Encompassing a series of experiments with atmospheric scenography, the following paper maps out the relationships between different materials and energetic flows as part of a spatial design. These investigations emanate from the basis that poetic relationships between material and immaterial processes can induce new meaning to the ways we inhabit our environment. In diffusing the boundaries between states of matter in the environment and the perceiver, the unfolding atmospheric processes enacted here function as perceptual amplifiers for transformations on scales that are usually not sensually accessible. The focus shifts from the concrete to the in-between. The visualization and enaction of flows that make up our surroundings suggest a greater involvement of oneself with the environment. Through these experiments we demonstrate 1) how spatial continuity can be achieved in

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Image 1: tangibleFlux
plenumorphic chaosmosis
microcosm no.2 plenuméliptique
périgée Navab, 2018
relating attributes of dynamic behavior of water, vapor, air, sound, and light to significances in space; 2) that the indifferent role of the human perceiver is challenged in making their impact and responsiveness to the environment part of the spatial composition itself; and 3) how the expressive qualities of atmospheric variables can be used to experience layers of meaning in spaces that are usually not comprehensible (such as ecological dimensions of water use).

Introduction

Discussions about climate change, scarcity of resources and the lack of distributive justice often point towards a phenomenological problem. People in Western industrial nations, who mainly live in urban areas, generally have little direct reliance on natural processes and therefore lack a sense for the direct significance of local consumption of resources and global consequences. Instead, digital networks regulate the climatic well-being of residents and consumers, car drivers or passengers. This is juxtaposed with the utopia of the off-the-griddler, people who invest their own physical energy to energy flows in their homes or early techniques and instruments of observation and navigation of natural phenomena that testify to human involvement in natural processes—which is contrasted by the navigation app. That being said, one can state that a direct perception of water and other energy cycles plays a little role in the everyday life of most people in the industrialized nations. The interdisciplinary projects presented here aim to explore the phenomenology of energy cycles and flow dynamics beyond scientific-technical approaches and to design poetic suggestions for new sensual milieus involving humans in a new, digital-analogue way.

In this paper, we investigate the use of ambient feedback to amplify qualities of usually unperceivable processes and relate them to the felt experience of space. How does the flow of particles in the air and ambient eco-feedback relate to our physical presence and actions in a meaningful way?

The first project to be outlined here explores the development and integration of two ambient eco-feedback displays that were integrated into the kitchen and courtyard spaces of a residential dwelling. The displays were created by Nima Navab with The Topological Media Lab. The house itself was built and exhibited by Team Montréal, a competitor in the 2018 Solar...
Decathlon competition in Dezhou, China. The collaborative effort intertwined a manifold of disciplines around situated concerns of sustainable living and passive building strategies. The second project takes its point of departure from the process and outcome of an interdisciplinary workshop series on responsive atmospheres. The project involves researchers and students from the Topological Media Lab, Synthesis Centre and the Institute for Arts and Media, bridging Philosophy, Architecture, Speculative Design, Arts and Media Technologies.
Ambient Feedback Ecology: Solar Decathlon’s ‘Performative Dwelling’

The first project covers two responsive lighting installations that were integrated into a house and courtyard in order to create a visually stimulating and experiential environment while raising awareness of consumption, performance, and behavior relative to use of water and energy resources.

The first installation is a lighting fixture embedded into the kitchen cabinets. By being installed in place where it visually connects the performed action of the residents in real time with the overall consumption of water, an experiential dimension of scales usually not accessible is added to everyday action. This communication of the relation of the amount of water used for washing the dishes or drinking water to resource consumption is purposefully mediated in an aesthetically pleasant way: water droplets are released inside the fixtures’ fluid chamber according to consumption trends, animated by light from the top of the chamber. This way the eco-feedback display gains an ambient quality that merges with the everyday activities. Ambient feedback thus has an advantage over other forms of data visualization, which are mostly abstract or oriented towards the deficits of the actions. Whereas charts or digital measure units quickly move to the background of our awareness, ambient feedback displays are capable of producing intuitive, bodily...
knowledge about the relationships between situational actions and overall consumption.  

While the light fixture that is embedded into the kitchen cabinets communicates through manipulation of liquid textures overall trends in consumption of water over time, the awning integrated into the courtyard of the house represents the overall balance of energy in using different light structures that animates shadows of plants. Shadows disperse and overlap, becoming more diffused as the energy consumption starts to outweigh solar energy gained during the day. Thereby the invisible interrelationship of occupants and their home expressed in the continuous flow of energy, water and other resources becomes present and can be experienced in its processual nature throughout time.

