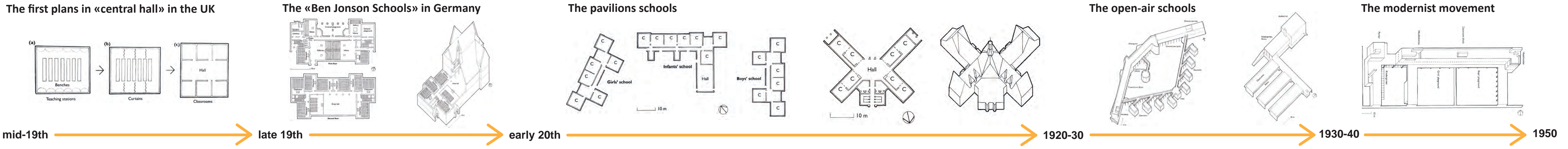


ARCHITECTURAL STRATEGIES TO INTEGRATE WELLBEING AND HEALTH EFFECTS OF DAYLIGHT INTO THE DESIGN OF PRIMARY SCHOOLS: a comparative analysis of exemplary case studies

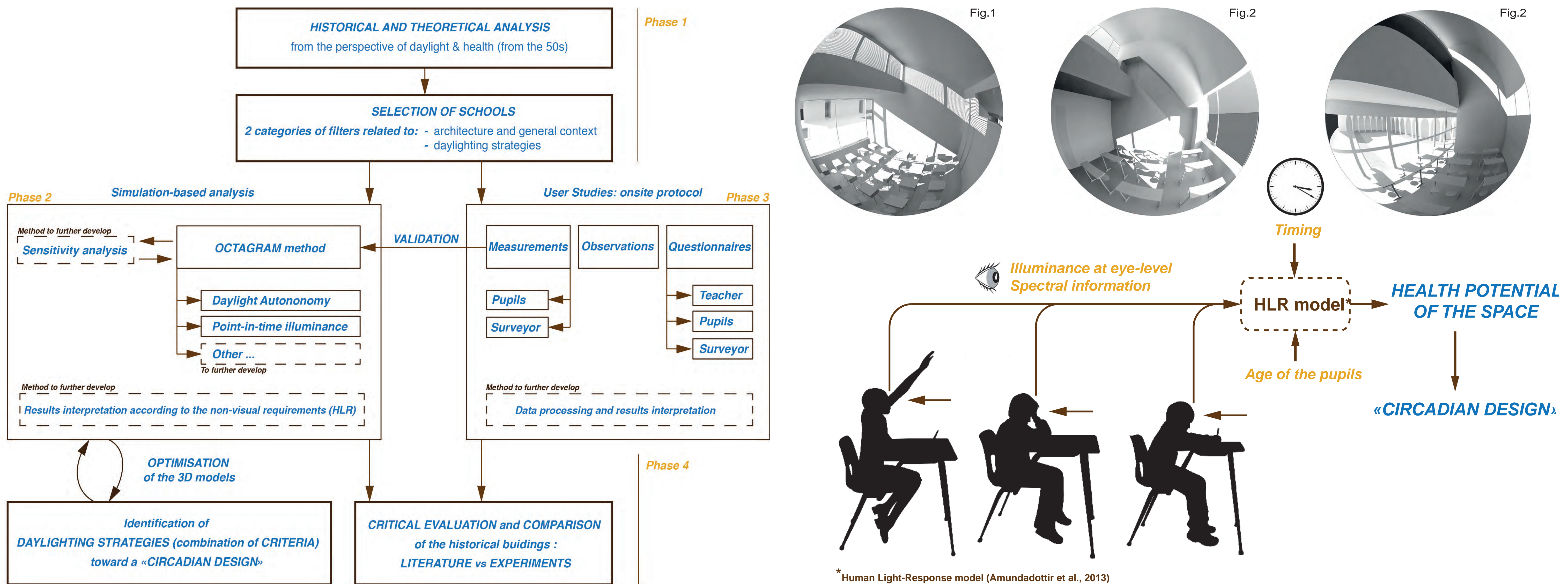
Jean-Denis Thiry, MArch.

