

# SWISS SCHOOL TYPOLOGIES

## FROM A DAYLIGHTING PERSPECTIVE BETWEEN 1945 AND 2015

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### ABSTRACT

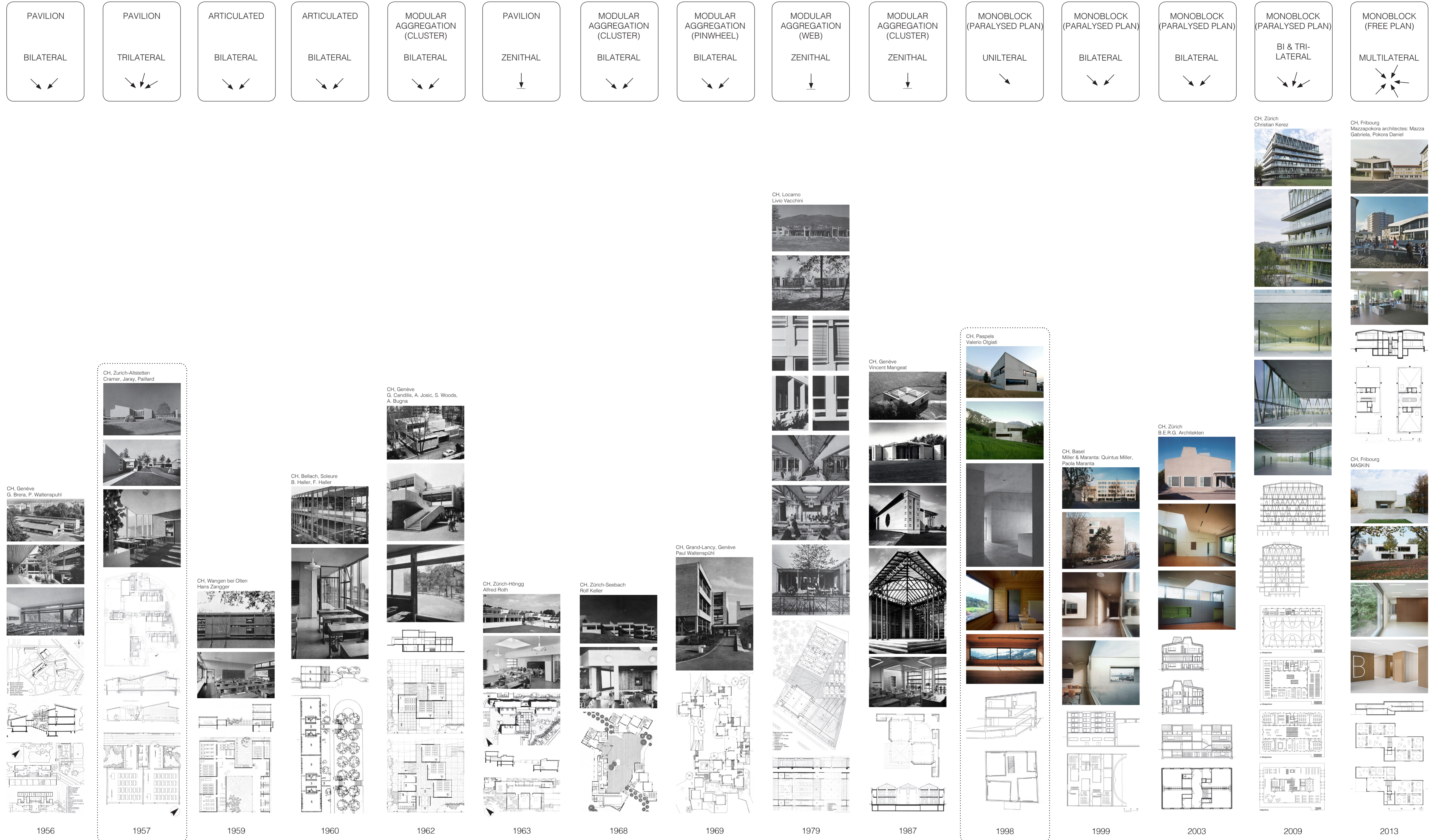
The research consists of three successive and interdependent parts.