The aim of the project was to investigate if eco-feedback technology integrated in such a way can sensitize for the impact of individual and collective
behaviors on the environment. It was found that material interfaces of Sense and Fluid are helpful in highlighting which activities residents can target to reduce water and energy demands, while the media installations evoke a sense of care by poetically engaging the residents with the matter to raise curiosity about consumer behavior in the first place.

Atmospheric media such as light and water have been found rich materials to serve in such a design context: they allow to express the subtle and gradual ambient shifts of the environment. These observations, perceptible in atmospheric relations, such as sunlight’s illumination of interior spaces or the sound of rain hitting the glass of window panes, became a way for us to map the dynamic and complex energy flows of our environment and their subsequent impact on the built world. Through the exploration of material agencies translated through temporal and textural properties of water and light, occupants attune to the rhythm of cumulative patterns of consumption. The quality of light, to signify changes gradually detailed and aesthetically rich, allows to relate abstract data to one’s own experience of space by making them perceptible and tangible through the slow and gradual composition. In sum, this project uses interactive and immersive technologies to enable design solutions for fluid lighting automation and communication of environmental data while paying close attention to everyday behavior in domestic space. Thereby, media installations that revolve around the concept of a performative dwelling and make use of architecture as an interface, directly relate and engage with internal and external flow dynamics of material and immaterial processes.

**Caustic Scenography: Responsive Cloud Formation**

The starting point of the second investigation is an installation to explore ephemeral fields of light, water, air, sound, and temperature as a trigger of pre-reflective, embodied ways of relating to environments by shifting boundaries between human agents and their environment. The installation creates mist and clouds of different textures and simultaneously intensifies and augments the movement and transformations of matter and their response to the exterior conditions.

At the core of the platform, a bed of ultrasonic atomizers is submersed in a pool of water. Variable ultrasonic power is converted to high frequencies
driving piezoelectric transducers. Through distributed continuous modulation of frequencies, atomizers vibrate particles at a rapid pace, in effect, allowing for the creation of low to high density cloud structures, while spreading water droplets around its periphery. For humidification purposes the droplets are considered a nuisance, but in the installation, they become instrumentalized, orchestrating subtle to dramatic undulations within the bounds of this reflective pool. A multi-directional embedded light design projects these wave patterns through reflection and refraction, creating a caustic scenography around the installation. The material computation makes physically and metaphorically felt the co-dependencies of immediate to remote actors in play within its spatial setting. In effect, performative qualities of transformative states of matter are amplified through caustic experimentations.

The experimental work runs parallel to philosophical investigations, with practice and theory constantly stimulating each other. Spatially, performative qualities are explored in a series of etudes ranging from participatory flow dynamics and gestural interaction, affecting airflow through movement and respiration, to compositions based on real-time atmospheric models and biophilic rhythmic compositions.

The questions that guided the project encompassed philosophical as well as design strategic inquiries. The philosophical questions are primarily related to phenomenology and the perceiving subject and how it emerges in encountering atmospheric processes. The authors wanted to understand what modes of perception it takes to recognize an event within diffusive processes, to recognize a meaningful referentiality between the elements at play. What kind of perceiver-subject emerges when the center of engagement is not a solid object but ambient conditions that can be experienced and embodied through their effects on multiple scales? Atmospheres envelop the perceiver in space. Consequently, we not only explored the relation between the perceiver-subject and the atmospheric surroundings in the act of observation, but also in what way embodied actions can lead to engagement with the clouds that become meaningful over time. What is idiosyncratic about atmospheric media such as clouds is that they change shape, take on form and dissolve on layers barely visible. Clouds are no solid objects, they are processual in nature. The leading question therefore was, how the perception of intermediate states instead of fixed objects can be extended in time and allow for meaningful bodily engagement. To approach this question, we investigated the patterns of cloud-formation
Image 6  Cloud Chamber 1.0
Atmospheres Workshop,
Synthesis Center, Tempe, Arizona
and transformation and ways to re-pattern them through movement. At the intersection of philosophy and design we wanted to find out if these novel engagements with atmospheric surroundings can push the relationship of observing or mapping environments towards being in environments, to suggest bodily rich and meaningful ways of dwelling. To approach these questions, we took into account the semantically rich meanings of atmospheres when constructing the installation. In the following the installation will be described in more detail and related back to the outlined research interests.

