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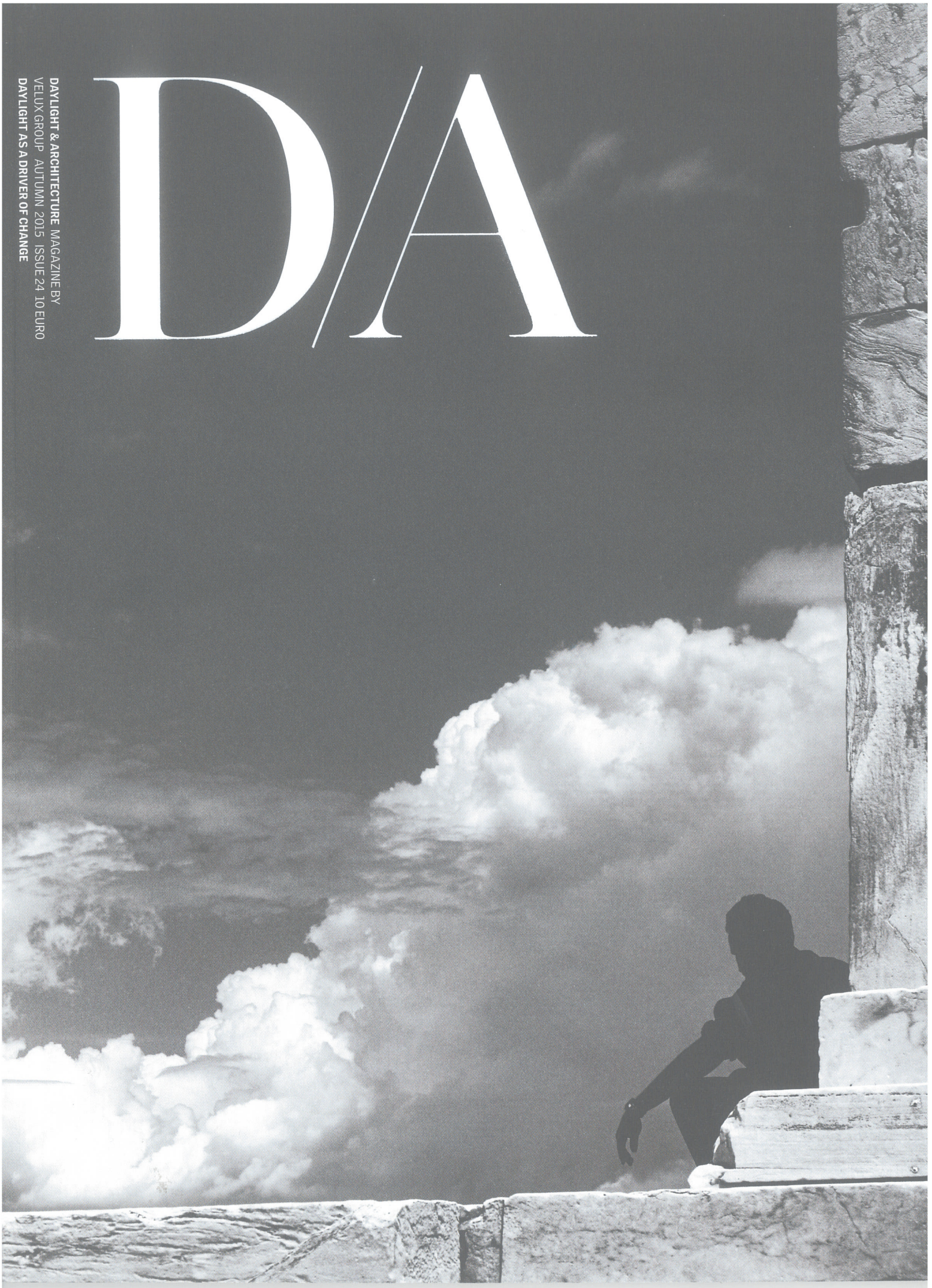
