

The affect of smells on humans

Architecture Nose

**Towards multisensory architecture, an
exploration of the sense of smell
Volume2**

Camille Kétsia Billottet
Technische Universiteit Delft | Faculty of Architecture
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Tutor : Stavros Kousoulas
S.Kousoulas@tudelft.nl

Camille K. Billottet / 4902769
C.K.Billottet@student.tudelft.nl / camille.billottet@gmail.com

Technische Universiteit Delft | Faculty of Architecture
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All illustrations and pictures presented are of my own production.

Abstract

Smells are everywhere around us. They are within ourselves and around us, they impact us in our mother's womb and throughout our entire lives, until death. But while sight and touch prevail in the contemporary approach of design and architecture, the olfactive dimension of our built environment is often forgotten.

This thesis aims at exploring the interactions between the space outside of the body and the body itself, studying how smells matter from the scale of the molecule to the urban planning. What are the potentials of this somewhat neglected sense and how could it be used by designers and architects? How do smells affect architecture and the humans inhabiting it?

During the research, we focused on both a theoretical and an experimental approach, studying the alterations of materials, construction techniques, spaces but also bodies and minds.

The research was conducted through different experimentations that helped the -exhaustive- understanding of the affects of smells on architecture. Interviews with different professionals in the landscaping, research or perfumery fields, such as perfumer Fredrik Dalman (from Maison Mona Di Orio), and the analysis of theories of affects with the texts of Deleuze and Guattari, Malgrave, Massumi, Grosz and others lead to the study of the affects of smells on humans.

Introduction

Smells are everywhere around us. They are within ourselves and around us, they impact us in our mother's womb and throughout our entire lives, until death. But while sight and touch prevail in the contemporary approach of design and architecture, the olfactive dimension of our built environment is often forgotten.

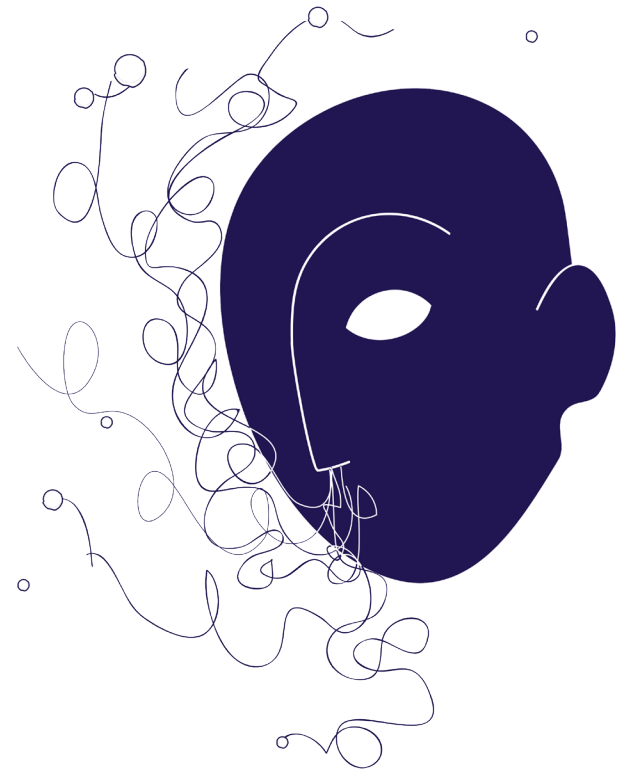
Indeed, architecture magazines often exhibit aseptic spaces, emptied of human presence, technical documents rarely reference the olfactive properties of materials, and the management of smells mainly consists of ventilation systems. But the myth of the human "bad nose" is being challenged by scientists¹ who found out that human beings can discriminate at least one trillion olfactory stimuli (and not the 10,000 thought until then), yet, only 15 to 20% of the molecules treated by the brain are used, the smeller needing to pay attention to his environment and the nose needing to be trained and educated to exploit more of them. And as we spend 87% of our time indoors and we breathe about 33000 times a day, designers should be aware of the potential of scents, considering our built environment not only as a built entity, but as a perceived and lived one.

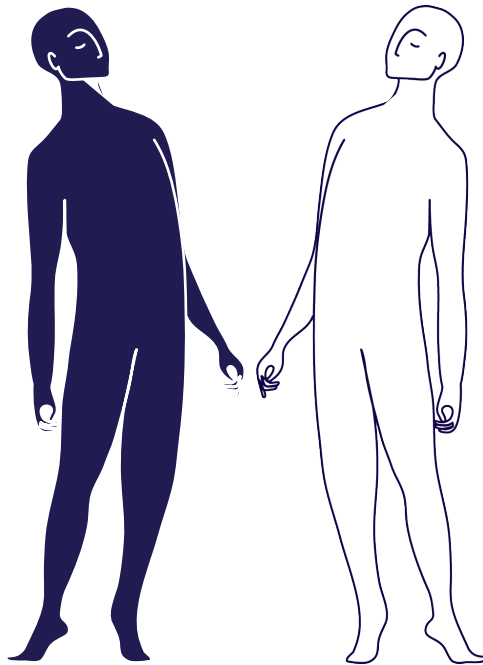
This research proposes to study the affect of smells on humans and architecture, bringing light to their potential for architects and designers. How do smells affect architecture and the humans inhabiting it? How can they be considered tools for designers? This project aims at exploring the interactions between the space outside of the body and the body itself, studying how smells matter from the scale of the molecule to the urban planning. What are the potentials of this sense and how could it be used in architecture? During the research, we focused on both a theoretical and an experimental approach, studying

the alterations of materials, construction techniques, spaces but also bodies and minds.

The research was led by three experimentations of smells in the built environment, researching materials properties and evolution, variations on a construction technique and exploration of the molecular scale. These experimentations helped the -exhaustive- understanding of the affects of smells on architecture. Interviews with different professionals in the landscaping, research or perfumery fields, such as perfumer Fredrik Dalman (from Maison Mona Di Orio), and the analysis of theories of affects with the texts of Deleuze and Guattari, Malgrave, Massumi, Grosz, and others lead to the study of the affects of smells on humans.

Chapter 1
The affect of smells
on humans





BECOMING OTHER

Affect theory is the way that we become sensitive to differences of intensity (like smells) in order to make a difference to ourselves or to the world. Spinoza defined affect as an “affection of the body, and at the same time the idea of affection.” (Spinoza, 1994, p.154)². Humans borrow what may serve their self-transformation from sensations (percepts and affects) because through them, through this ability to affect and to be affected, the body faces the transformation from one state to another, makes itself a work of art, becomes a being of sensation and this passage is perceived through the increase or decrease of the forces of the body.

