Proc. of CISBAT 2011*, Lausanne, September 14-16, 2011

I. Mack, S. Mertin, V. Le Caër, A. Schueler and Y. Ducommun. Air cooling powered by façade integrated coloured opaque solar thermal panels. In *Proc. of CISBAT 2011*, Lausanne, Suisse, 14-16 September 2011.

S. Mertin, V. Le Caër, M. Joly, J.-L. Scartezzini and A. Schueler. Coloured coatings for glazing of active solar thermal façades by reactive magnetron sputtering. In *Proc. of CISBAT 2011*, Lausanne, Switzerland, September 14-16, 2011

M.C. Munari Probst, C. Roecker, Urban acceptability of building integrated solar systems: LESO-QSV approach, in *Proc. of ISSES 2011*, Kassel, Germany, 28th August – 2nd September 2011

M.C. Munari Probst, C. Roecker, Architectural integrability of solar thermal systems: present and future, in *Proc. of Energy Forum Bressanone*, Italy, 4-5 September 2011

O. Pol, D. Robinson, Impact of Urban morphology on building energy needs: A review on knowledge gained from modeling and monitoring activities, In *Proc. of CISBAT 2011*, Lausanne, September 14-16, 2011

S. Pelisset, M. Joly, V. Chapuis, A. Schueler and S. Mertin et al. Efficiency of silicon thin-film photovoltaic modules with a front coloured glass. In *Proc. of CISBAT 2011*, Lausanne, September 14-16

D. Perez, J. H. Kämpf, U. Wilke, M. Papadopoulou and D. Robinson. CitySim simulation: the case study of Alt-Wiedikon, a neighbourhood of Zürich City. In *Proc. of CISBAT 2011*, Lausanne, September 14-16.

L.-E. Perret, P. Heinstein, V. Chapuis, S. Pelisset and C. Roecker et al. New challenges in solar architectural innovation. In *Proc. of CISBAT 2011*, Lausanne, September 14-16.

D. Robinson, U. Wilke, F. Haldi, Multi agent simulation of occupants' presence and behaviour, *Proc. of 12th Conference of International Building Performance Simulation Association*, Sydney, 14-16 November 2011

J.-L. Scartezzini. Advanced Window and Lighting Technologies in net Zero Energy Buildings. *Proc. of RHEVA Annual Conference 2011*, Tallin, Estonia, May 16-18, 2011.

U. Wilke, M. Papadopoulou, D. Robinson, Towards a 2kW city, the case of Zürich. In *Proc. of World Renewable Energy Congress 2011*, Linköping, Sweden, May 8-13, 2011

U. Wilke, F. Haldi, D. Robinson, Stochastic activity modeling in residential buildings, In *Proc. CISBAT 2011*, 811-816, 2011

U. Wilke, F. Haldi, D. Robinson, A model of occupants' activities based on time use survey data, In *Proc. 12th Int. IBPSA Conf: Building Simulation 2011*, 2125-2132, Sydney, Australia, 2011

EXTENDED CONFERENCE ABSTRACTS

A. Borisuit, F. Linhart, J.-L. Scartezzini and M. Münch. Effects of two different office lighting conditions on subjective alertness and visual comfort in young volunteers. in *Proc. of Design & Health, 7th World Congress*, Boston, July 5-10, 2011.

J. F. Duffy, S. W. Cain, A. Chang, A. J. Phillips and M. Münch et al. Sex difference in intrinsic circadian period in humands. *In Proc. of Associated Professional Sleep Societies (APSS) The 25 th Annual Meeting*, Minneapolis, Michigan, USA, June 5-10, 2011.

Conference abstracts [cont'd]

S. Frey, A. Birchler Pedross, M. Hofstetter, P. Brunner and T. Götz, M. Münch, K. Blatter, V. Knoblauch, A. Wirz-Justice, C. Cajochen, Challenging the sleep homeostat in young depressed and healthy older women: sleep in depression is not premature aging. *In Proc. of Joint Meeting of the Swiss Neurological Society and the Swiss Society for Sleep Research, Sleep Medicine and Chronobiology SSSSC*, St Gallen, November 3-5, 2011.

