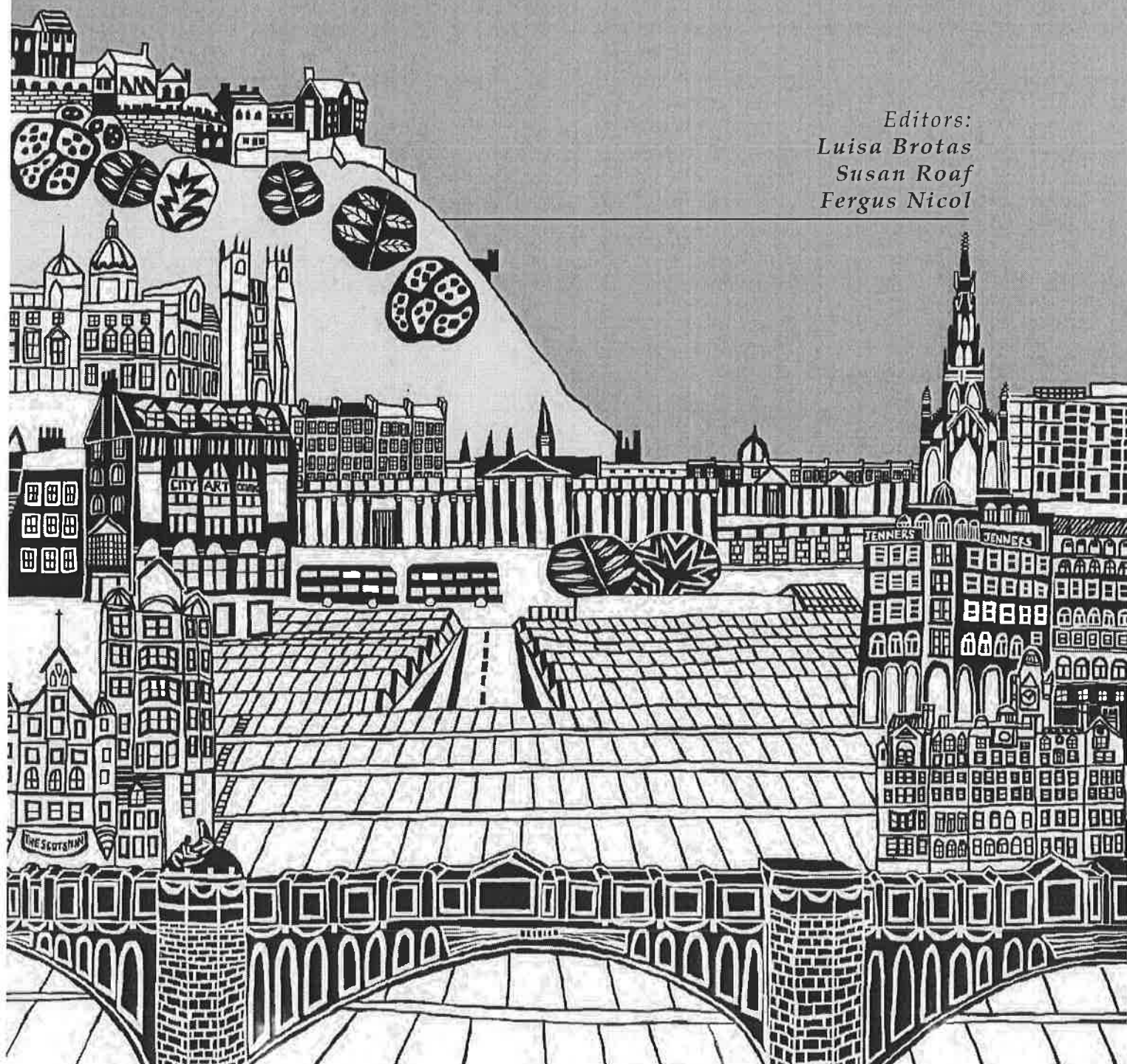


DESIGN TO THRIVE

Proceedings
Volume II

PLEA 2017 Conference

Editors:
Luisa Brotas
Susan Roaf
Fergus Nicol



Design to Thrive - PLEA 2017

Proceedings of 33rd PLEA International Conference
Design to Thrive
Edinburgh, 2th-5th July 2017
PLEA 2017 Conference www.plea2017.net

Published by NCEUB 2017
Network for Comfort and Energy Use in Buildings <http://nceub.org.uk>
to download go online to www.nceub.org.uk

Copyright in the contents, the cover, the design and the typographical arrangement of this publication rests with the NCEUB unless otherwise stated. Copyright of the individual papers remains with the Authors. The Editors do not accept any responsibility for the content of the papers herein published. The contents of this publication may be reproduced free of charge in any format or medium for the purposes of private research and study or for internal circulation within an organisation.

This is subject to the contents being reproduced accurately and not in a way that implies official status. The reproduced material must be acknowledged as NCEUB Copyright and the title of the publication specified. Any other use of the contents of this publication would require a copyright licence or written authorisation by the Authors.

All contributions to the 2017 PLEA Conference included herein were independently peer reviewed as a full paper, prior to publication.

Introduction to the Proceedings of PLEA 2017

The question we all too often forget to ask is Why? Why, for instance did we in Edinburgh set out on the PLEA 2017 journey to give ourselves all the very hard work of creating a huge conference in which people from all over the world were invited to discuss and develop ideas of Passive and Low Energy Buildings (PLEA)? Well the answer is that we believe the issue of good building design, embraced for thirty five years by the PLEA movement is simply one of the most important there is in the evolution of a safer world in which people will be able to live comfortable and affordable lives in a rapidly changing world.

The PLEA organisation started in 1982 as a small group of international friends dedicated to the ideal of sharing knowledge on how to design and operate minimal and renewable energy buildings. The development of solar buildings lay at the core of its ethos in those early days and still does. PLEA now has a membership of several thousand professionals, academics and students from over forty countries (www.plea-arch.org). Having expected three to five hundred abstracts for the 2017 PLEA conference we were overwhelmed by more than fourteen hundred.