But while affect is acting on and through the body, it is not personal in the sense that it is not subjective (contrarily to emotions). It is “autonomous” as Massumi explains in *The Autonomy of Affect* because it does not stay confined in the body, it is open and it is indeed described by Deleuze as an immanent process to an unstable plan that one has to build constantly. This way that sensations (composed of both percepts and affects) allow humans to overcome themselves, to become a “subject-in-process” (Grosz, 2008, p.79)³ is developed by Deleuze in the concept of “becoming-other.” It is the removing one element from its original functions and the inducing of new ones. Becoming-other is established via “diversity, multiplicity, and the destruction of identity”: we have to move away from our old habits and outdated attitudes to “bring forth what does not yet exist.” (Deleuze, 1995, p.44)⁴

In the context of architecture, an art that produces and generates intensity, the nervous system will be impacted and sensations will be intensified. This is where the property of smell being an intimate sense is interesting. While sight is the sense of the distance and control, one cannot refuse what is offered to the nose. I can close my eyes and cover my ears but “scent is the brother of breath,” will say Süsskind⁵, I cannot escape smells, I am subjected to them. I find myself in fusion with my environment. I am either in a relationship of acceptance of this fusion

with the world or, otherwise, I feel repulsion and an impression of intrusion. The smell is indicative of our emotional relationship to the world, how we perceive it, how we adhere to it, or how we distance ourselves from it.

To give the sense of smell a chance, one has to let go, to welcome what happens around him, to pay attention to his environment. This allows him to re-appropriate the world by accepting to internalize it, both physically and mentally. And architecture is perfect to help this process because it enables the body to be “directly touched by the forces from which it so carefully shields itself in habit, cliché.” (Grosz, 2008, p.21)³.

Stiegler explains indeed that one consequence of the humans’ shift to bipedalism is the “defunctionalization of the sense of smell,” (Stiegler, 2005)⁶ emptied of its sexual role, removed from the earth’s surface where most odorous molecules travel, giving the eye the leading role. Following this thought, Victoria Henshaw explains that the sense of smell was often portrayed as a “primitive and animal-like” sense (Henshaw, 2014)⁷ and therefore, paying attention to them was -and still is- perceived as a shameful activity. So what E. Grosz brings out is that the arts have the capacity to take the body out of its own prejudices and seclusion, architecture offers this out of the ordinary predisposition that would allow us to pay more attention to our environment, to new textures, lights, sounds, smells etc...

Therefore, architecture enables us to move away from old habits, because it brings the visitor in an experience of new, unpredictable sensations, sensations that announce the future. So architecture and smells, by allowing one to be actively touched by new sensations, not because he/she is passively perceiving something but because he/she is part of an experience, create a new more sensible person.

In his text, *Bare Architecture: A Schizoanalysis*, Chris L. Smith tells his

experience of Peter Zumthor’s Serpentine pavilion, a square building, both dark and bright, calm and full of life. Smith describes the change in people’s behavior when experiencing the spaces. They “walk a different pace” or stand in another manner (Smith, 2017, p.14)⁸. They abandon behind themselves bikes and other toys. They are struck by the contrasts imagined by the architects but more importantly, I believe, they are put in a setting favorable to contemplation. They are gently manipulated into entering a new, unknown world, and though they don’t lose their free will, by setting foot in the building, they make the choice to be transported and to “listen” to the designed story.

In that sense, Smith explores the idea that the visitor lives a unique experience time and thought will clarify. I myself precisely remember trying to read a book in the Vals Thermes and not being to focus, my eyes glazing at every detail, my body understanding temperatures and sounds, trying to capture every one of my sensations, quite similarly to Smith’s description of the father “busy pondering what just happened and who he now is” (Smith, 2017, p.17) while trying to read.

This feeling of in-between, of not being really in the present moment but also feeling strangely close to the surrounding detail changes us. Just as Elizabeth Grosz explained it, these moments and spaces change us because new sensations are experienced.



**AWARE OF
THE INVISIBLE**

But designers face one major problem: our lack of attention towards smells. In his research *Human and animal olfactory capabilities compared* (2017), Matthias Laska, a psychologist at Linköping University in Sweden explains, “Except for smell researchers such as me, we are not constantly aware of the odor stimuli in our environment,” (Buettner, 2018)⁹ a statement confirmed by perfumer Fredrik Dalman, whom I work with. He indeed expressed that though humans suffer from an inferiority complex compared with animals’ olfactory capacities, increasing our attention to smells in our daily life would prove to us how well we can smell.

As a matter of fact, in 2014, researchers at the Laboratory of Neurogenetics and Behavior of the Rockefeller University found out that humans can discriminate at least one trillion olfactory stimuli (and not the 10,000 thought until then)¹. Furthermore, researchers from the Department of Applied Biological Chemistry at the University of Tokyo explained in a recent study on attention that “because we often do not pay attention to our olfactory surroundings, we remain oblivious to the odors around us. How we perceive odors depends on how our attention is focused on our olfactory environment.” (Singh et al., 2019)¹⁰

Smells indeed celebrate impermanence, ephemerality. They carry the mystery of floating movements and times, of invisible changes and progressions. Their perception itself might never be twice the same -because the plant will evolve, the aromas will mix, the people around the experience will change. Smells appear and disappear, we most of the time are not even conscious of them, they stain us often without our knowledge.

In Japan, though, a passionating ceremony takes place, the Kodo. It consists of the slow-burning of precious woods and of the act of smelling them in a small group, lead by a master, of breathing them

three times only, identifying them, describing them, and letting them disappear. This ceremony celebrates what will die and disappear by celebrating the beauty of its ephemeral presence. Its name itself carries this definition, Kodo meaning the way of fragrances, thus emphasizing not on the permanence of this art but its evanescent passage from one state to another, towards a form of perfection in tune with nature.

In that sense, smells evoke the presence while also signifying absence. They hold the mystery of both a suggested world and a disappeared one through its mnemonic properties. They transport one into a mental world and stimulate the thought process. Just like in Proust fragrance flashback in *A la Recherche du Temps Perdu (1927)*¹¹, and in the Kodo ceremony, the smeller feels new sensations and is not the same after this experience. This precise moment changed him.