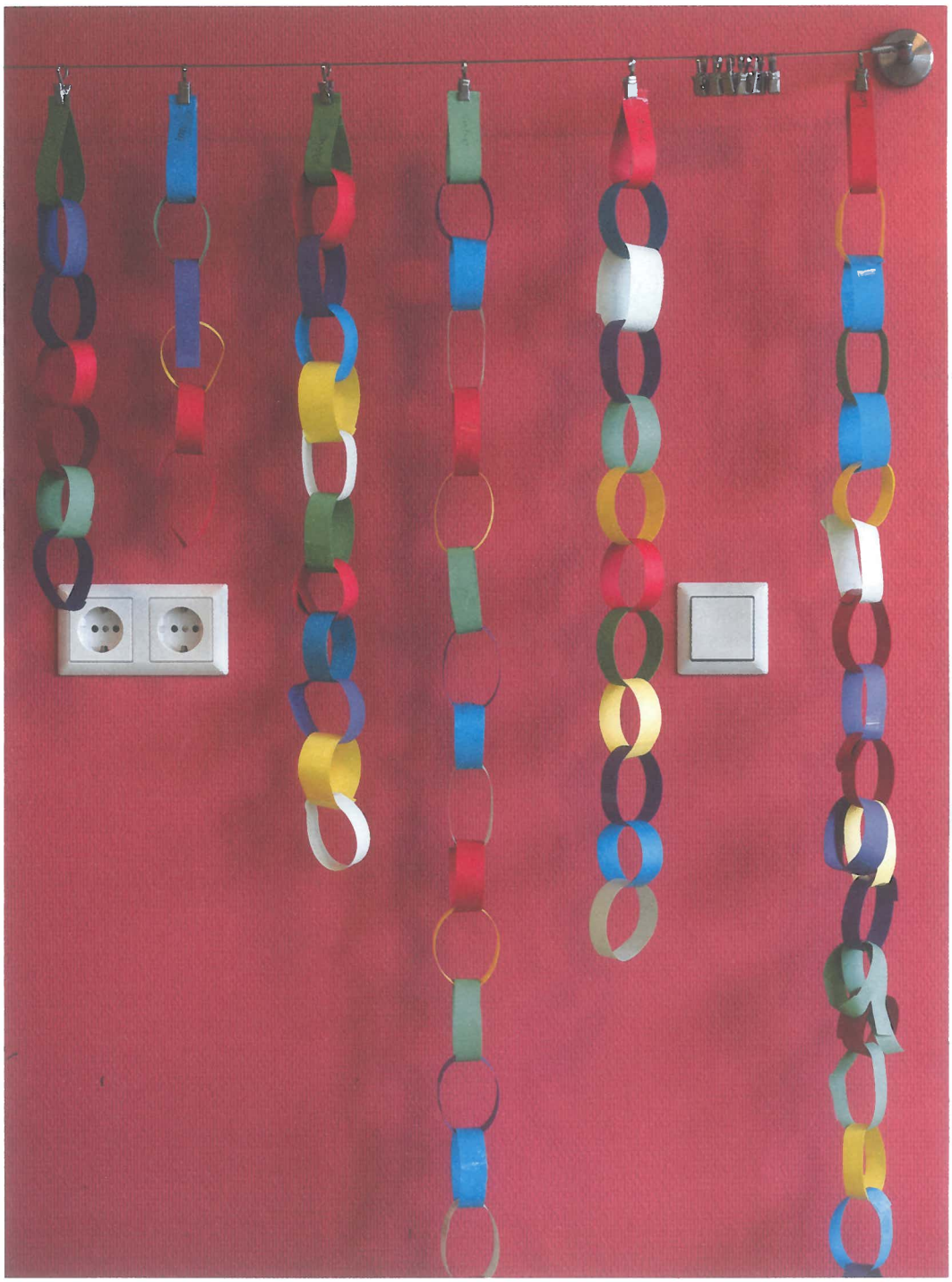
DAYLIGHT AS A DRIVER OF CHANGE





