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THE WATER WALL: a bio-inspired thermo-regulative façade
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1. The relationship between research and design

All the research done during the past months is reflected upon the design concept. From building physic principles to biomimetic rules and material properties, everything was taken into account while structuring the façade system. The vast research on the heat transfer mechanisms helped me fully understand the way a building skin works and how it can be adjusted in terms of exchanging thermal energy.

Moreover, the final outcome is bio-inspired but not zoomorphic. It derives from general observations on the mechanisms living organisms use to thermoregulate but it doesn’t copy their morphology; it actually reflects the principles of thermoregulation behind the inspirational mechanisms but not their appearance. Without having explored biomimetics though, without being inspired by all these fascinating examples and without having tried to understand on which principle they rely on I wouldn’t have gotten to the final result.

2. The relationship between the theme of the graduation lab and the subject/case study chosen by the student within this framework

Looking several months back, when the decision upon this thesis topic was made, I can’t decide whether it was the right choice or not. The choice of using biomimicry as a design methodology looked really promising and many case studies and examples inspired me and gave me the priming to start.

The first part of the research – the literature review and the initial design phase – was really enjoyable and productive, but combining the things derived from the natural world with building physic aspects was quite challenging. Biomimicry is a vast field, and one can easily get lost into finding more and more things, exploring new examples and ideas and implementing the outcome of all this research to design concepts. Because there are so many interesting things, but as an engineer I miss the biological knowledge upon the organisms, selecting the usable examples proved quite difficult. In addition, analyzing all these concepts in a building physicist way was a challenge, since materials and design principles had also to be taken into account. In addition, understanding the principles of heat transfer and implementing them into a design that would also be inspired by nature was a huge challenge.

Moreover, my decision to explore many design concepts (more than 7 at some point) proved wrong, since I had to do a second literature study upon materials and construction techniques, simulations with software I used for the very first time and to explore more and more things that in the end didn’t
use at all. The time is quite limited and focusing on just one design or one material or even one principle sometimes may be more efficient.

Last but not least, looking back to P2, my graduation plan was quite tight, including such a variety of different aspects, that not only it had no flexibility for changes or difficulties that may occur in a research, that also even if I worked a lot during the past few months the outcome is not yet what I expected it to be. I really hope though that in the end the final design/ outcome will prove me right and I will be proud of it.

3. The relationship between the methodical line of approach of the graduation lab and the method by the student in this framework

The design process started with research on heat transfer and heat management in buildings, according to the knowledge on climate design and building physics I have gained during the past year. This provided a good starting point for the design and set the right basis. Comparing all the different concepts derived from biomimicry though was quite tricky. Maybe in the end it helped determining each concepts strengths and weaknesses and prevented working out a concept that would not function all year long but valuable time was actually spent in concepts that will remain unexplored/ non-used.

The simulations done so far were also used as a design tool and helped me on setting limits and restrictions to my design. Additionally, having an actual case study was not that useful after all, because of the complexity of the final design. Simulating such a complex system for a whole façade of a building needs more time than expected and also many constrains need to be taken into account that by default they are not that easy to be set.

4. The relationship between the project and the wider social context

The relevance of the research in a wider social context is that it provides a solution for a common problem in office buildings, the overheating of the building due to heat load, by looking in Nature for solutions that the engineers sometimes ignore. Generally speaking, the notion of biomimicry is a great way to design our world in ways that benefit local ecosystems instead of depleting them. The “Water Wall” is one such example of ingenuity, function and form of a simple solution which benefits the people, the planet and the economy.

People studying ecological design often underline the importance of thermal mass for keeping not only buildings but also outdoor places cool in the summer and warm in the winter. Moreover, it goes beyond being just efficient, attractive, on time and on budget. It combines energy efficiency, architectural qualities and overall sustainable design. The complete element is designed to be fabricated in the factory and transported to the site for assembly. Less workers and on-site building and construction are required. In the same time, scraps and waste materials are limited to the minimum. This energy efficient thinking shouldn’t be limited and new innovative solutions, like the one suggested through this thesis, should continue find their way into the building industry.