What about odorless spaces? One may ask. Bachelard explains in *Air and Dreams (1943)*¹², that the air is a means for odors to travel through the Earth's surface and he will say that "an odor has, in the air, an infinity." (Bachelard, 1943, 136) Idealized, the most precious air is often thought to be composed of sweet fragrances, of expensive spices or warm honey, the Egyptians covering their hair and bodies of various oils, of myrrh and flowers and the gods listening to incense, "They bind memories to desires, an enormous past to an immense and unformulated future" (Bachelard, 1946, 136). But Nietzsche fantasized about the emptiness and freshness of the air, of its odorless properties. Cleared from its impurities, the experience of nothingness is, for him, a blessed, free, and new moment. While Jean-Baptiste Grenouille tried to capture the smell of his victims to forever keep them, one also holds on to the reassuring feeling one gets when encountering a familiar or exotic scent. Detached and freed from the past, the fresh, dry and pure air Nietzsche finds pleasure in, raises awareness of the promise of a future, of power:

*I sit here, sniffing the best air,
Verily, paradise air,
Bright, light air, golden, striped,
As good air as ever
Fell down from the moon-
Nietzsche, Thus spoke Zarathustra, 1883, 449*¹³

*the air fills with promises
I feel the breath of unknown lips pass over me
-the great freshness is coming.
Nietzsche, Dionysus Dithyrambs, 1888*¹⁴

Thus, in this cold environment, the air breathed becomes tonic and dynamic, and affects the smeller in such ways that he/she reaches a "a higher body" (ein höheren Leib). Attacked by the cold, the body becomes aware of the air it is breathing, it knows how to grow, how to inhale and exhale. Therefore, in this odorless environment, life emerges from the cold mountain, transforming the body.

Therefore, architecture, helping us to remove ourselves from old habits, and bringing experiences of new, unpredictable sensations allows us to pay attention to our surroundings, to the surprise of the unknown, to the freedom of the odorless or the mystery of the fragrance.





THROUGH SMELLS AND OTHERS

While aromatherapy still suffers rejection from certain medical audiences, the scientific research on its various effects is way broader than one might think. As Christina Salcedas, Global Director of Education at Aromatherapy Associates London explains, “Our sense of smell [...] has the ability to alter the way we feel” (2017)¹⁵, a potential she explores in her work, studying the effect of aromatherapy on the emotional and physical states through the use of fragrances and essential oils.

And indeed, this leftover of ancient medicine is now acknowledged and used by a concerned population of citizens to not overuse medicines, but also by a large amount of industrials and commercials. From Nike to Apple, most brands invest in unique fragrances that, once smelled by the client, increase the trust in the product, but also its memorability, triggering a specific connexion between this smell and the experience of the store, but also increasing the feeling of quality of each product. Nike ran different studies on the impact of in-store scent and proved that adding their fragrance to their stores “increased intent to purchase by 80 per cent.” (The Independent, 2011)¹⁶ In a similar way, M&M’s store add chocolate scent to their shops, bakeries add warm bread, and Starbucks and many petrol stations add coffee.

While all these companies profit from this affect of smells on humans, it is also possible to use fragrances for the well-being and the health of all, or to emphasize the experience of the visitors. These properties of plants and smells to induce a change in our mood, health or well-being is more and more researched nowadays. Indeed, Judith Amores from MIT Media Lab¹⁷ explores various wearable olfactory devices able to diffuse a different scent depending on the situation, for instance increasing calm with lavender.



Lavender: Quite famously, lavender helps in diminishing stress and anxiety, it has also shown results in improving sleep, soothing pain and healing burns and wounds faster.^{18&19}



Peppermint: Multiple studies explored the effect of peppermint during mathematical and cognitive tests, using electroencephalography. The aroma of peppermint increased significantly performances on visual tasks and also showed a gain in the quality of working memory.²⁰



Clary sage, geranium and thyme: Helps balancing estrogen, progesterone, cortisol, thyroid and testosterone levels.²¹



Oregano: Immune-boosting, antiviral and antibacterial properties because of two compounds found in it carvacrol and thymol which have antimicrobial effects.²²



Frankincense: Immune-boosting, antiviral and antibacterial properties. The study resulted in frankincense essential oil eliciting selective cancer cell death.²³

And while these plants have various effects on our mood or health, our perception of them will defer depending on our actions, and vice-versa. Just as one will not perceive the landscape similarly by running or sitting, the temptation of the landscape might also lead us to stop for a minute. Therefore, it is in the hands of the designers to imagine how smells will be perceived depending on the actions of the visitors, and how their actions will be affected by the smells as well.

As explained in chapter III *Towards a multisensory architecture* of the first volume of this research²⁴, it is also primordial to understand that sense modalities are not separate from each other. As M.Merleau-Ponty said “My perception is [therefore] not a sum of visual, tactile and audible given, I perceive in a total way with my whole being, I grasp a unique structure of the thing, a unique way of being, which speaks to all my senses at once”²⁵.

Following this line of thought, playing with what senses the designers decide to “activate” or “repress” through different spaces will also affect the perception, the movements and the actions of the visitors. In that sense, figures 1 & 2 are different through the smells they propose, but also the actions suggested by the space and the variations in tactile, ocular, hearing, taste etc.. cues.

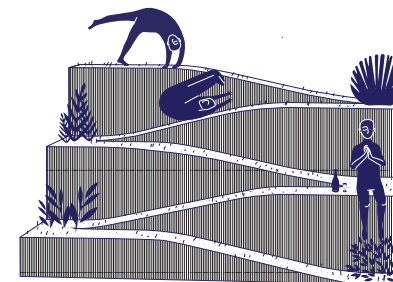


Fig 1. Boosting energy with Peppermint, Rosemary, Eucalyptus and Jasmine.

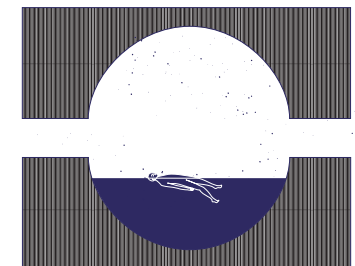
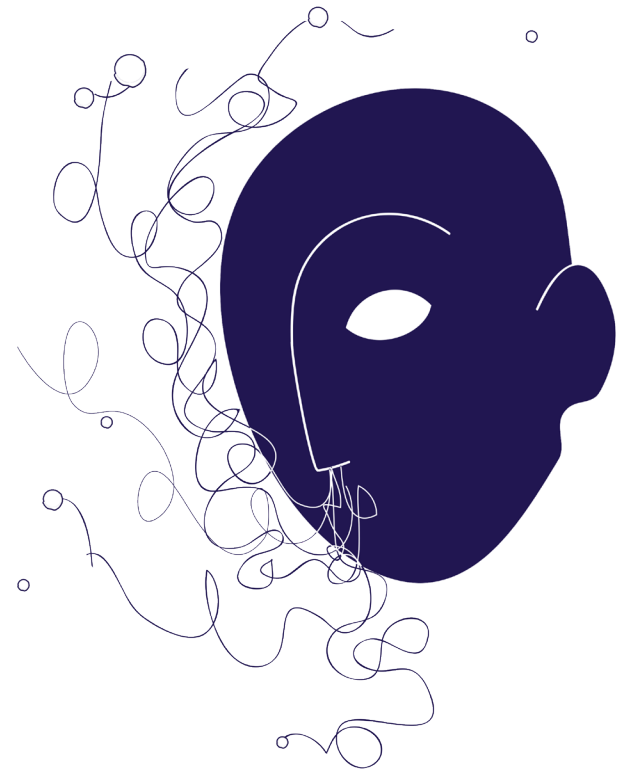