It is obvious that the time for PLEA thinking has come.

Where better to share these important ideas than in Edinburgh, the 18th Century capital of the European 'Age of Enlightenment'? It is here we set about creating our Team Scotland to organise the conference, held on the 2nd – 5th July 2017 and including 665 papers published in these Proceedings. The impressive list of people who helped us included: the Scottish schools of architecture and engineering, the City of Edinburgh, the Scottish Government, Historic Environment Scotland, the Royal Incorporation of Architects in Scotland, the Chartered Institution of Building Services Engineers and a host of related professional companies and organisations.

Reflecting the diverse interests of the team involved, the subject matter of the conference is separated in the following proceedings into papers sorted according to the thirty-one Forums in which they were presented at the conference. Readers should first review the contents lists to see which subject areas are of particular interest to them and then browse through the varied papers by selected Forums. Separation of the papers into these various fields enabled authors to present their ideas at the conference to smaller groups with whom they could expertly explore and discuss their own results while learning from other related studies that might lend light to their own thinking.

Introduction to the Proceedings of PLEA 2017

In discussions at one of our Forum Leader meetings we decided that in reality many of the the larger challenges we face could be distilled down into five different themes:

- Building Better, Safer Places for All (inclusion and resilience)

- Designing to Thrive in a Changing world
(affordability and well-being in good buildings)

- Learning from, and building on, the Lessons of the
Past (evidence based design evolution)

- Powering our Lives with Sustainable Energy
(clear, durable and affordable futures)

- Empowering Current Generations (Education for change)

These themes run through in the pages of these proceedings, and were accompanied at the conference itself by a fascinating exchange of ideas, interpretations and assumptions and their attendant design solutions.

The conference was also accompanied by a simple Enlightenment message, presented in four flanking banners in the Ballroom of the Assembly Rooms where generations have deliberated since it was first opened at the height of the original Age of Enlightenment two hundred and thirty ago:

Sun – Light – Wind – Natural Energy Buildings

*The Editors:
Luisa Brotas
Sue Roaf
Fergus Nicol*

Volume Contents

PLEA 2017 Conference

Volume I includes the following forums:

- Adapting to Climate Change
- Aesthetics and Design
- Bridging the Performance Gap
- Building Performance Evaluation
- Carbon Accounting
- Comfort and Delight
- Community Energy
- Construction

Volume II includes the following forums:

- Cool Cities and Urban Heat Islands
- Culture and Society
- Digital Design
- Education and Training
- Energy Efficiency
- Future City Visions
- Green Infrastructure
- Health and Air Quality
- Historic Buildings and Refurbishment
- Light

Volume III includes the following forums:

- Low Carbon Design
 - Materials
 - Overheating
 - Passive Climatic Design
 - Place Making and Well-being
 - Renewables Solar and Hydrogen Buildings
 - Resilience Aging and Adapting to Change
 - Sound
 - Transition Communities
 - Transport
 - Ventilation
 - Water and Waste
 - Windcatchers and Windows
-

Table of Contents

Introduction to the Proceedings of PLEA 2017	ii
Volume Contents	iv
Volume 2	
Cool Cities and Urban Heat Islands	1628
Rethinking a classic technique of assessing the success of urban outdoor Spaces Mary Myla Andamon and Andrew Stephen Carre	1629
An evaluation of seasonal patterns of thermal conditions inside a vegetated courtyard area of a Mediterranean city (Athens) Ioannis Charalampopoulos, Fotoula Droulia, Areti Tseliou and Ioannis Tsiros	1637
Evaluation of a sustainable urban redevelopment project in terms of microclimate improvement Angeliki Chatzidimitriou, Spyros Kanouras, Lena Topli and Michael Bruse	1645
Environmental modeling using WUDAPT for addressing climate change issues impacting urban areas Jason K. Ching, Gerald Mills, Linda See, Valery Masson, Julia Hidalgo, Xuemei Wang, Benjamin Bechtel, Oscar Brousse, Adel Hanna, Dev Niyogi, Dan Aliaga	1653
Using urban indexes to predict urban air temperatures: an integration of ANN models and GIS Pedro Renan Debiazi, Léa Cristina Lucas de Souza	1661
Urban Wind Patterns in High-Rise Residential Super-Blocks: assessing pedestrian comfort, air quality and building ventilation potential Mark DeKay, Sitan Zhu, J. Cullen Sayegh, Geng Liu,	1669
A novel approach to predict real-time urban heat island effect and indoor Overheating Hu Du, Phillip Jones and Chao Long	1677
Disentangling the influences of atmospheric stability and urban form on local cooling in a high latitude city: evidence from Glasgow Rohinton Emmanuel and Patricia Drach	1685
Is Urban Heat Island Mitigation Necessarily a Worthy Objective? Evyatar Erell	1693
Cooling the city of Delft – a park design aiming for a minimization of heat Stress Marjolein Pijpers-van Esch, Alexander Wandl and Arjan van Timmeren	1701
Simulation and comparison of urban heat island mitigation strategies under Mediterranean climate: The case of Dora district, Beirut, Lebanon Jeff Fahed, Stéphane Ginestet, Elias Kinab and Luc Adolphe	1709
Optimization of neighbourhood green rating for existing urban forms through mitigation strategies: A case study in Cairo, Egypt Mohammad Fahmy, Yasser Ibrahim and Hany Mokhtar	1717
Mapping Local Climate Zones for São Paulo Metropolitan Region: a comparison between the local climate zone map and two other local maps Luciana Schwandner Ferreira, Alessandra Prata Shimomura, Anderson Targino Ferreira, Denise Helena Silva Duarte	1725
Do small scale green spaces function as "cool islands" within the urban heat island? Characteristics and performance of selected green spaces in central London Anne Hanrahan and Frances Hill	1733
The influence of angular road orientations on high-density urban ventilation at pedestrian level Yueyang He, Abel Tablada and Nyuk Hien Wong	1741

