Abstract

What are the aesthetic, programmatic and performative consequences of a climatically capricious built-environment? An Architecture in which the material fabric itself becomes a place of refuge as a sort of built allostatic apparatus. An architecture where we inhabit its puffy skin.

Consequently, surfaces become skins and articulations become complexions: Cutaneous Tectonics. Those performative envelopes generate, modulate and communicate climate and are environmentally performative. Erratic ornament helps users to navigate through space by visualising intensive parameters of what we call thermal comfort: temperature, humidity and turbulence. In this process, Matryoshka-like skins alter flows of air between inside and outside. The program is nestled within and in-between the inflated cavity spaces.

In nature shape is cheap but material is expensive (Vincent 2009). If we want to be closer to nature we have to rethink. We have to create Puffy Spaces.
"[...] we persist in discussing buildings as though their aesthetic impact upon us were an exclusively visual phenomenon. And this leads immediately to serious misconceptions as to the actual relationship between the building and its human occupants." (Fitch 1988, p 4) The following essay is divided into a series of chapters, which look upon the aesthetics of puffy spaces from different angles and highlights a series of lines of thought. Together the chapters Migrating Functions, Climatic Granularity, Cutaneous Tectonics, Erratic Articulations and conclusively Puffy Spaces demarcate a field of speculations on potential futures of the relationship of the city, architecture and its skins. The figures are outcomes of the author’s research over the past years and consists of both digital and physical design speculations. Their digital design workflow relies heavily on the use of computational fluid dynamics (CFD) simulations and generative design tools. The immediate feedback loop via physical study models allows for design explorations that include tactile stimuli, materiality and levels of rupture.

Migrating Functions

James Marston Fitch has stated that the task of architecture is ‘to provide the optimal thermal environments for the whole spectrum of modern life’ (Fitch 1975). It is this modernist idea that is still dominating our understanding of indoor and outdoor. The fundamental idea is, that what is outside is wild, natural, capricious and hostile. With the change in our perception of the natural environment and our contemporary engagement with climate, we have to renegotiate our relationship with nature. Nature becomes abruptly visible, bursting established thresholds and getting evermore unpredictable; nature is no longer just décor (Serres 1995). This transformation of nature from object to objective gives the opportunity to discuss architecture’s approach towards inside and outside. One option is to defend indoor by building stronger walls and advancing technologic ‘defence’ mechanisms. Another option, which is fundamentally more radical, is to adapt expectations. In such a scenario the optimised programme, locally fixed functions and building performance are replaced by migrating functions, layered climates and fluctuating ornamentation. The resulting architecture would be excessive, in terms of ‘overcoming of a limit’ (Calabrese 2017), and open.

Climatic Granularity

Imagining an architecture that has no fixed climate implies two consequences: First, inside and outside lose their association with climatic contradiction. Second, the envelope is liberated from the function of a barrier. While inside and outside still have extensive properties (volume, area) attributed to them, their intensive properties (temperature, humidity, pressure) become the key drivers of space making (Reiser & Umemoto 2006). The emergence of granular microclimates, that are distributed around
and within a structure heterogeneously, demands new methods to actively communicate those invisible parameters.

The level of thermal comfort is usually defined by the following factors: temperature, air movement, humidity, clothing and metabolic rate (CIBSE 2006). The first three are invisible to the human eye and the latter two are depending on the inhabitant’s condition and activity. As long as a room is sufficiently heated or cooled, humans feel comfortable and we have learned to expect this demand to be continuously satisfied all across the interior. We are used to navigating through indoor spaces in full awareness of this condition (subconsciously to be specific). Nonetheless, our conscious perception is visual and so is our verbal description of architecture. In the wild, we rely on vegetation, water, clouds and so forth to perceive invisible changes in the environment. This forms our ‘multisensory existential experience relating us fully with our setting.’ (Pallasmaa 2016)

Nonetheless, this granularity has gradual densities, zones of higher and lower comfort, which generate a four-dimensional field. In the centre of this voluminous boundary, a more stable core can be established. This core, with a less capricious micro-climate, houses more permanent functions and is inhabited all year long. This climatic nucleus is wrapped in a series of skins that create onion-like layers with varying climates.

**Cutaneous Tectonics**

Cutaneous (= relating to or affecting the skin) Tectonics describes an understanding of architectural surfaces as performative skins. The resulting aesthetics and formal language are driven by their environmental performance. Design methods such as folding, layering, infusing, roughening, wearing and inflating give rise to a plethora of expressions. Air, which flows over the surfaces and through the cavities, is modulated by those surfaces and its composition is altered. Performance is increased not by thickening but by layering. Cavities are embraced - they become inhabitable spaces, which create a puffy milieu around the core. Those Cutaneous Tectonics create this milieu with multiple conditions which modulate microclimates that ‘eminate from the exchange of an object with its specific environment’. (Hensel & Menges 2008) Because of their multitude of relationships and their porous identity - and aesthetics - a differentiation between object and subject becomes diffuse; so does the differentiation between nucleus and milieu. Consequently, the cutaneous architectural skin becomes a perpetual mediator and an interface. Fitch described the wall as an ‘interface between natural macro-environment and man-made meso-environment’. (Fitch 1975) By this, he attributes congruent meaning to both limit and interface. In a system as proposed here, the understanding of the interface is closer to what Branden Hookway describes as ‘a relation between things or conditions, or to a condition as it is produced by a relation.’ (Hookway
2014) It is the whole skin, the whole set of porous and layered cavities, that constitutes such an interface.