Fig 2. Calming with Lavender, Chamomile, Valerian and Clary Sage.

As we studied, architecture has the capacity to take the body out of its own habits, prejudices, and seclusion, and offers this out of the ordinary predisposition that allows us to pay more attention to our environment, to new sensations, textures, lights, sounds or smells.

In that sense, bringing affects and intensities to the composition of a wall, a floor, a roof or any other architectural component, would help “link the lived or phenomenological body with cosmical forces, forces the body can never experience directly” and would be a “testimony of the participation and immersion of the body in nature, materiality, chaos” (Grosz, 2008, 12)²⁶ and thus induce a transformation of the body and the world.

Chapter 2
The affect of smells
on architecture





EXPERIMENT 1

MATERIALS

While bodies are affected by their environment, one must not forget that the relationship isn't one-sided and therefore, it might be interesting to question in what way the materials of our environment are affected by our interaction with them. Of course, touching a material generates a patina over the course of time, oxidation, fatigue, and wear. Light will also slowly emphasize the trace of the furniture and other picture frames (making them may be more visible after removing them). Effectively noticeable is the manner air affects materials. At a smoker's house or on a farm, where the wall gets imbued by the habits of the inhabitants, for example, or how façades turn black due to pollution.

Mainly used for their aspect or their texture, materials not only have their own smell, they also release those they are impregnated with. In Lawrence's autobiographical *Seven Pillars of Wisdom* (1926), the author wrote, "The clay of its building is said to be kneaded for greater richness, not with water, but with the precious essential oils of flowers. My guides, sniffing the air like dogs, saying, "This is Jasmine, this violet, this rose."²⁷ (note the Englishman's comment: to smell the air brings his hosts closer to animals).

Correctly designed, these impregnated odors can be very desirable to designers, using the inherent smell of the chosen materials (maybe even choosing materials for their smells!), but also playing with their ability to absorb and diffuse foreign scents. If one wants very little absorbent surfaces, he or she will rather use materials with more compact molecules such as ceramic or plastic. Very porous materials such as carpeting, wood, should absorb odors before releasing them gradually.

But, though these ideas are more consciously used in other cultures, Japan for instance, where certain woods are chosen for their therapeutic qualities, it is quite difficult in Europe to find documents researching

the smells of materials, or exploring which materials absorb and release a scent the best. Indeed, companies' technical documents usually describe various properties of their products, their density, thermal conductivity, colors, and else, but rarely do they depict the scents that come with them.

Looking for those answers would feed the panel of tools of designers, allowing us to make conscious choices in what can be the "background smell" of the spaces we imagine or giving life to the strong and powerful sense we rarely explore nowadays.

In order to learn more about the matter, the following experience was set in place. Through it, 11 materials have been tested by a panel of students, over the course of the semester and during 4 different steps.

Step number 1 consisted of a sensible description of each material by the panel. The students were able to use a list of words as the exercise proved to be difficult at first.



Step 1. Inherent smell	Step 2. Absorption	Step 3. Diffusion	Step 4. Heat and humidity
/Jar and material sample/	/Jar, rosebuds in a tea bag and material sample/	/Jar and material sample/	/Jar, water drops, warm water, and material sample/

Step number 2 proposed for each material to absorb a foreign smell, here rosebuds. The rosebuds were put in a teabag to allow the absorption of the scented molecule through the air and not through direct contact. This step took 1 week.

Afterward, the teabag was removed from each bocal and therefore started step number 3: the diffusion of the absorbed smell. Every 5 days and for 3 weeks, the panel was asked to grade the intensity of the smell of rosebud and note any other comment (inherent smell of the materials, enjoyable or stinky smell, etc...).

After 3 weeks, the affect of humidity and heat was studied on each of the 11 bocals. Each bocal was immersed in a bucket of hot water to rise temperature while three drops of water where added inside the bocals to generate humidity.

Material	Granite	Limestone	Concrete	Rammed earth	Rammed earth w/ charcoal	Fire brick	Ceramic	Oak	Scots Pine	Expanded Cork	Wool
Density [kg/m ³]	2 691	2700	2240	1600	~1600	2150	2130	705	400	600	1 314
Porosity [%]	0.5-1.5	5-30	9	34	?	20 à 55	?	50-60	60-70	0.8-7.0	
Thermal cond. [W/(m.K)]	2,2	1	0.92	0,32	0,32	0,84	1,28	0,16	0,15/ 0,36	0,04	0,05
Thermal diffu. [10 ⁻⁶ m ² /s]	1,18		0,54	0.27	?	0,28...0,34	1,00	?	0,12	0,115	?
Inherent smell, described by a pannel of people	G a m y , m i n e r a l , s m o k y , c l e a r , a s p h a l t / s o i l / f o r e s t	Gamy, petri-chor, chalky,	Cold, sandy	Gamy, earthy, chalky, sulfurous, argillaceous.	slightly sandy, dusty	Strong, earthy, clayey, argillaceous	Cold, earthy, chalky, fresh clay, clay dried on her hands, clay baking in the kiln	G a m y , w a r m ,	Gamy, clean, healthy, refreshing, sharp	Warm, sour, old	Comfor-ting, warm
Emission capacity 5 days	7/10 Cold smell of rose, mineral	7/10 Cold smell	5/10 Cold and dusty smell	6.3/10 Soft smell of rose	2.3/10 Very light smell	4.6/10 Nice mix together	5.5/10 Cold and dusty smell of rose	7.3/10 Soft inherent smell in the back-ground	5.5/10 Strong inherent smell	8/10 Weird mix, both very present smells	8.3/10 Strong rose smell, warm
10 days	4.3/10	4.3/10	3.8/10	5.8/10	1.2/10	6.2/10	3.7/10	6.8/10	4.8/10	5.8/10	7.8/10
20 days	4.2/10	5.3/10	3/10	6.2/10	1.5/10	5/10	3.5/10	6.2/10	4/10	4.5/10	7.5/10
After heating and humidity	7.8/10 Powerful but soft rose, appreciated	7.7/10 Wet earth, nice combination with the rose	5.5/10 Cold smell, little rose, subtil	7.3/10 Strong scent of rose, powerful scent, inherent smell of earth too, nice	3.3/10 Not much smell, very little rose	8.2/10 Nice clayey scent, good combination with rose, warm	3.3/10 Cold smell, not much smell of rose	4.3/10 Great smell, like sauna, very warm, soft rose (fragrance flashback), pleasant	6.7/10 Nice smell, less of roses that Oak, (smells like ikea)	4.5/10 Much nicer than without heat, strong smell but nicely received	8.2/10 Strong smell, not very nice, a bit like wet dog