Cool roof and natural ventilation for UHI mitigation and indoor comfort – cooling indicators for a commercial building Madi Kaboré, Emmanuel Bozonnet, Patrick Salagnac, Marc Abadie and Rémi Perrin	1749
The influence of bioclimatic urban redevelopment on outdoor thermal Comfort Ioannis Karakounos, Argiro Dimoudi, Stamatis Zoras	1757
Impact of Urban green open space/playfield in the street level microclimate of residential area at Dhaka, Bangladesh Ahmed Yousuf Khan, Ruksana Afroz and Khandorker tariqul Islam	1765
A Computational Approach in The Wind Distribution to Evaluate the Pedestrian Thermal Comfort Through the Effect of Roof Garden Placement Mochamad Donny Koerniawan, Suhendri	1773
Eco-district design and decision process through building energy and local microclimate assessment Georgios-Evrystheas Kyriakodis, Maxime Doya, Emmanuel Bozonnet and Peter Riederer	1781
Architectural Archetypes Database Propositions for WUDAPT Valéry Masson, Marion Bonhomme, Julia Hidalgo, Nathalie Thornay, Serge Faraut, Robert Schoetter, Linda See, Jason Ching, Gerald Mills, Edward Ng, Chao Ren	1789
Using WUDAPT to explore urban exposure to climate risks in selected cities Gerald Mills, Benjamin Bechtel, Paul Alexander, Nalalie Theeuwes, Michal Foley, Jason Ching, Chao Ren, Xu Yong	1797
The City of Salvador's Urban Planning based on Urban Climate Investigations Jussana Nery, Tereza Moura, Telma Andrade, Lutz Katzschner, Elisabete Santos	1805
Cooling Load Mapping by Using the Summer Temperature and Humidity Distributions in Hiroshima Shuhei Ota, Kaoru Matsuo, Makoto Yokoyama, Yui Sasaki and Takahiro Tanaka	1813
Diamond Bazaars in Mumbai - User adaptability and comfort in urban outdoor spaces in a hot and humid climate Saachi Padubidri	1821
Density and Environmental Performance: Analysing Diverse Characteristics of Outdoor Thermal Environment in Urban Villages, Shenzhen Wenjian Pan, Juan Du	1829
Park design and pedestrian thermal stress: evaluating the effects of shade and ground surface materials David Pearlmutter, Martina Petralli, Marco Napoli, Luciano Massetti, Giada Brandani and Simone Orlandini	1837
Sensitivity analysis of 'Local Climate Zone' based urban morphology parameters for outdoor thermal comfort in the tropics Narein Perera and Rohinton Emmanuel	1841
Impact of Solar Access on visitors' Behavior in an Urban Square in a Subtropical Location Nicole Piaskowy, Eduardo Krüger	1849
Urban Greenery as a Tool for City Cooling: The Israeli Experience in a Variety of Climatic Zones Oded Potchter and Limor Shashua-Bar	1857
Comparison of high-resolution climate model data with a Test Reference Year for building simulations Delphine Ramon, Hendrik Wouters, Nicole van Lipzig and Karen Allacker	1865
China's Urban Wind Corridor Plan: The Story behind Climate Change Adaptation and Eco-Planning in Chinese Cities Chao Ren, Edward Ng	1873
Green spaces, proposal for the improvement of the climate in tropical cities Mireya Alicia Rosas-Lusett, Miguel Ángel Bartorila, José Adán Espuna Mújica and Eduardo Camacho Oropeza	1880
Vegetation Cover and Surface Temperature in Urban Areas: An Analysis Using Remote Sensing in the City of Salvador, Bahia, Brazil Rossana Santos, Telma Andrade, Neila Branco, Patrícia Borja, Júlio Pedrassoli and Thiago Vale	1888
Environmental Densification Approaches for Berlin. Mitigating the Urban Heat Island Effect Jil Schroth and Rosa Schiano-Phan	1896

Potentials of Enhancing Urban Cooling through Differential Riparian Shading of Wetlands through Advection: Findings of field measurements and simulation study Abu Taib Mohammed Shahjahan, Khandaker Shabbir Ahmed	1904
Urban vegetation as a strategy to reduce heat island effects in the Mediterranean climate context, Lisbon – Portugal Caio Silva, Teresa Santos e José Antonio Tenedório	1912
Urban Water Pond Cooling Effect and Related Microclimate Parameter: a Scale Model Study Nedyomukti Imam Syafii, Masayuki Ichinose, Eiko Kumakura, Steve Kardinal Jusuf, Kohei Chigusa and Nyuk Hien Wong	1920
Awareness trends of urban thermal environment during summer based on tweets and photos Koujiro Takeda, Eiko Kumakura, Nobuyuki Sunaga	1927
Urban Geometry Design Guidelines for Heat Mitigation and Airflow in Bangkok Pattaranan Takkanon	1935
The impact of increasing surface albedo on pedestrians' thermal comfort Mohammad Taleghani	1943
Applying WUDAPT Product into the Spatial-Temporal Analysis of Land Use Change in the Pearl River Delta Region from 1988 to 2009 Ran Wang, Chao Ren, Yong Xu and Edward Ng	1948
Microclimate on outdoor spaces in the context of tropical climate: a case study in Brasilia – Brazil Daniela Werneck and Marta Romero	1956
Making Climatic Zoning Maps in Yokohama -Comparison between WRF model and MSSG model Makoto Yokoyama, Takahiro Tanaka, Satoru Sadohara and Toru Sugiyama	1964
A Modelling-Mapping Approach for Fine-Scale Natural Ventilation Evaluation in High Density Cities Chao Yuan, Leslie Norford, Rex Britter, Edward Ng	1972
Culture and Society	1980
Sustainable Rehabilitation in the low-income residential sector of Medellín, Colombia. A model for oriented self-construction Verónica Lopera and Alexander González	1981
The use of nostalgia at the ideation stage of permaculture design: opportunities for sustainability? Mary Loveday Edwards and Dr Bruce Carnie	1989
The Dual Role of Technology in Architecture: A Conceptual Framework and its Educational Application Michael McGlynn	1997
Pedestrian Comfort in Open Urban Spaces - A Conceptual Approach Paula Lelis Rabelo Albala Roberta Consentino Kronka Mülfarth	2005
Evaluation of Social Dimensional Sustainability of Built Environment in the Poor Rural Areas of China Li Wan, Edward Ng	2013
Digital Design	2021
An energy efficiency optimization method applying adaptive thermal comfort in a public office building in San Juan-Argentina Bruno Arballo, Ernesto Kuchen and Daniel Chuk	2022
A differential growth approach to solar envelope generation in complex urban environments Giovanni Betti and Stefano Arrighi	2030
Buildings with large glazed surfaces: optimization of solar control strategies in relation to the building's thermal inertia Antonio Carbonari	2038
Computational simulation analysis and calibration of insulation in social housing in the city of Valparaíso, Chile Francisco Carrasco, Jaime Espinoza and Nina Hormazabal	2046
The Power of Transformation: Modifying Colour and Geometry as the Primary Means of Transforming Existing Building Envelopes Isak Worre Foged	2053