Atmospheres can mediate moods, they can affect the perceiving subject in the way she feels. This emotional-affective quality of atmospheres is expressed in the installation by way of dramatic structured lighting, which suggests natural phenomena that are already charged with a certain mood, such as sunsets or sunrises, the reflection of sunlight on a water surface at the horizon. In re-creating these phenomena at arm’s length from the perceiver, she becomes corporeally affected. Memories of familiar phenomena merge with the felt significance of testimony. Being in space thereby is loaded with meaning and emotionally intensified. Besides the emotional charge of atmospheres, atmospheres in the climatic sense of the word also mediate weather phenomena, in being the sum of the parameters that constitute weather: air temperature, atmospheric pressure, humidity, precipitation, solar radiation and wind. We cannot experience climate in its complexity, but we do know weather phenomena and we experience their impacts. In our installation, these familiar phenomena are made tangible: the multiple phases that constitute the formation of dense clouds, their dissipation and transformation into water droplets, the impact of wind and pressure on the movement of clouds and mist, is laid out in a sensually accessible and bodily experienceable way. These effects are both applied within the installation as well as in the space that surrounds it through the digitally controllable matrix of the platform - the dynamics of processual phenomena can be empathized. In blowing into the cloud formations, using the hands or objects to touch or move the clouds, one’s own body can become part of the internal dynamics of the system. In using fans of different sizes and angles as well as heat plates, the impact of temperature change and airflow is used to extend the clouds towards space. The heat plates are installed above the water level and move the mist upwards. Fans installed on the edges can form a vortex in the middle of the platform, fans connected to a pipe suck the mist upwards and release a thick stream of vapor into the
air. Each of these different movements and ways to create, transform and dissipate clouds allows for bodily engagement on different layers.

One can blow into the mist, touch it, move it, increase the impact of the airflow or heat or try to weaken it. This way, atmospheres create a context in which one’s own body becomes the medium for experience and the way sensory experience is structured—as part of processes that are related to something known in order to become meaningful—relates the perceiver to the everchanging surroundings. Turning towards atmospheres in this way, means to enrich the experience of the in-between: the multi-relational zone between bodies in space, between objects, between the perceiving subject and its environment. Thereby, we argue, atmospheric media can induce new meaning to the ways we inhabit our environments. By seeing and feeling how our bodies and the surrounding atmosphere interrelate, we begin to focus our attention in a new way and become aware of the processes and relationships that normally only form the background of our perception.

Conclusion

In both projects, the unfolding of material and energetic processes that enact both space and its inhabitants are moved from the background of experience to the foreground. The visualization and enaction of these flows not only offer a greater understanding of a place and its microclimatic conditions—it also offers new affordances to act in this space and thereby suggests a greater involvement with the environment. This involvement impacts the sense of agency: When solid boundaries are replaced with processes of transition, exchange and transformation of matter, one’s own impact and responsiveness to the environment must be mediated in a new way in order to gain meaning. The projects show how the implementation of atmospheric phenomena into space discloses layers of interaction and relation, thereby creating a space that affords multiple layers of engagement. The layers that compose a space can encompass multiple dimensions of experience such as social and ethical—such as the water use of a household - or physical - in the ways our bodies participate in metabolic processes that our surroundings are made of, in sharing the air we breathe, the energy we take in and the wastes we release back into our environment. If these layers become meaningful for an experiencing subject, its own actions as well as
the actions of others can be experienced as relevant in novel ways. We have shown that the expression of different, formerly invisible layers of a site can enable new ways of engaging with a space as well as with others. A further investigation would have to show if this experience and a more continuous engagement with different layers of spaces can impact a lasting change of habits as well.

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Additional References


Since his years at OCAD studying Environmental Design, Nima Navab has become increasingly focused on spatial design, and more specifically, examining the role of art and technology in enhancing both intimate and large-scale public interactions. Through a variety of mediums and means, Nima investigates the various roles humans play in shaping both the ecological, political and sensorial landscapes of our built environment. His increased attention to everyday spatial interactions has brought to light the importance of field research, discussion and collaboration with those occupying the space as well as the space itself, highlighting the importance of spatial experience and theoretical research, both which continue to form the basis of his creative process. He is a research associate at the Topological Media Lab.

Desiree Foerster’s research revolves around the study of embodied aesthetics. Her goal is to incorporate additional sensory modalities into the current aesthetic frameworks, such as thermoception, interoception, chemoception. Taking on the perspective of process philosophy and mediaesthetics, she investigates the role that liminal experiences play in situating the human subject apart from a conscious reference to the world. Her PhD thesis asks questions such as: in how far can aesthetic framework inspired by metabolism (and process philosophy) provide new understandings to the emergence of subjectivity? She is a PhD candidate at the University of Potsdam, where she is advised by Birgit Schneider (Potsdam) and Sha Xin Wei (ASU).