Smell intensity/time

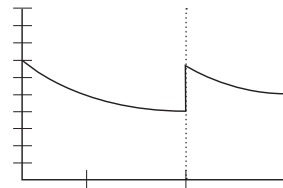
Smell intensity defined by the panel. Experimentation on 30 day.

After 20 days, 2 drops of water were poured in each jar, put in warm water.



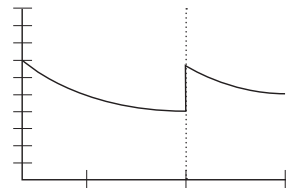
Granite

- High inherent smell when wet
- Very pleasant smell close to petrichor, liked by people.



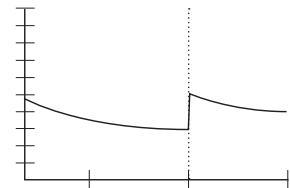
Limestone

- High inherent smell when wet
- Very pleasant smell close to petrichor, liked by people



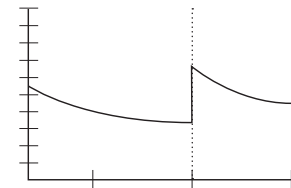
Concrete

- Cold smell, quite chalky
- Releases smells more with heat/humidity



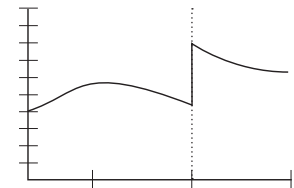
Ceramic

- Strong inherent smell
- Does not absorb/release much



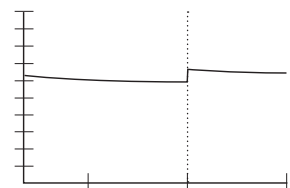
Brick

- Slight clayey inherent smell
- Liked in combination with the rose



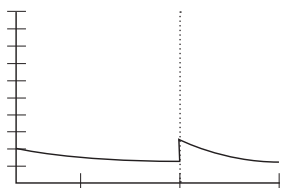
Rammed earth

- Slight inherent smell
- Liked by people



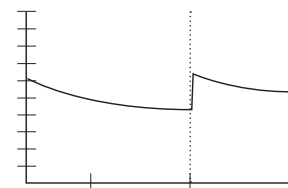
Rammed earth with charcoal

- No inherent smell
- Does not diffuse smells



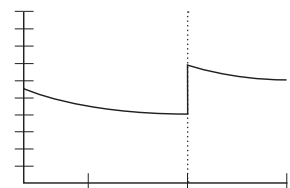
Oak

- Slight inherent smell dry
- Strong inherent smell when humid/warm «sauna»



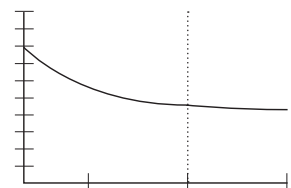
Pine

- Strong inherent smell
- Smell stronger of roses when humidified, but less than oak



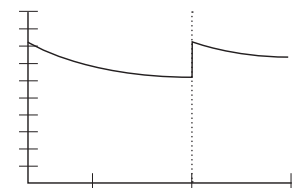
Cork

- Strong inherent smell
- Smell preferred after being heated/humidified as it is softer



Wool

- Slight inherent smell
- Very bad smell when wet/warm



Results

Step 1: Inherent smell

The descriptive process itself was quite interesting. Students were surprised and confused to analyze the smells of each material. The use of a list of descriptive words (designed with perfumer Fredrick Dalman) allowed students to choose words closer to their sensations. Already, the inherent smell of materials affected the panel. Indeed, cork was, for instance, rejected by a participant who was reminded of wild parties and tough mornings, and asked me to never use this material in my design. On the other hand, bricks and stones brought back pleasant flashbacks from childhood.

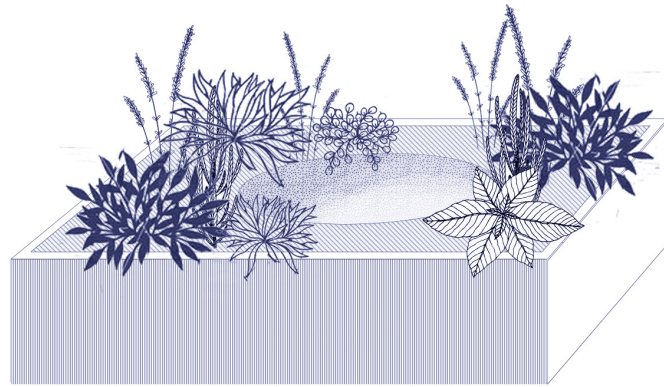
Steps 2 & 3: Absorption & diffusion of the foreign smell

Some materials were more interesting than others. For instance, the capacity of rammed earth to release the smell in a very constant way could be interesting in architecture. Differently, the two stones, granite, and limestone diffused the smell very intensely in the first days of the experiment but the panel reported a quick reduction of it. Oak and pine carried strong inherent smells that would mix with the scent of roses. The panel had mixed feelings about the smell of pine mixed with roses. Charcoal was extremely impressive in its capacity to absorb and to not release smells.

All of the said observations have a direct affect over the design of buildings. Indeed, one can use the absorbing quality of a material or defend himself from it. In the obvious case of a swimming pool, one might prefer a dense material to avoid the absorption of the strong smell of chlorine in case of rehabilitation.