**Erratic Articulations**

Where there is exchange there is an interface. They demand articulation in one way or the other. Those articulations increase the performance; may it be the interface as a filter, the interface as a barrier, the interface as an attractor or the interface as a mediator. Punctual interfaces, such as traditional ones like doors or windows are often regions of greater ornamental intricacy. These articulations exaggerate the interface’s presence, but also clearly detach it from the surface aesthetically and functionally. Such openings in the traditional sense allow for limited exchange between inside and outside.

If the interface, as described in Cutaneous Tectonics, is composed by the entire multi-layered envelope, we cannot see it as a local phenomenon. Speaking of the architectural envelope as a skin demands an appropriate vocabulary. Tim Ingold’s writings on surfaces, vision and materiality in the context of ecology suggest the use of complexion instead of texture.

> “In complexion, the lines and wrinkles of the face, and its palette of shades from pallid to ruddy, are so completely blended with health and mood, and even with the atmospherics of weather, that they cannot be disentangled.” (Ingold 2017, p 103)
This implies that the drivers for articulation can origin from beneath the surface’s datum. Emerging topological structures, material-inert performances as well as climatic residues (condensation, evaporation, dirt) are what formulate the resulting Erratic Articulations. In the design process, space is given for such things to happen but their actual coming-to-be is unpredictable and climatically circumstantial. This gives the opportunity to attribute more meaning and performance to those cutaneous surfaces. They can actively communicate invisible parameters of thermal comfort, guide inhabitants over greater distances and allow buildings to change appearance according to environmental conditions. Consequently, the architectural skin - as well as the inhabitable cavities, poche spaces and niches - matures into an interface between human inhabitant and the natural environment.

**Puffy Spaces**

Puffy Spaces - this essay's title - describes resulting aesthetics of an architectural design strategy that focuses on the creation of large cavity spaces between skin-like surfaces. Similar to Frederick Kiesler's move away from unified 'egg-shapes' via 'baroque clusters of pods' toward a system of 'shell, womb-like organic cavities, and textural surfaces'. (Phillips 2001) In this essay: The dissolution of a building as a unity and on a smaller scale the dissection of the envelope. This means, from a sticky and compressed composite towards an ecology of inhabitable spaces with varying climatic conditions. The program is nestled within and in-between the inflated cavity spaces which vary greatly in appearance and sensual experience. This creates changing spatial sequences,
manifold occupation patterns and a symbiotic relationship between human, nature and architecture.

This proposed envelope relies on air passing through, in-between and over each skin - air becomes the single most valuable material and the modulating layers define its new aesthetics.

Conclusion

Climatic granularity - a deliberately heterogeneous indoor climate - requires a programmatic organisation that allows functions to migrate within a porous envelope. This elastic envelope is multi-layered. Such cutaneous layers compose a permeable boundary and act as an interface in their entirety. Environmental performance and activity generate erratic forms of ornament that indicate climatic conditions and help users to navigate through space. As such this essay speculates on possible futures of architecture and ornamentation come together and form a new form of climatic aesthetics. When taking climate into consideration (especially when treating inside and outside as one) computational tools - especially CFD simulations - are a great opportunity to design with turbulence, capricious environments, and erratic articulations. While this essay elaborates on an alternative approach to environmental design, building construction and the role of the architectural envelope as a skin, it also speculates on resulting digital and post-digital aesthetics. This manifests in a series of design outputs that engage with materiality, simulation, digital fabrication and drawing. Therefore, Puffy Spaces suggests an architecture of Cutaneous Tectonics which potentially enhances the relationship between inhabitant, building, nature and the city by embracing nature’s capriciousness, the city’s diversity, the building’s envelope and the inhabitant’s multisensorial interaction.
Bibliography

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Author Biography

Andreas Körner is an Austrian architectural designer and researcher currently committed to his doctoral studies at the University of Innsbruck. He has graduated from Vienna University of Technology and the Bartlett School of Architecture. Andreas has been teaching in Oxford, Innsbruck and London, where he is part of the group Biophile.

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Image Captions.

In order of appearance.

Figure 1: Andreas Körner, A speculative floor plan of a multi-layered and puffy space, 2015, property of the author

Figure 2: Andreas Körner, 3d-printed model showing a setup of several skins and the digitally generated environmental forces surrounding them, 2016, property of the author

Figure 3: Andreas Körner, Digital Fossile - Design explorations into surface articulations and spatial configurations based on computational fluid dynamics simulations, 2019, property of the author

Figure 4: Andreas Körner, Close-up photo of a 3d-printed model exploring multi-layered Cutaneous Tectonics, 2015, property of the author

Figure 5: Andreas Körner, Model photo of a 3d-print that explores different levels of roughness, 2015, property of the author

Figure 6: Andreas Körner, Interactive thermochomic façade element. Exhibited during Biophile’s exhibition at the London Festival of Architecture, Clerkenwell Gallery, 2017, property of the author

Figure 7: Andreas Körner, Diagrammatic design speculation showing puffy spaces, 2016, property of the author

Figure 8: Andreas Körner, Specualtive design proposal for a multi-layered and highly-intricate building envelope, 2019, property of the author

Figure 9: Andreas Körner, Model photo of a thermochromic 3d-print that changes colour from black to white when exposed to heat, 2016, property of the author