M. Münch, A. Borisuit, F. Linhart, J.-L. Scartezzini. Daylight – visual comfort and non-visual functions. *4th Velux Daylight Symposium*, Lausanne, May 4-5 2011

M. Münch, L. Leon, S. Crippa and A. Kawasaki. Sleep-dependent effects on the pupil light reflex in humans in response to a narrow bandwidth light pulse. *In Proc. of Symposium: Circadian Output Pathways, Oxford*, United Kingdom, August 20-26, 2011

M. Münch, F. Linhart, A. Borisuit, S. Jaeggy and J.-L. Scartezzini. Effects of prior daytime light exposure on cognitive performance, subjective sleepiness and hormonal secretion in the evening. *In Proc. of the 23rd annual meeting of the Society for Light Treatment and Biological Rhythms*, Montreal, July 10-13, 2011.

M. Münch, F. Linhart, A. Borisuit, S. Jaeggi and J.-L. Scartezzini. Effects of daytime light exposure on early evening performance, subjective sleepiness and hormonal secretion. *In Proc. of Schweizerische Neurologische Gesellschaft SNG und Schweizerische Gesellschaft für Schlafforschung, Schlafmedizin und Chronobiologie SGSSC*, St-Gallen, November 4-5, 2011

E. J. Silva, S. W. Cain, M. Münch, W. Wang and D. Aeschbach et al. Age related differences in the effect of chronic sleep restriction on sleep quality. In *Proc. of Associated Professional Sleep Societies (APSS), The 25th Annual Meeting 2011*, Minneapolis. Michigan, USA, June 5-10, 2011.

BOOKS, PHD THESES

D. Daum, J.-L. Scartezzini and N. Morel (Dirs.). *On the Adaptation of Building Controls to the Envelope and the Occupants*. EPFL Thesis No 4935, Lausanne, 2011

M.C. Munari Probst, C. Roecker, E. P. F. L. Press and D. by Routledge (Eds.). *Architectural Integration and Design of Solar Thermal Systems*. EPFL Press - Routledge Taylor & Francis Group, Lausanne, 978-0-415-66791-3, 2011.

D. Robinson (Ed.). D. Robinson, A. Rasheed, M. Bruse, F. Haldi, J. Kämpf, D. Perez, K. Axhausen, F. Flourentzou, M. Batty, *Computer Modelling for Sustainable Urban Design*. Earthscan, London, Washington, DC, 978-1-84407-679-6, 2011.

J.-L. Scartezzini (Ed.). CISBAT 2011 - *International Conference - Cleantech for Sustainable Buildings* . EPFL, Lausanne, Vol.II: 978-2-8399-0918-1, 2011.

J.-L. Scartezzini (Ed.). CISBAT 2011 - *International Conference - Cleantech for Sustainable Buildings*. EPFL, Lausanne, Vol. I: 978-2-8399-0907-5, 2011.

OTHER PUBLICATIONS, REVIEWS, EXPERTISE REPORTS

J.-L. Scartezzini. State of the Art in Daylighting at EPFL. *4th Velux Daylight Symp.*, Lausanne, May 4-5 2011

M. Münch, Chronobiologie: Rhythmen des Lebens (German), in *Psychiatrie & Neurologie*, vol 2, p.16-18, 2011

INVITED PRESENTATIONS

Scartezzini J.-L., Advanced Window and Lighting Technologies in net Zero Energy Buildings. *Keynote Speaker*, *RHEVA Annual Conference 2011*, Tallin, Estonia, May 16-18 2011

Scartezzini J.-L., State of the Union in Daylighting at EPFL. *Keynote Speaker*, *4th VELUX Daylight Symposium*, EPFL Campus, Lausanne (Switzerland), May 2011

Scartezzini J.-L., Electricity within Buildings: Friend or Foe? (in French). *Invited Lecture*, *ElectroSuisse Meeting 2011*, EPFL Campus, Lausanne (Switzerland), October 6th 2011

Scartezzini J.-L., CleanTech Worldwide Categories: The Switzerland Assets, *Invited Lecture*, *CleanTech Investment Seminar*, Beaulieu Conference Center, Lausanne (Switzerland), December 7th-8th 2011

Kämpf J., Solar Energy from Nano to Urban Scale: Actual Projects and Perspectives in the Sustainable Urban Development Group, *Invited Lecture*, *Joint EPFL-SJTU Workshop on Sustainable Urban Regeneration*, Jiaotong University, Shanghai, 7-11 November 2011