Step 4 : Humidity and heat

The affect of humidity and heat on each material was quite astonishing. Most of them indeed saw their intensity increase by 1.29 on average. This phenomenon is due to various reasons. First, the humidity in the bocal triggers an exchange of heat between the material and the air, causing scented molecules to escape. The humidity in the air also traps odor-causing molecules and allows them to travel farther, but also linger longer. Lastly, it is when the air is warmed and humidified and becomes similar to what our body temperature would be, that the nose operates optimally. One might also note that the adsorption capacity of a material is inversely proportional to the temperature and humidity of the air to be treated.



EXPERIMENT 2

MOLECULES

Architecture, like the city, is as enveloping as it is enveloped. It is an integral part of a soil, a terrain, a landscape. It is this integrity that Wright claims when he defends the idea of “organic architecture”: “The first condition of simplicity, it seems to me, is that any construction must be in love with the soil on which it is built. Too often, in the old architectural tradition, (...) the building literally hates the ground on which it stands (...).” (Frank Lloyd Wright, 1982, 242)²⁸

The soil is our “natural place”, as Aristotle would have said. Of course, this involves our atomic composition - water and carbon - but also our condition. All mythologies say that humans are the sons of the earth. The early Adam of the biblical text comes from the Hebrew *adâmâ*, which means the soil. Similarly, Greek mythology -the myth of Prometheus for example- also relies on the idea that man is drawn from “Mother Earth”, from a nourishing soil, from the “bowels of the earth.”

Mankind comes from the ground and returns to the ground. Being born, existing, and dying is a way to vary a tried and tested ground. Because the soil is lived before it is known, it is inhabited before it is exploited. In French, childbirth takes thus literal meaning, “l'accouchement”, or the act to lie down, to be placed on the ground, and death, is a recovered soil. For mankind, the soil, therefore, has the meaning of a genealogy, a genesis, before one of a geology. The ground refers first of all to a qualified space, a valued one.

Therefore, the soil is a surface, the surface layer of the earth’s crust, is also the place where civilizations settle. They leave their traces there as they settle in layers that superpose themselves, marking the soil and making their passage visible. Therefore, the soil is a memory keeper. It is capable of recording, of becoming the memorial of a civilization, because it is made of duration, of solid matter.

The floor “smooths over the surface of the earth, creating a first

(human) territorialization” (E, Grosz, 2008, 23)³. From the unstable soil of the planet, humans preferred a plane surface. It is by reference to this stable soil that Kant conceives the possibility of a judgment, a reason, capable of sharing entangled ideas and untangling them in the exercise of common sense. This smoothed surface is for him the way to fight anarchy, barbarity, and thus reaching morality. In the *Critique of Pure Reason* (1781)²⁹, Kant explains that it is needed to “clear and level ground with mad vegetation” (Kant, 1781, 733), because of the fear of seeing the enemy emerge, an enemy found in the form of a mole. Indeed, in this text, Kant proposes a systematic cleaning process, capable of “clearing and consolidating the ground that must support the majestic building of morality, this ground where one meets mole holes of all kinds dug by reason and which threaten the solidity of this building” (Kant, 1781, 266).

But Ingold criticizes the “groundlessness of modern metropolitan life” (Ingold in Mallgrave, 66)³⁰, the fact that most of the urban environment is paved while the limited vegetation often is for the eyes only. This soil humans built their communities on disappeared under a plane of concrete and while it appears to me as the extreme of sedentarization, it strikes a strong contradiction towards the relationship to the ground. While this relationship used to mark the birth of mankind, the recording of it, it is now ignored by it.

The carved floor brings back elements of the earth to the built entity, from the visible topography to the invisible smells of soil and wet grass. And this manipulation of the perception of the floor generates a double lecture of it: a Man-made creation linked to the terrestrial force of tectonic movements. Through it, smells and topography become expressive qualities, expressing a new relation of the territory to interior and exterior milieus. Thus, the recesses where one can lie down are ambiguous, both from the earth and the dwelling, from chaos and also from the body. Therefore, if rhythms are the “in-between whereby

milieus communicate with one another, within themselves and with chaos,” (Bogue, 2003, 18)³¹ thus this reterritorialization of the floor generates a new rhythm. A Rhythm in the bond of the body and its surroundings, submitted to forces of the Earth never experienced before.

Filled by rainwater, the topography takes yet another meaning, a bath or a muddy pond, and this relation to the element, to the ritual of bathing, of washing, is to transform oneself, not to remain as one is, to modify oneself: to attain a form of transhumanism. Water carries the notions of a hamiotic, prenatal world, an orthopedic device that allows the body to transform itself, a ritual that all religions seek to capture. From the mikveh of the Jews, the baptism of Christians, the ablutions before the prayer of Muslims: water symbolizes the rebirth, the abandonment of the sinner’s body to redeem itself, and thus redeem a part of society.

About the dividual: if different people lie down there, though they would all be more or less in the same bodily position (lying down), the way the olfactory bulb “sorts” the odorous molecules arriving from the neuroreceptors is personal to everyone, meaning that there are as many ways to perceive a scent as there are people on the planet. Therefore, the group would acquire a certain “degree of cohesion, of group identity, yet doing so without dissolving and merging with one another.” (Bogue, 2003, 42)³¹ Therefore, each one would be transformed individually while actively sharing a new experience in cohesion.

The individual would lie down in this carved floor, the nose primitively close to the ground. In an exterior environment, the soil, the grass, the plants, the animals have a scent one rarely smells. But why is that?

While studying the different materials, I noticed that it was possible to smell some of the scents from afar, as rosebuds for instance, but others needed to get a “closer sniff” to perceive them. Why is it that one can smell roses from afar, but not soil? Therefore, a new question came to mind: Are some of the scented molecules more volatile than others?

A first answer was found in a discussion with perfumer Fredrick Dalman³², he explained that different types of scents exist and that they are commonly used in perfumery. A basic and traditional way to put it follows the pyramid of scents of perfumery. It sorts each smell in different types: the ones diffusing «top notes» hold light and volatile molecules, the plants diffusing «heart notes» are more floral and full-bodied, while other plants -or infused pots- diffuse «base notes», heavier and longer lasting. Perfumers use these properties to know which scents will last longer on the skin, while others will give the introduction to the story of the perfume. They organize the smells together to form a coherent whole in a bottle.