PhD advisors: Prof. Marilyne Andersen and Prof. Bruno Marchand

PRELIMINARY PHASE 1: THE BEGINNING OF A RELATIONSHIP BETWEEN ARCHITECTURE AND DAYLIGHT IN THE DESIGN OF SCHOOLS



PHASES OF THE RESEARCH PLAN



ABSTRACT

Starting from an architect's point of view, the aim of this doctoral research is to combine the daylight performance of educational spaces with a broader spatial, cultural, and historical approach. Through a rigorous study of school typologies, the geometry of their spaces, and their associated daylighting strategies, this work aims to connect design practitioners with aspects of health and well-being for the pupils, as far as these aspects are related to the quality of daylight.

The proposed methodology seeks to analyse a range of outstanding case studies from the masters of modern architecture, embodying architectural strategies specifically designed to ensure adequate illuminance levels in learning areas throughout the day. A selection of some singular primary schools will be established through a historical analysis which emphasizes the impact of hygienists' principles - legacies of Modernism - on the evolution of plans and volumes of different school typologies in Switzerland and Europe, from 1950 to the present days (PHASE 1).

An analysis of the selected case studies will be carried out using an innovative representation method of average illuminance received at eye-level and combined with a HLR model – currently under development at LIPID – which assesses the health potential of daylight using a dynamic approach (PHASE 2). Through a validation of the simulated results using different *in situ* measurements and analyses following a specific protocol (PHASE 3), we aim to accurately identify architectural criteria and propose strategies for achieving "circadian design", more specifically those having a positive impact on the health and wellbeing of occupants. We will also carry out a comparative critical assessment of the buildings selected as case studies in the initial phase of this proposed research (PHASE 4).

The goal is to positively influence decisions related to the conception of naturally lit spaces, specifically in schools and according to their impact on health, wellbeing and student productivity. The methodology will be a complementary blend of observations, *in situ* measurements and qualitative and quantitative analyses, both in a simulated environment and in actual working conditions of the selected case studies.