Marilyne Andersen

Building occupants in the spotlight

DAYLIGHTING AS A RESEARCH TOPIC situates itself at the interface between psycho-physiological and environmental factors. It brings together questions relevant to architectural design and building engineering, but also to human physiology and behaviour, which makes it both a challenging and essential aspect of how "performative" a space can be considered.

Can we better integrate the complexity of human needs in buildings into effective design and decision-making support for daylit spaces? How well a given space is daylit is, by essence, a multifaceted question. It is a key factor in how well any visual task will be performed and a main driver of occupant satisfaction regarding visual and thermal comfort (and hence energy consumption resulting from trying to meet comfort requirements). It has a strong impact on human health and well-being, a close association with (subjective) emotional delight and perceived quality of a space, and is highly dynamic and variable in nature resulting from a combination of predictable (sun course) and stochastic (weather) patterns. There is, as a result, a multiplicity of perspectives from which daylighting performance can – and should – be evaluated in building design. Through very different perspectives, ranging from task-driven illumination or comfort to human-driven health and perception, the architect is hence faced with multiple, highly variable criteria that can conflict but need to be brought together to lead to a satisfying solution.

What the numerous existing tools and approaches have in common is the aim of trying to either define or meet broadly acceptable (yet sometimes population- or condition-specific) target values so as to guide design towards objectively 'better' performance. Yet daylighting is known to be a field where no strictly defined numerical boundaries are enforced. There is a vast range of parameters and values that contribute to 'good' daylighting design and make absolute performance targets of questionable relevance. The question of "how good is good?" is indeed far from trivial with the multifaceted, highly variable nature of daylighting performance, about which people – occupants as much as designers – have highly diverging opinions.

Architectural design cannot be replicated by a well-defined computational process because optimisation does not respond well to the non-deterministic, ill-defined and unpredictable nature of the design process. Therefore, computer technology and its efficiency in comparing and testing options should be used to help designers fulfil their primary role, which is: to know what to look for.

The 'human' challenge at hand is twofold. It comes from the human nature of the designer, which remains the main driver of a design process: the ultimate balance between multiple, often-conflicting criteria cannot solely be based on measurable parameters, thus the design process must remain non-deterministic. And it comes from the human nature of the occupants, which encompasses individual diversity and temporal variability: as we know, to feel comfortable in a daylit space can result in very different constraints depending on the time of day, the season and the location of the building. Furthermore, human factors will induce diverging preferences for comfort from individual to another. The necessary flexibility and dynamic response of design goals also applies to our cyclic physiological needs or to the ever-changing ambiance of a space that contributes so intimately to its uniqueness.

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"To more deeply embed the diversity and variability of human needs as foundational elements of daylighting design and put human occupants back at the core of the question, we need to reach out to other research fields, so as to bring new insights and a deeper understanding of how we interact with our environment."

insights and a deeper understanding of how we interact with our environment:

- as human inhabitants of a living space who need to be in an environment conducive to health, and have physiological light exposure needs whose time- and spectrum-dependent non-visual effects we are only beginning to understand, thanks to recent findings in circadian photoreception research
- as users of a (work)space who perform a task for which comfortable visual conditions are needed, and behave dynamically in a space in which lighting must be well controlled as a key factor of workplace satisfaction and ergonomics
- as witnesses of a delightful space who want to enjoy it and seek to experience its choreography of geometry and light dynamics
- and so on.

What we must identify is how a building should respond to two inputs: on the one hand to what we have, i.e. analysing the resources available to work with (i.e. the building's environment whether natural or built, its localisation, climate etc); on the other hand to what we need, to determine whether and how the needs of the building's occupants can be met. The ultimate objective is to provide building designers with the means necessary to assess critical parameters in a successful design and efficiently combine qualitative and quantitative criteria in the solution search process.

A more comprehensive and extended version of this text has been published in the Fifty Year Anniversary Golden Issue for Building and Environment as: M. Andersen, Unweaving the Human Response in Daylighting Design, Building and Environment 91: 101-117, Sept 2015 (http://dx.doi.org/10.1016/j.buildenv.2015.03.014).

Marilyne Andersen is Full Professor of Sustainable Construction Technologies and Dean of the School of Architecture, Civil & Environmental Engineering (ENAC), at the École Polytechnique Fédérale de Lausanne (EPFL). She is also Head of the Interdisciplinary Laboratory of Performance-Integrated Design, whose research activities focus on building performance in the architectural context, and particularly on the use and optimisation of daylight in buildings.

Before joining EPFL, she was Associate Professor at the School of Architecture & Planning at the Massachusetts Institute of Technology (MIT) in Cambridge, USA, and Head of the MIT Daylighting Lab that she founded in 2004.