The environmental potential of multi-storey housing in central Sao Paulo: An opportunity for reoccupying the city Joana Carla Soares Gonçalves and Mônica Dolce	2061
Outdoor Space Modelling for BIM-BASED Building Thermal Simulation Hidenori Kawai, Takashi Asawa and Yuta Manabe	2069
Limiting the buildings' envelopes in order to prevent the surrounding mask effect: towards an efficient implementation in the context of SketchUp Thomas Leduc and Kevin Hartwell	2077
The analysis and design strategy research of the new edition "Assessment Standard for Green Building" of China Jiwei Li, Lixiong Wang, Juanli Guo, He Xu and Hongxin Feng	2084
A parametric sensitivity analysis of the impact of built environment geometrical variables on building energy consumption Anas M.Hosney Lila and Simon Lannon	2092
The Integration of Outdoor Thermal Simulation Tools in Architectural Design Emanuele Naboni, Marco Meloni, Silvia Coccolo, Federico Cucchi, Giacomo Macrelli, Jérôme Kaempf, Jean-Louis Scartezzini	2100
Shape optimization of louver by numerical analysis of solar radiation Kazuaki Nakaohkubo	2108
Thermal performance simulation of green roof on social housing in hot and dry climate in Brazil Bianca de Abreu Negreiros, Rodger Edwards, Aldomar Pedrini and Clara Ovidio	2116
Integrating urban energy simulation in a parametric environment: a Grasshopper interface for CitySim Giuseppe Peronato, Jérôme H. Kämpf, Emmanuel Rey, Marilyne Andersen	2124
Towards a Holistic Approach to Low-Energy Building Design: Consequences of Metrics for Evaluation of Spatial Quality on Design Pil Brix Purup, Stina Rask Jensen, Steffen Petersen and Poul Henning Kirkegaard	2132
Raising Energy-Efficiency of a Heritage Building – A Modelled Case Study: The Commercial Chamber in Alexandria, Egypt Yousra Rashad, Khaled El-Deeb, Nevine Gharib	2140
Interdisciplinarity around design tools for new buildings and districts: the ANR MERUBBI project Mathieu Schumann, Thierry Duforestel, Hassan Bouia, Mathias Bouquerel, Adrien Brun, Clément Ribault, Thomas Leduc, Nadia Hoyet, Marc De Fouquet, Emmanuel Dufrasnes, Jean-Marie Sonnet, Régis Lécussan, Gilles Rusaouen	2148
Understanding ENVI-met (V4) model behaviour in relation to environmental Variables Tania Sharmin and Koen Steemers	2156
Assessing Cooling Energy Load and Dehumidification in Housing Built to Passivhaus Standard in Jakarta, Indonesia Roy Candra Sigalingging, David Chow and Steve Sharples	2165
Evaluation of ENVI-met's multiple-node model and estimation of indoor Climate Helge Simon, Lukas Kissel and Michael Bruse	2173
Performance-Based 3D Interior Space Layout Optimization Yun Kyu Yi	2181
Education and Training	2189
Changing attitudes in educating the developing world: Incorporating Earth Construction in East African curriculum Achilles Ahimbisibwe, Alex Ndibwami	2190
Deciphering the code of 'sustainable' architecture; Exploring the discourse of PLEA 2014 Sara Alsaadani	2197
The Ethical Commitment to Sustainability in the Gulf Countries; Architectural Education Challenge Kheira Tabet Aoul	2205
Enhancing Creativity and Independent Learning of Architectural Technology Students through the use of a Real Life Design Competition Module Heather Bibbings and Piotr Antoni Bieluga	2213