FIGURES

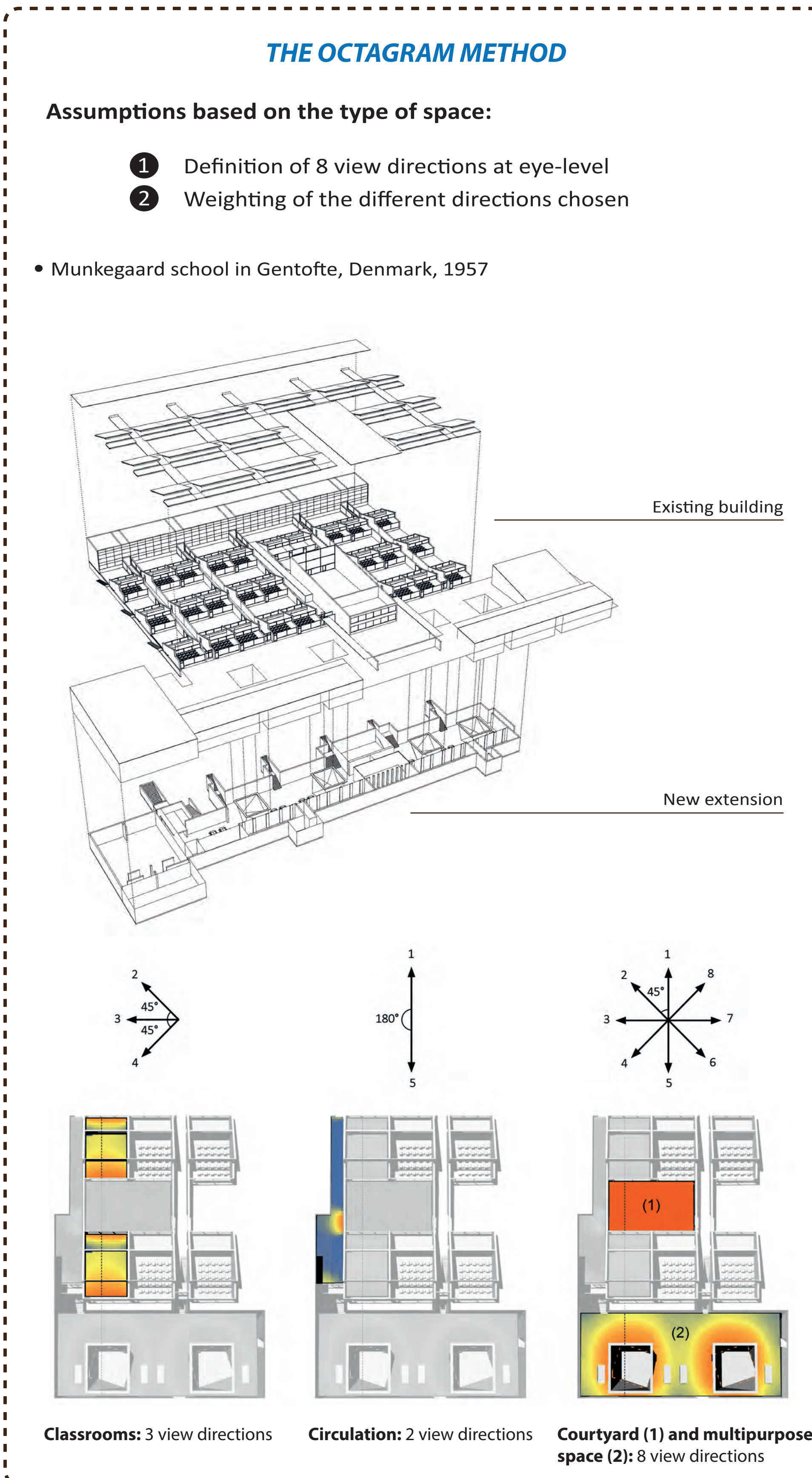


Fig. 1 • Munkegaard school in Gentofte, Denmark, 1957 - Architect: Arne Jacobsen
 Fig. 2 • Elementary school in Monte Carasso, Switzerland, 1979 - Architect: Luigi Snozzi