Schüler A., Nanocomposite thin films for solar energy applications, *Invited Lecture*, *Centre de Recherche Européenne CREE de St-Gobain*, Cavaillon, France, January 26th, 2011

Schüler A., Nanocomposite optical coatings for solar energy applications, *Invited Lecture*, *St-Gobain Recherche SGR*, Paris, France, February 11th, 2011

Schüler A., Nanocomposite coatings for solar energy conversion: Large opportunities for small structures, *Invited Lecture*, *Eidgenössische Technische Hochschule Zürich ETHZ*, May 19th, 2011

Schüler A., Thermochrome Beschichtungen und farbige Kollektoren, *Invited Lecture*, *Schweizerische Energieforschungskonferenz*, Bern, November 29th, 2011

Munari Probst M.C., Architectural Integration and Design of Solar Thermal, *International Conference Solarpraxis*, Berlin, Germany, *Keynote Speaker*, 17-18 November 2011

Munari Probst M.C., Solar Systems: The Architectural Integration Problematic, *Keynote Speaker, International Conference ISES 2011*, Kassel, Germany, 28 August – 2 September 2011

Munari Probst M.C., Solar Thermal Technologies and Buildings, *Invited Lecture*, *Melbourne Forum: Solar Architecture* Melbourne, Australia, 29 September 2011

Munari Probst M.C., Integration des systèmes solaires: limites et possibilités, *Invited Lecture*, *Commune de Pully*, 25 May 2011

Munari Probst M.C., Architectural Integration of Solar Thermal, *Invited Lecture*, *Solar Energy and Architecture: Knowledge and Inspiration Seminar*, Oslo, Norway, 1 April 2011

Munari Probst M.C., *Invited Lecture, Solar energy and Urban Planning Workshop*, Copenhagen February 2011

Münch M., Daylight: Visual comfort and non-visual functions, *Keynote Speaker*, *4th VELUX Daylight Symposium*, EPFL, Lausanne (Switzerland), May 2011

Li W., CitySim: Comprehensive Micro-simulation of Energy Flows for Sustainable Urban Planning and Retrofitting, *Invited Lecture*, *Joint EPFL-SJTU Workshop on Sustainable Urban Regeneration*, Jiaotong University, Shanghai, 7-11 November 2011

Perez D., Modélisation des flux énergétiques durables, *Invited Speaker*, *Ecoparc Neuchâtel*, March 24, 2011

MEDIA

Borisuit A.,
Recherche: Une Thaïlandaise bien éclairée, *L'Hebdo*, Septembre 2011

Münch M.,
Natural light is best for the brain, *World Radio Switzerland*, June 7, 2011

Münch M., Scartezzini J.-L.,
Lumière. Bureaux bien éclairés, neurones mieux activés, *L'Hebdo*, Avril 2011

Münch M.,
Fit durch Licht; *Focus*, January 2011 Lectures

Münch M.,
Licht sorgt für Gesundheit (German), *Tagesanzeiger*, October 2011

LESO LUNCHTIME LECTURES

Title	Lecturer	Date
L'Adaptation au lieu de l'architecture vernaculaire dans les régions de montagne avec les nouvelles techniques constructives, combinaison parfaite prouvée pour construire ou rénover des bâtiments performants	Josep Bunyesc, architecte indépendant / Technical University of Catalogna (E)	02.12.2011
Ouvertures et impasses d'une politique énergétique de ville	Jean-Yves Pidoux, conseiller municipal, directeur	11.11.2011
A GIS based Spatial Decision Support System for integrating buildings energy efficiency in urban policies	Stefano Pili, University of Cagliari (I)	15.07.2011
Dynamic thermal behaviour and energy optimization of building envelope, in regions with high levels of solar radiation	Gianpiero Caruso, University of Pisa (I)	17.06.2011
Daylight and Windows - Is it possible to address a more 'holistic' approach to daylight requirements?	Jens Christoffersen, Velux (DK)	06.05.2011
Sustainable urban growth: New floating dwellings on the lagoon of Venice	Andrea Ferialdi, Studio Ferialdi - Zannovello, Venice (I)	15.04.2011