Designed response: Informing future student inquiry using design frameworks and full-scale construction Kenneth Black	2220
Experiential aesthetics as a basis for design in the classroom Gail Brager	2228
Life Cycle oriented Design put into Practise - Designing (and Building) a new Pavilion for the Students' Union at the University of Applied Sciences Bremen Maria Clarke, Andrea Dung and Michaela Hoppe	2236
Thinking hands: A hands-on, pedagogical living lab approach to green building methods in hot arid regions Marwa Dabaieh, Deena El Mahdy and Dalya Maguid	2244
Research, education and transfer: energy efficiency for sustainable building Silvia de Schiller and Julian Martin Evans	2252
Architectural Design Studio as a tool to promote University Social Responsibility (USR) in the improvement of urban environments Montserrat Delpino and María Isabel Rivera	2259
The schoolyard: an opportunity to learn, play and make community Valentina Dessi, Antonella Bellomo	2267
Success of Solar Entrepreneurship Development Programmes Towards Solar Energy Mission Avadhoot Dixit and Priyanka Bendigiri	2275
Teaching innovation and the use of social networks in architecture: Learning Building Services Design for Smart and Energy Efficient Buildings Samuel Dominguez-Amarillo, Jesica Fernández-Agüera, Patricia Fernández-Agüera	2283
Education for Sustainable Development of the Built Environment: Problem-Based Learning Approach for Embedding Sustainability Heba Elsharkawy and Sahar Zahiri	2291
A Study on Improving Online Sustainable Design Studios Robert Fryer and Rob Fleming	2299
Moving from Snapshots to Movies: The Analysis of a Design Process Combining Integral Theory and Systems Thinking Robert Fryer	2307
Sustainable architecture and innovative technologies for deep renovation of school buildings: the design experience in the Environmental Design course of the architecture school at the University of Florence Paola Gallo, Rosa Romano	2315
Handbook for Sustainable Construction in Eastern Africa Susanne Gampfer	2323
A classification model for urban spatial interventions in relation to urban Metabolism Ulf Hackauf, Arjan van Timmeren	2331
Sustainable material use in the Zero Pentathlon, a design assignment on holistic sustainable renovation of dwellings Elke Knapen, Elke Meex, Bart Janssens and Griet Verbeeck	2339
Tiny School - A Thought Experiment in Indian Architectural Education Harshit Singh Kothari and Tanvi Jain	2347
Neighbourhood-scale Evaluation to Benchmark the Integration of Urban Sustainability (NEBIUS). An innovative education and research methodology Sophie Lufkin, Emmanuel Rey	2355
Building Bridges or Chasms? Separating energy efficiency education for better integration Sanyogita Manu, Prasad Vaidya and Rajan Rawal	2363
From model to model: Lessons of perimeter in Jaime Sanfuentes' houses Ginnia Moroni and Hugo Pérez	2371
Articulation, Space and Sustainability: A Report on diploma student projects at the Technion, Israel Jonathan Natanian, Or Aleksandrowicz	2379

Energy performance analysis in interdisciplinary education – Lessons learned from a simulation-based teaching approach Emilie Nault, Sergi Aguacil, Emmanuel Rey and Marilyne Andersen	2387
The University as agent of change in the city: Co-creation of live community Architecture Dr Rachel Sara and Dr Matthew Jones	2395
Educational Buildings as Educational Buildings: Can sustainable architecture help support sustainability in the curriculum? Claire Speedie and Mark Mulville	2403
Redesign your previous design studio work according to the environment! - Learn principles of environmental design from famous architect's houses and taking your own field measurements - Masahito Takata, Shin Taniguchi and Akira Hoyano	2411
Sustainable Lighting Design – Appropriate metrics for built environment education? Gillian Treacy	2419
Architectural design teaching in Brazil – experiences in the midst of school's Multiplication Taiana Car Vidotto, Ana Maria Reis de Goes Monteiro	2427
Biomimetics in architecture Barbara Widera	2435
Energy Efficiency	2443
Campus Wide Energy Intensity Reduction through Performance Evaluation at Building Level - an Example in Singapore Patricia Alvina, Nilesh Y. Jadhav, Priya Pawar, Geraldine Though	2444
Energy consumption meter for housing with hardware and open source Design Miguel Arzate, Gerardo Arzate and Silvia García	2452
Evaluation of different shading devices for a Tehran primary school classroom Zahra Balador, Fatemeh Imani, Morten Gjerd	2459
Prioritising Energy Efficiency Measures Using Household Archetypes Hui Ben and Koen Steemers	2467
Labelling of the energetic efficiency on a case study in Passo Fundo, RS, Brazil, in accordance with the mentioned methods under the respective Brazilian regulation – RTQ – C. Letiane Beninca, Grace Cardoso and Cristiana Rodrigues	2475
Post-Occupancy Evaluation for a school building: a case study in the city of Passo Fundo/RS – Brazil Grace Cardoso, Tales Visentin, Letiane Benincá and Alcindo Neckel	2483
Solar Urbanism and Building Design in Buenos Aires – Design Guidelines Florencia Collo and Simos Yannas	2491
Energy Efficiency in Higher Education Alejandra Cortés, Paz Araya and Manuel Diaz	2499
Morphological characteristics and energy consumption of office buildings in the central area of Brasilia Joao Costa, Natalia Oliveira and Claudia Amorim	2507
Reshaping Architectural Choice through Adaptation in Al-Khobar, Saudi Arabia Noorihan Deraz	2515
Impact of Shading Windows on the Significance of Thermal Insulation Khaled El-Deeb	2523
Multi-Zone Adaptive Building Envelope: a Pilot Study James Erickson	2531
A study of the thermal performance of tweed curtains under controlled Conditions Richard Fitton, Alex Marshall, Moaad Benjaber, William Swan	2539
Developing a new weather indicator for better management of environmental control and energy consumption in galleries and museums Shashwat Ganguly, Fan Wang, and Michael Browne	2547