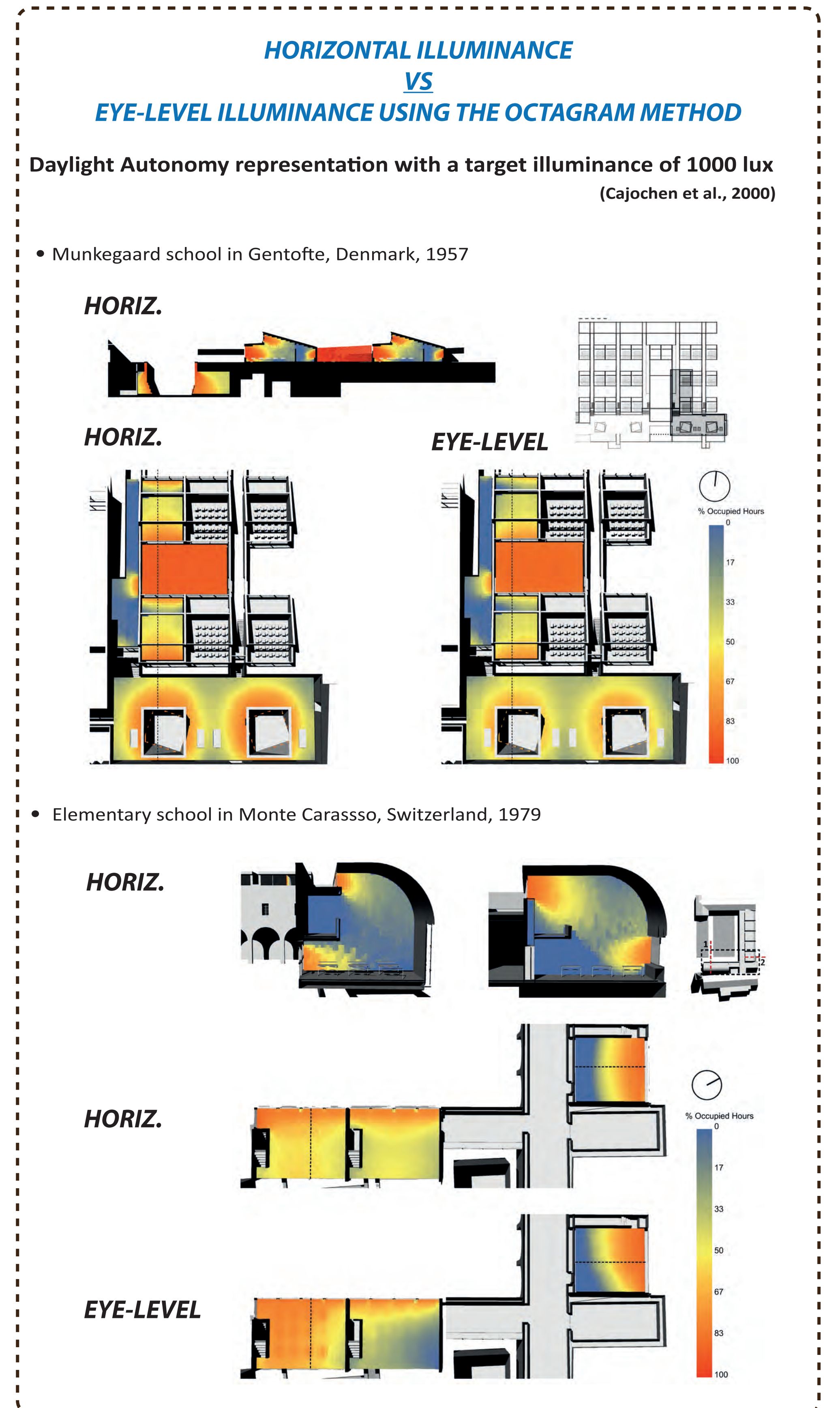
REFERENCES

- Amundadottir M.L., Hilaire M.A., Lockley S. W. and Andersen M., Modeling non-visual responses to light: unifying spectral sensitivity and temporal characteristics in a single model structure. CIE Centenary Conference "Towards a New Century of Light", Paris, France, 2013
- Amundadottir M.L., Lockley S. W. and Andersen M., Simulation-based evaluation of non-visual responses to daylight: proof-of-concept study of healthcare re-design. BS 2013: 13th International Conference of the International Building Performance Simulation Association, Chambéry, France, 2013.
- Cajochen C., Zeitzer J.M., Czeisler C.A., Dijk D.J., Rose-Response Relationship for Light Intensity and Ocular and Electroencephalographic Correlates of Human Alertness, Behaviour Brain Research, 2000, 115:75-83

PHASE 2: SIMULATION-BASED ANALYSIS



TEST OF THE PHASE 2: PRELIMINARY RESULTS



JEAN-DENIS THIRY
 jean-denis.thiry@epfl.ch

Jean-Denis joined LIPID lab. late 2014 as a PhD candidate in the Doctoral Program in Architecture and Sciences of the City (EDAR). He holds a B.Sc.Arch and a M.Arch from the Université catholique de Louvain in Belgium (2012). During his studies, he was a visiting student at the Tampere University of Technology in Finland and at the Iuav University of Venice in Italy. His master's thesis "The lighting mechanisms in the architecture of Alvar Aalto's libraries" was awarded the IBE-BIV prize for the best Belgian master's thesis in the field of lighting. Upon graduating, Jean-Denis received a teaching assistantship position in the undergraduate design studio and architectural theory course at the UCL where he taught for two years. His activity includes several years of professional experience too, as a registered architect in Belgium and the north of France. His research in architecture, daylight, well-being and health is supported by EPFL and the Swiss NSF, a Wallonie-Bruxelles International Excellence Fellowship (WBI), and a Christian Leleux research fellowship from UCL.