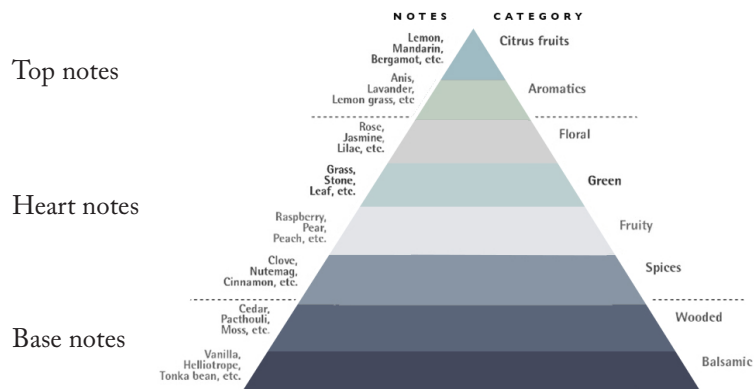


Fig 1. Perfumer's pyramid

But is it also true from scents in our environment? Well in *Le discret pouvoir des odeurs (The discreet power of scents)*³³, the authors explain that most scented molecules travel at the ground surface, thus explaining the powerful olfactory system of most animals developing at that height. But lighter scents are believed to be more volatile by perfumers and to test this hypothesis came the idea of a model. What would one smell if his/her nose was underground? Would heavier molecules be separated from lighter ones that would travel with winds more easily?

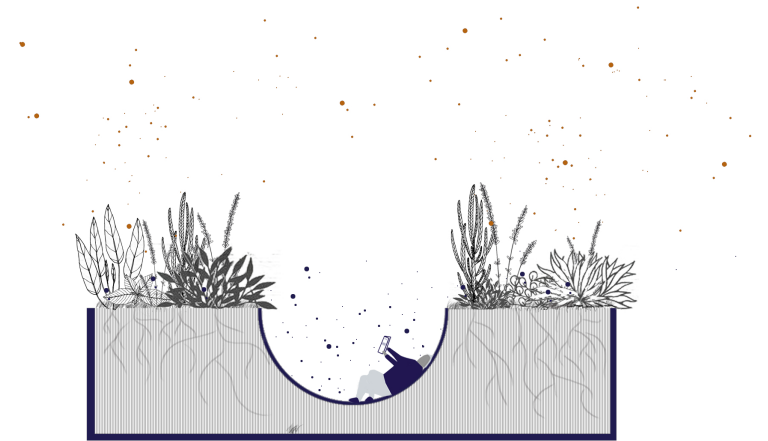


Fig 2. Topographic trap

This section translated in the following model, theoretically permitting for the heavier molecules to be “trapped” in the bowl-shaped recess, protected from winds. A hole drilled at the bottom of the bowl allows one to smell the said heavy molecules.

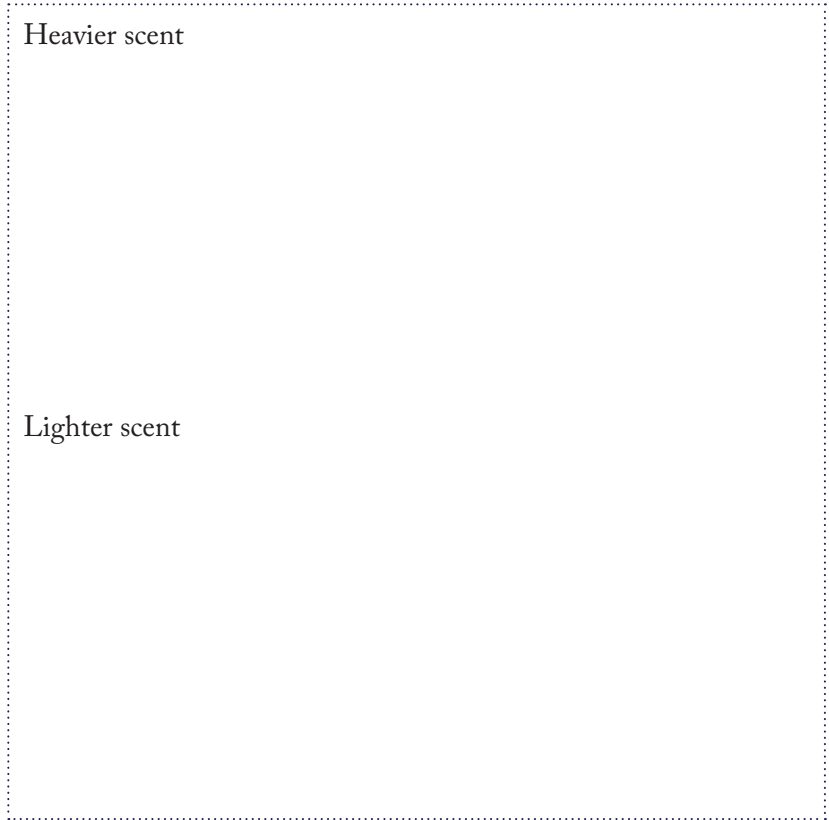
Result

Indeed, the heavier molecules slide down and are stuck there. One can, therefore, smell scents of soil, grass or other muddy fragrances when positioning his/her nose under the model. Above or from afar, the scents of flowers and other aromatic herbs are clearly perceived.



Fig 3. The soil's scented molecules are smelled from below while floral scents, more volatile, are smelled from above.

Architecturally, this observation means that the design of space and the behavior it induces in us: nose closer to the floor or the ceiling, different heights, etc. change what will be perceived by our noses, thus giving another perspective on the relation of habit and habitat.