Optimal calculation of outdoor air fraction for conserving energy Goopyo Hong, Jun Hong, Daeung Danny Kim and Byungseon Sean Kim	2555
Nearly Zero Energy Laboratory Buildings (nZELab) Michael J Keltsch	2563
Statistical Analysis of the Influence of Constructive Parameters in the Energy Efficiency of a Building Amanda Fraga Krelling, Ana Mirthes Hackenberg, Elisa Henning	2571
An energy-neutrality based evaluation into the effectiveness of occupancy sensors in buildings: An integrated life-cycle study Tarun Kumar and Monto Mani	2579
Thermal-energy performance for office buildings in Brazil using multiobjective Optimization Felipe da Silva Duarte Lopes, Daniel Cóstola and Lucila Chebel Labaki	2587
An Assessment of Glazing Systems suitable for the Mediterranean Climate Etienne Magri, Vincent Buhagiar and Simon Paul Borg	2594
Does Energy Performance Certification evenly increase residential values? Carlos Marmolejo-Duarte	2602
Incorporating Biomimicry Principles into Building Envelopes: An Overview on Developed Examples Maryam Farzin Moghaddam and Soofia Tahira Elias-Ozkan	2610
Reinforcement Learning for smart buildings and cities Zoltan Nagy, June Young Park and Jose Vazquez-Canteli	2618
Modern requirement for thermal performance of building envelope in Russia Anna Nefedova, Bykova Iuliia, Anatolijs Borodinecs, Darya Nemova	2625
Envelope design of mixed-mode office buildings: theory versus practice Leticia Neves, Rafael Manoel, Karin Chvatal and Caroline Santesso	2632
UK Government's Household Energy Efficiency Incentives and Social Housing Organizations' Perspective on Energy Efficiency Retrofit Suraj Paneru, Amar Bennadji and David Moore	2640
Impact of surface modulation on solar heat gain: A performance evaluation of brick cantilevers/overhangs in brickwork Gargi Priyamwada, Rajan Rawal, Rashmin Damle	2648
Simulations for energy efficiency of residential and office building Skyscrapers Tanya Saroglou, Isaac A. Meir, Theodoros Theodosiou	2656
Variety and Bias in the Energy Performance Certification for Existing Residential Properties across Europe Sally Semple and Dr David Jenkins	2664
Integration of passive and active solar techniques towards developing a Zero-Energy Strategy for Egyptian office Buildings Ahmed Shahin, Daisuke Sumiyoshi	2672
Electricity generation in social housing: strategies for ZEB houses in Brasília Larissa O. Sudbrack, Cláudia N. D. Amorim and Caio F. Silva	2680
The Window to Wall Ratio for High-Rise Office Buildings in a Temperate Climate: Assessing Façade Embodied Energy and Building Operative Energy (Life Cycle Energy) in London Hashem Taher and Heba Elsharkawy	2688
Factors affecting the energy consumption for space heating of residential buildings in Tashkent region, Uzbekistan Gulnora Tangabaeva, Tetsu Kubota	2696
Establishing Baseline and Experimental Set- Up for Performance Evaluation of Innovative Solar Insulation Film for Fenestration: A Test-bed in the Tropics Rithika Susan Thomas and Priya Pawar	2704
Effect of Air Conditioning Operation Patterns on Indoor Thermal Environment and Energy Consumption of Multi-Residential Buildings in Hot and Humid Region Meinan Wang, Nobuyuki Sunaga, Jinghui Ma and Meiling Zhang	2712

Studies on energy performance utilizing computer simulations towards a ZEB building: a case study in Chico Mendes Institute in Brasilia Daniela Werneck, João Costa, João Aguiar, Natália Sousa, Adriano Lopes, Claudia Amorim	2720
Future City Visions	2728
The Portrayal of Renewables in Science Fiction Films: A Utopic or Dystopic Future? Islam Abohela	2729
Geospatial analysis of bike-sharing systems Alexandra Bardóczy and Kristóf Kapitány	2736
Compact Cities vs Spread Cities Oscar D Corbella and Patricia R Drach	2743
State Investment in Architecture and Public Health in the Scarce Resources Residential Sector of Medellin, Colombia Anny Gómez Patiño and Alexander González Castaño	2751
Usability analysis in public spaces in Medellin, Colombia Natalia Isabel Jiménez Guarín, Laura Restrepo Ávalos and Juan Esteban Tobón Ramírez	2759
Desertification and city resilience in Siwa, Egypt Inji Kenawy and Salwa Al Hegazi	2767
Lessons from Fukushima Disaster for Architects towards a Post-Nuclear Age Ken-ichi Kimura	2775
Suzhou Industrial Park: A Case Study of Town Building based on Singapore Model Zhongjie Lin, Ying Hu	2783
The Societal Impact Methodology – Connecting Citizens, Sustainability Awareness, Technological Interventions & Co-creative City Visions Craig Lee Martin, Andy van den Dobbelen and Greg Keeffe	2791
“multipliCities”: multi-scale energy modelling of urban archetype buildings, case-study in Toulouse Tathiane A.L. Martins, Serge Faraut, Luc Adolphe, Nathalie Tornay, Marion Bonhomme, Genevieve Bretagne, Patrice Contart and Geraldine Casaux-Ginestet	2799
Re-inhabiting the roof: Han Slawik Covered Roof Terrace, Amsterdam Simone Medio	2807
Strategic Urban Plan for the Araucania Region (Chile): The urban and environmental awareness of the Community Irene Perez, Andrea Maldonado	2815
Critical mapping for transformational cities Dr. Rob Roggema and Leena Thomas	2823
Evaluating Future Land Use Scenarios from the Viewpoint of CO2 Emission in Provincial Small Town: Designing and assessing scenarios in Fuchu, Hiroshima Shota Tamura, Takahiro Tanaka and Shinpei Iwamoto	2831
Green Infrastructure	2839
The effect of geometrical parameters of urban street on shading requirement in hot arid climate - Contemporary urban street of Biskra - Naidja Amina, Khammar Zedira, and Pr.Bourbia Fatiha	2840
TransPLANT: Transportation Hub Architecture and Living Wall Systems Danelle Briscoe	2848
Benchmarking the Environmental Impact of Green and Traditional Masonry Wall Constructions Corinne Gauvreau-Lemelin and Shady Attia	2856
Thermal comfort in outdoor spaces: Street markets in Presidente Prudente, Brazil Bruna Hamanaka and Carolina Lotufo Bueno-Bartholomei	2864
Living with Nature: Tiaki Taiao / Tiaki Tangata. The case of Zealandia William Hatton, Bruno Marques and Jacqueline McIntosh	2872