The **1<sup>st</sup> part** seeks to reconstruct the typological evolution of primary schools and their associated daylighting strategies between 1945 and 2015 in Switzerland – a country widely recognized for its constructive quality and its concern for integration of natural light in schools – while demonstrating the significant impact of foreign influences on Swiss production. To do this, a large **chronological and systematic census of schools** is carried out in four major architectural journals: *Werk, L'architecture d'Aujourd'hui, Techniques & Architecture* and *Architectural Review*. The formal and constructive evolution of the projects is detailed and the daylighting mechanisms of the class units are identified, while looking at the impact of the evolution of child pedagogy on architecture. Then an identification and selection of school models, that are most representative of the typological evolution and the use of lighting throughout the different epochs, is carried out for the second part of the thesis.

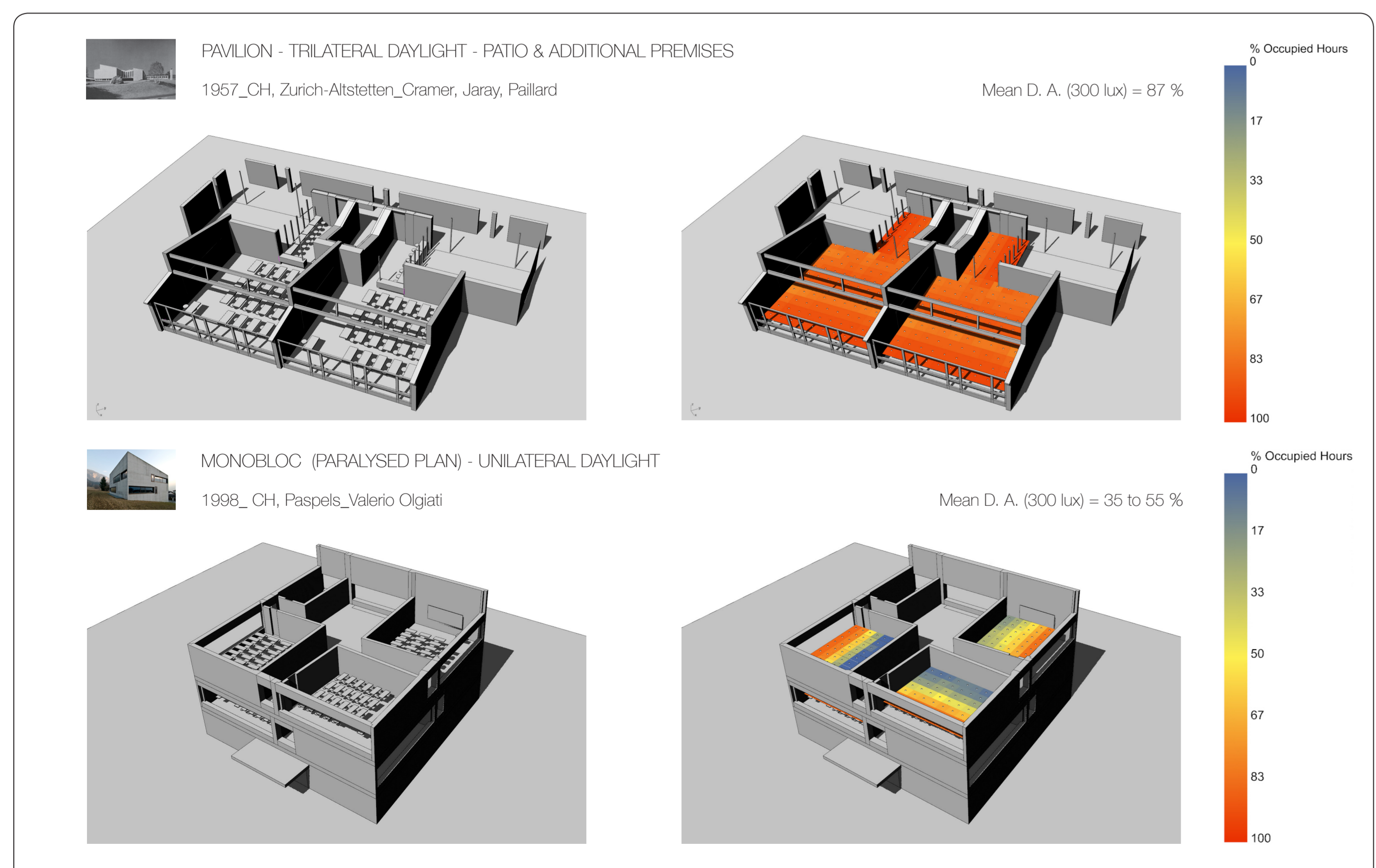
The **2<sup>nd</sup> part** begins with the observation, that many recent research findings demonstrate the importance of a significant and controlled amount of natural light for reading and writing tasks and more generally, its role in the physical and psychic well-being of the students. Thus, it is now necessary for designers to reflect more and be aware of the use of ideal natural lighting strategies, no longer relying on electrical lighting – often permanently lit – to provide the necessary light levels, although electrical light is less comfortable for the human eye and synonymous with significant energy expenditure. The second part proposes to **analyze the daylighting performance of the selected schools by using 3D simulation**. This in order to quantify the different levels of illuminance and to study the resulting luminous atmospheres. Several observations and measurements are also carried out *in situ* following a precise protocol. The objective is to **compare the principles and typological families of our initial theoretical census, by iteratively varying the different architectural elements constituting the units of modeled classrooms** (geometry, openings, solar protections, types of glazing, etc.), while **questioning the recommendations and regulations** related to the daylighting of school buildings that are in force in Switzerland and abroad.