REPRESENTATION

EPFL INTERNAL

Name	Board, committee etc.	Start	End
Prof. J.-L. Scartezzini	Member of ENAC Academic Promotion Committee	2009	-
Prof. J.-L. Scartezzini	Chairman of CISBAT 2011 Editorial Committee	2011	2012
Prof. J.-L. Scartezzini	Member of Working Group on Excellence in Doctoral Education	2008	-
Prof. J.-L. Scartezzini	EPFL Doctoral Programme in Energy (EDEY), Member of Doctoral Committee	2010	-
Dr. N. Morel	Member of CISBAT 2011 Scientific Committee	2009	2011
MER Dr D. Robinson	Member of CISBAT 2011 Scientific Committee	2009	2011
Dr. M.C. Munari P.	Expert examiner at EPFL Design Studio of Prof. S. Benish	2011	2011
Dr. A. Schueler	Member of CISBAT 2011 Scientific Committee	2009	2011
Dr. A. Schueler	Coordinator for Security COSEC for LESO-PB	2011	-
Dr. A. Schueler	Coordination of technical services EPFL, validation of security for new Nanosolar Laboratory	2011	2011
MSc C. Roecker	Member of CISBAT 2011 Scientific Committee	2009	2011
MSc C. Roecker	Member of ESOPP Scientific and Piloting Committees	2010	-
MSc M. Joly	Coordinator Bike to Work contest	2010	-

EPFL EXTERNAL

Name	Organisation, Function	Start	End
Prof. J.-L Scartezzini	Novatlantis Platform, ETH-Board Evaluation (Bern), Member of Experts Panel	2010	2011
Prof. J.-L Scartezzini	European Centre and Laboratories for Energy Efficiency Research (ECLEER), Member of Advisory Board	2009	-
Prof. J.-L. Scartezzini	International Journal of Photoenergy, Member of Editorial Advisory Board	2010	-
Prof. J.-L. Scartezzini	The Open Construction & Building Technology Journal , Member of Editorial Advisory Board	2009	-
Prof. J.-L. Scartezzini	Solar Energy International Journal, Associate Editor	2000	-
Prof. J.-L. Scartezzini	IPCC Working Group III – Mitigation, Scoping Meeting for Renewable Energy, Expert Reviewer	2008	2011
Prof. J.-L. Scartezzini	Qatar National Research Fund (QNRF), National Priorities Research Program (NRRP), Peer Reviewer	2007	-
Prof. J.-L. Scartezzini	SIA Regards 2011 – National award for sustainable and promising achievements, Swiss Society for Engineers and Architects (SIA), Zurich, Member of Jury Panel	2010	2011
Prof. J.-L. Scartezzini	Swiss Competence Centre for Energy and Mobility (CCEM-CH), Research Committee Chair	2005	-
Prof. J.-L. Scartezzini	International Council for Research and Innovation in Building and Construction, EPFL Representative	2004	-
Prof. J.-L. Scartezzini	European Renewable Energy Research Centres Agency (EUREC), College of Members, EPFL Representative	2004	-

EPFL external representation [cont'd]

Prof. J.-L. Scartezzini	Ministry of Région Wallone, Energy Division, ENERBAT 2011 Programme, Expert Reviewer	2011	2011
MER Dr D. Robinson	Journal of Building Performance Simulation, Editorial Board Member	2009	-
MER Dr D. Robinson	National Science Foundation of Portugal, Programme Architecture and Urban Studies, Member of Evaluation Committee	2009	-
MER Dr D. Robinson	Research Program "UrbanNet", Swedish Research Council, Member of Evaluation Committee	2010	2011
MER Dr D. Robinson	On-line journal "Sustainability", Editorial Board Member	2009	2011
MER Dr D. Robinson	EcoParc (Neuchâtel), Board Member	2009	2011
MER Dr D. Robinson	French National Research Agency (ANR), Programme "Villes Durables", Member of Evaluation Committee	2008	2011
MER Dr D. Robinson	Swiss Chapter of Int. Building Performance Simulation Association (IBPSA-CH), Founding Board Member	2006	2011
Dr M.C. Munari Probst	IEA Task 41 Solar Energy and Architecture, Subtask A co-leader	2009	2012
Dr M.C. Munari Probst	Swissolar Association (Bern), Member of Architecture Group	2010	-
Dr M.C. Munari Probst	Conference PLEA 2011, Louvain La Neuve, Belgium, Session Chair	2011	2011
MSc C. Roecker	IEA Task 41 Solar Energy and Architecture, Subtask A co-leader	2009	2012
MSc C. Roecker	French National Research Agency (ANR), Member of Evaluation Committee	2011	2011

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