Influence of Extensive Green Roofs to the Local Microclimate: cooling assessment for a social housing project in the South of Brazil Lisandra Krebs, Erik Johansson, Carlos Krebs, Beatriz Fedrizzi and Eduardo Grala da Cunha	2880
The Future of a Past Porous City: Public spaces as integrated components of Lahijan's stormwater management infrastructure Masoumeh Mirsafa	2888
Urban greening as a tool for urban heat island mitigation – a survey of research methodologies in different climatic regions Hadas Saaroni, Jorge H. Amorim, Jelle A. Hiemstra, David Pearlmutter	2896
A Butterfly Commons for the Industrial Center of Los Angeles- An eco positive approach to a zero carbon built environment Steven Sandifer, PhD	2904
Introduction of a BVOC emission model into the microclimate model ENVI-met Helge Simon and Michael Bruse	2912
Greenery in Green Building Rating Tools Chun Liang Tan, Nyuk Hien Wong and Marcel Ignatius	2920
A Semi-Empirical Model to Evaluate Urban Wind Environment with Trees Chao Yuan, Leslie Norford, Edward Ng	2927
Health and Air Quality	2935
The efficiency of natural ventilation to combat hospital infections João Aguiar and Caio Silva	2936
Reinterpreting Courtyards: Design for Occupant Health and Well-being Sadiqa Al Awadh and Paul Kenny	2944
Firewood heating and pollution in the south of Chile: a systems approach for a comprehensive literature review Paz Araya	2952
Healthy Home Barometer – A survey among European citizens Susanna Beranova, Lone Feifer, Marie W. Elkjær, Ulrich Bang, Michael K. Rasmussen, Jens Christoffersen	2959
Detailed simulation of the indoor environment as a tool to design ventilation systems in low energy houses María del Carmen Bocanegra-Yanez, Paul Strachan, Janice Foster and Tim Sharpe	2967
Performance Comparison of VOCs Reduction by Three Indoor Air Pollution Abatement Plants Pasinee Sunakorn, Ramida Bandatran, Chanikarn Yimprayoon	2975
Connecting householders with their homes using low-cost technological Interventions Gloria Vargas, Christopher Tweed and Gabriela Zapata-Lancaster	2983
The Effect of the Dessicant Solution Droplet on Dehumidification Yu-Lieh Wu, Yuan-Lin Chen and Chia-Wei Lin	2991
Historic Buildings & Refurbishment	2999
Integrated design strategies for renovation projects with Building-Integrated Photovoltaics towards Low-Carbon Buildings: Two comparative case studies in Neuchâtel (Switzerland) Sergi Aguacil, Sophie Lufkin and Emmanuel	3000
Traditional architectural and environmental features of the old city of Cádiz Elena Vilches Álvarez and Simos Yannas	3008
Thermal Retrofitting, Refurbishment and Re-Use of Traditional and Historic Building Stock in Malta: a cost-sensitive, value-added approach James Bonnici, Vincent Buhagiar and Simon Paul Borg	3016
Hygrothermal modelling of a sustainable retrofit taking into account the urban microclimate. Case study of the medieval city center of Cahors (France) Sophie Claude, Stéphane Ginestet, Marion Bonhomme, Gilles Escadeillas, Jonathon Taylor, Valentina Marincioni and Hector Altamirano	3024

The rehabilitation of historical heritage as urban and sustainable regeneration: The case of the city of Seville Antonio Cubero-Hernandez, Teresa Perez-Cano and Francisco Montero-Fernandez	3032
Refurbishing the Corviale: a sustainable city inside a single building Irene Giglio and Simos Yannas	3040
Addressing Thermal and Daylight Performance in Energy Efficient Retrofits: The Mundella Centre Achilles Sophia Madhi Gnanaprakasam, Lucelia Rodrigues and Caroline Fox	3048
Energy-efficient retrofitting in Educational Facilities in Hot Arid Climate Mohamed Gomaa	3056
Towards energy transition of Chilean public housing from the sixties, 1010 and 1020 CORVI's modern architecture typologies Nina Hormazábal, Carolina Carrasco, Natalia Bustamante	3063
Building Community Resilience: identifying relationships that reduce disaster-related building downtime, improve functionality and build capacity Lisa D. Iulo, Maria Hurtado Ortiz, Danial Mohabat Doost, Mamak P. PourabdollahTootkaboni, Louise Comfort	3070
Restored store in Marqués de Larios St. Rafael Rafael Assiego de Larriva, Carlos Cifuentes Álvarez, Fernando Gómez Gil, Gonzalo Gil Muñoz, Abel Porras Illescas	3078
The RenovActive Concept – a healthy and affordable renovation concept Jonas Lindekens, Sabine Pauquay, Isabelle Bruyere and Lone Feifer	3086
Development of Traditional Architecture: Typology Transformation of the Lebanese House Habib Melki – Associate Professor	3094
The Construction of the European periphery since 1950. Constructive types used in Andalusia in a comparative study with European References of Innovation Daniel Navas-Carrillo, María Teresa Pérez Cano and Juan Carlos Gómez de Cózar	3102
Conversion of Santo Domingo of Atares Castle: a bioclimatic evidence based Approach Talia Quesada Campana, Rosa Schiano-Phan	3110
Comfort and Energy Efficiency in a Victorian House in the Past, Present and Future Priya Singh and Lucelia Rodrigues	3118
Improving the Energy Performance of Historic Timber-Framed Buildings in the UK Christopher J. Whitman, Oriel Prizeman, Julie Gwilliam and Pete Walker	3126
Light	3134
The influence of building's volumetry and urban configuration in the indoor environment daylight availability Luciana Beck, Fernando Pereira and Veridiana Scalco	3135
Natural versus artificial lighting use in an office building under clear sunny Skies Azeddine Belakehal, Kheira Tabet Aoul, Amar Bennadji	3143
Factors of the luminous environment involved in memorization in undergraduate students while using a computer screen Yadira Benitez, Salvador Islas, Douglas Leonard, Víctor Fuentes and Felipe Gutierrez	3151
The importance of the information regulation available in the lamps Packaging Helena C.L. Brandão, Mona Carvalho and Flavia Souza	3159
New Buildings, New Lighting, New Critique: Student Analysis of Integrating Daylight and LED Lighting Macy L. Brannan, Michael J. Coleman, Luz A. Escalante, Byron T. N. Greene, Bruce T. Haglund, Hanna R. Kuipers, Xiaoyi Lui, William R. Lundgren, Liuyingqin Yin	3167
Daylight and visual comfort in office buildings Luisa Brotas and Fergus Nicol	3175
Experimental Study of Light Pipe and Heliostat for Conducting Sunlight to Underground Spaces in Porto Alegre Yasmin Bystronski, Waldo Costa-Neto and Betina Martau	3183
Toward new design of laser cut panels for scattering of sunlight at high Latitudes Paola Jara Cerda and Barbara Szybinska Matusiak	3191