Based on the results obtained, the **3<sup>rd</sup> part** proposes to accurately identify criteria and architectural models that offers adapted and controlled levels of illuminance for students. The first aim is to reconstruct the evolution of 70 years of school construction in Switzerland, based on the original perspective of daylight integration principles. The second aim is to propose a **library of examples of good architectural practices**, while also objectively criticizing the daylighting strategies in Swiss schools – and of the literature that made it known – by comparing contemporary production and recommendations in terms of lighting with the constructions built from 1945, and which placed – at least for certain typologies – natural light in schools at the center of the projecting process. By combining the daylight performance of school spaces with a wider historical, spatial, and pedagogical approach, the objective is to **positively influence decisions related to the design of naturally lit spaces in the school of tomorrow**.

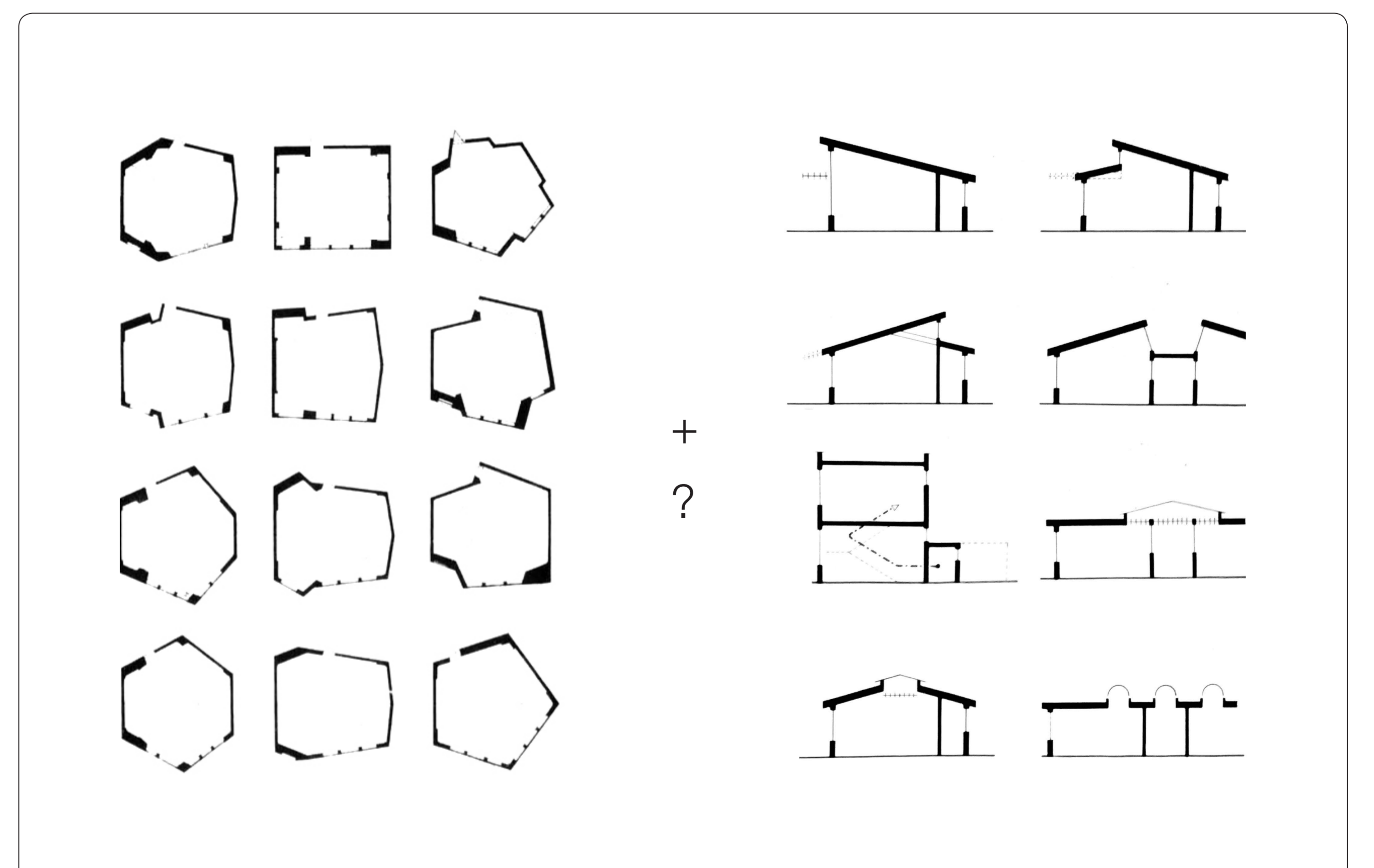
### 1 CHRONOLOGICAL EVOLUTION OF TYPOLOGICAL TRENDS WITH THEIR RESPECTIVE DAYLIGHT STRATEGIES



### 2 SENSITIVITY ANALYSIS: VARIATIONS OF THE DAYLIGHTING MECHANISMS' GEOMETRY



### 3 IDENTIFICATION OF GOOD PRACTICES CRITERIA AND CRITICISM OF ARCHITECTURAL MODELS



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Jean-Denis joined the LTH2 and LIPID laboratories in 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, and was a visiting student at the Tampere University of Technology in Finland and at the Luav University of Venice in Italy. 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. He has also been a guest lecturer and a guest critic in many design studios at the bachelor and master's levels in Belgium and Switzerland, a co-advisor on several master's theses, and a design teacher for the EPFL's entry to the United States' edition of the Solar Decathlon competition. He has four years of professional experience as a registered architect and collaborator, during which he worked on public and private personal projects in France and Belgium. His research in theory of architecture and daylight is supported by the EPFL and the Swiss NSF, and a Wallonie-Bruxelles International Excellence Fellowship (WBI).

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