Effects of Anidolic Integrated Ceiling in interior daylight distribution for deep spaces under high exterior illuminance levels Safa Daich, Mohamed Yacine Saadi, Morello Eugenio, Barbara E.A Piga, Ahmed Motie Daiche, Nouredine Zemmouri	3199
Daylight: The good, the bad, and the glary. Occupant perceptions of thermal comfort, visual comfort, and productivity Julia K. Day, Seth Heronemus and Rhiana Martin	3205
External Versus Internal Solar Screen: Simulation Analysis for Optimal Daylighting and Energy Savings in an Office Space Fatma Fathy, Hanan Sabry, Ahmed Atef Faggal	3213
Development of a calibrated model for proof of energy efficient lighting concept with Daylight harvesting light tubes Matthias Haase and Andreas Ampenberger	3221
Daylight study in a chateau hall Jiri Hirs, Jitka Mohelnikova, Luisa Brotas, Josef Filla, Alena Selucka, Martin Dvorak	3229
Light Study in Kiasma Museum of Contemporary Art Qianwen Hong and Benson Lau	3237
New method for analysing a luminous environment considering non-imageforming effects of light Parisa Khademagha, Myriam Aries, Alexander Rosemann, and Evert van Loenen	3245
Using Solar Using Solar Screens in School Classrooms in Hot Arid Areas: The Effect of Different Aspect Ratios on Daylighting Levels Ahmad Kotbi, Eleni Ampatzi and Huw Jenkins	3253
An Occupant's Role-Specific Approach to Identifying Lighting Parameters for Concert Performances in Cambridge King's College Chapel Villian Wing Lam Lo and Koen Steemers	3261
An application of light pipe dimensioning model Bruna Luz, Vinicius Pavin, Jéssica Antônio, Daniella Yamana, Flavia Nunes and José Churrucá	3269
Enhancing outdoor shading without diminishing indoor daylight integration: simulations from Colombo, Sri Lanka Nusrath Maharroof, Narein Perera and Rohinton Emmanuel	3277
Envelope first / Inside later: Aperture Sunlight and Skylight Indices John Mardaljevic and Nicolas Roy	3285
Towards Dynamic Real-Time Daylight Simulation Dr Andrew Marsh and Dr Spyros Stravoravdis	3293
A comparative study between digital and scale model simulations of a luminous environment under a sunny clear sky Toufik Mezerdi, Azeddine Belakehal and AmarBennadji	3301
Optimizing the Performance of Variable Geometry Shading Screens for Occupant's Comfort Niyati Naik, Jingling Yang, Ihab Elzeyadi	3309
Evaluating blue spectral irradiance, illuminance level and the associations with health and wellbeing in older adults Amanda Nioi, Jenny Roe, Alan Gow, David McNair, Peter Aspinall	3317
Comparing the Effects of Daylight Illuminance and Solar Radiation on Students' Spatial Behaviour in Campus' Outdoor Spaces Bushra Obeidat, Mohammed Alshayeb and Afnan Barri	3325
The role of geometry and non-uniform distribution of openings in daylighting performance of solar screens* Farzaneh Oghazian, Khosro Daneshjoo, Mohammadjavad Mahdaveinejad	3332
Evaluation of Daylighting Performance in a Retrofitted Building Façade Doris Chi Pool, Eleonora Brembilla and John Mardaljevic	3340
Daylight performance depending on the atrium geometry conditions within buildings in Santiago de Chile Jeannette Roldán Rojas	3348

Urban density versus light, health and sun Diego A. Romero Espinosa	3356
Comparative Study of Daylighting in Outpatient Department in Hospitals Sahil Samnani, Manoj Parelkar and Roshni Yehuda	3364
Impact of compliance to Annual Solar Exposure requirements as per LEED v4 on Fenestration Design for Indian Context Agam Shah	3372
Parametric Configuration of Window Light Shelves for Daylighting of Hospital Patient Rooms under a Desert Clear Sky Ahmed Sherif, Ayman Mahmoud, Maryam ElSharkawy and Aya Eissa	3380
An Experimental Investigation on the Adaptive Luminous Comfort in the Built Environment Masanori Shukuya and Shogo Kadokura	3388
Visual Perception and Daylight Variables: Experiments in a Climate Chamber Cintia Tamura, Eduardo Krüger, Marcel Schweiker, Cornelia Moosman, Andreas Wagner	3396
Visualizing Daylight as a Material of Architecture: Empirical and Literary Explorations Judy Theodorson	3404
Low Carbon Daylighting Design: Proposal of an Innovative Daylighting Ceramic Facade System Elina Triantafyllidou, Rosa Urbano Gutierrez	3412
Multi-Region Contrast Method – A New Framework for Post-Processing HDRI Luminance Information for Visual Discomfort Analysis Ayman Wagdy, Veronica Garcia Hansen, Gillian Isoardi and Alicia Allan	3419
The Myth of Light – A Study of Luminous Environment of the Unitarian Church of Rochester Lu Wang, Benson Lau	3427
Annual glare evaluation for fabrics Jan Wienold, Tilmann E. Kuhn, Jens Christoffersen and Marilyne Andersen	3435
Predicting Indoor Daylight Illuminance from Solar Irradiance and Weather Forecast Data Deok-Oh Woo	3443
Air Conditioning Electricity Use Simulation in Low-Cost Residential Housings after Daylighting Redesign Chanikarn Yimprayoon, Nuanwan Tuaychareon, Nongnart Chuancheang, Wanarat Kornisaranukul, Pakapop Tavasit	3451
Celestial polarized light as an application opportunity into architectural openings design Juan Felipe Zapata	3458
A Pilot Study of Effects of Coloured Glazing Systems in a Daylit Office: Visual Comfort, Alertness, Mood and Wellbeing Xin Zhang, Xiaodong Chen and Jiangtao Du	3466
The Poetics of Light in the Extension of the Canova Sculpture Gallery by Carlo Scarpa Zhe Zhou and Benson Lau	3474



Papers in the table of contents have links to the associated paper in the book.
To go back to the table of contents press the image logo on the top on the paper.