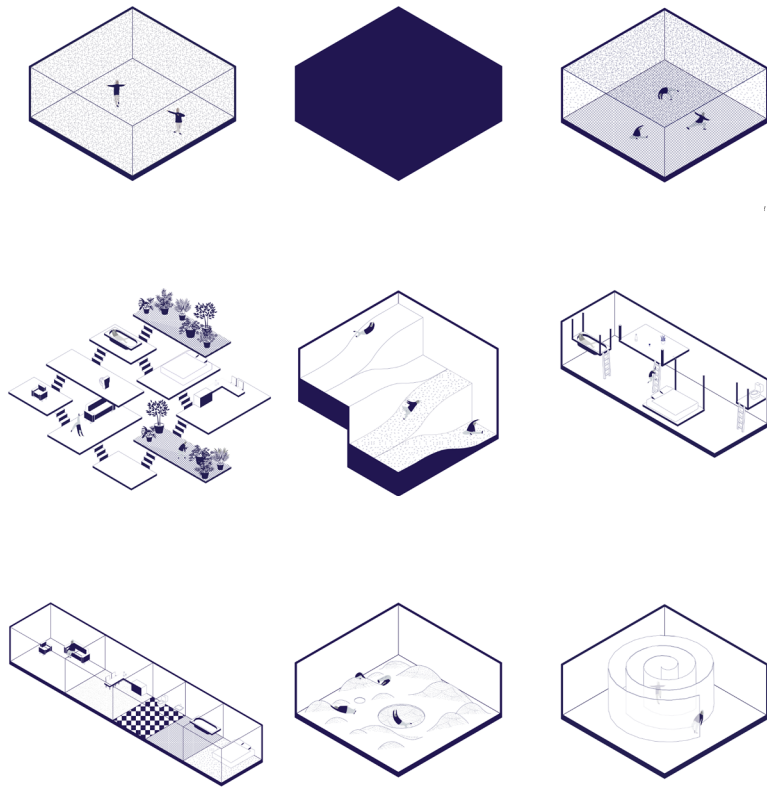
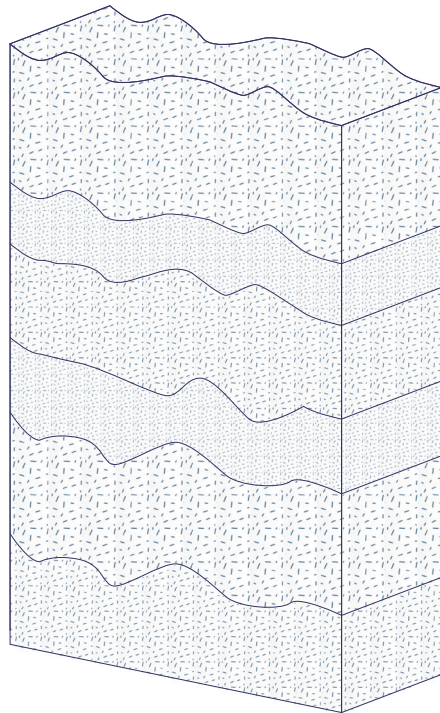


Fig 4. Impact of architecture on perceived smells



EXPERIMENT 3 TECHNIQUE

If we follow the words of the architect and philosopher Richard Scoffier, architecture has its roots, not in the search for a protective shelter, but in an animal search for limits. Two-sided and polymorphous object, the wall displays paradoxical concepts. It opposes and unites. It hides to show. It is material and spiritual. It stands up and marks gravity. He imprisons and releases. “It divides, separates but also provides new connections, relations with those on the other side [...]” It is a built frame that selects the territory and transforms it [...]” (E, Grosz, 2008, 23)²⁶. Its etymology itself reveals this ambiguity: *Paries* referring to the welcoming, benevolent and protective nature of the living walls, and *Murus*, of Etruscan origin, reflecting the confinement and isolation associated with them.

The act of rising a wall frames chaos, it breaks “the continuity of space, cutting off a plot of it and making it a specific unit endowed with meaning. A piece of space has thus been unified and separated from the rest of the world.” (Simmel, 1983, 98)³⁴ Indeed, framing is the territorialization of the Earth’s forces, cutting into a milieu, and delimiting a space. Therefore, “it enables the body to be affected by, protected from the chaos outside” (Grosz, 2008, 23)²⁶. In this containment, qualities emerge and unleash to become materials of art.

But Perec notes that the importance and the meanings behind this built entity are often neglected. He explains that, he himself, “forgets there is a wall” in his house, using the surface for the sole purpose of displaying photographs. This attitude toward his environment, immensely visual but inherently blind to a deeper meaning of elements echoes the experience one has in his/her everyday life. Rarely does one get to experience the thickness, the materiality, the textures, the smells, the weight, the support of a wall. It often appears as a flat surface surrounding us, where indeed we can hang pictures - pictures we “don’t even look at.” (Perec, 1974, 39)³⁵

While the horizontal limit that the wall generates is quite obvious -though it tends to be forgotten-, the rising of walls in our own way, refers to the original phenomenon of human erection. The wall summons humans in its verticality. Challenging the current horizontal approach of the wall by organizing the affects and perception on a vertical orientation could help redefine the lecture of the wall. Indeed, rather than passing by indifferently next to a surface, the visitor might be intrigued by the play of textures, colors, and mainly by smells. Wondering where they come from, being curious about an element hardly noticed usually, one could interact with the wall in all its dimensions, smelling, touching, tasting, looking, pushing, sitting or standing, laying down next to it, imagining and so on... This interaction could, therefore, go further than the geographical/architectural footprint of the wall but rather, towards its antigravitational properties. Therefore, the line on the blueprint would spread, and “the partition projected forward [that] induces the wall, which constitutes the possibility of an inside and an outside” (Grosz, 2008, 14)²⁶ could be transformed into the possibility of an around. The still and impervious structure would become a porous, moving, and diffusive entity, expanding its boundaries beyond its tangible reach.

From what we learned of the previous experiences, the design of space and the materials used affect our experience of architecture through smells, but what about challenging a complete construction technique? As learned during the bocal experiment, rammed earth had the property of diffusing an absorbed smell quite stably through time. It is also a very sustainable construction technique, it produces no waste during its application. In fact, it is mainly composed of soil found on site, so there is less transportation pollution. It is durable over time and even renewable. For those reasons and more (its insulating properties, its aesthetic, etc..) we chose to study how to challenge it through three different processes.

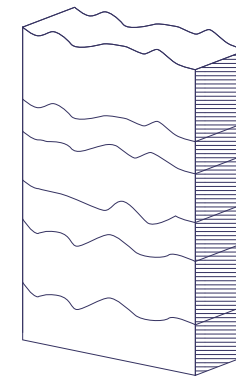


Fig 1. Absorbing

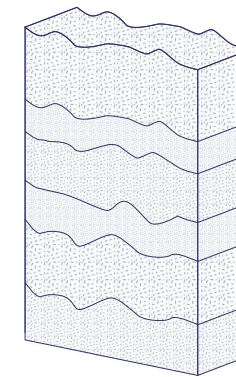


Fig 2. Scented

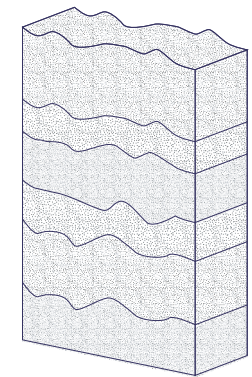


Fig 3. Neutralizing

As we studied earlier, rammed earth absorbs and diffuses smells very interestingly for our case. A rammed earth wall was therefore put in a box full of roses for a week, releasing the scent softly day by day. On the other hand, once mixed with charcoal, the samples studied in the bocals proved to absorb and contain smells, making it a filter for unwanted fragrances. Finally and resembling a bit more Adobe, it was possible to add plants and spices to the mix, making the walls themselves scented.

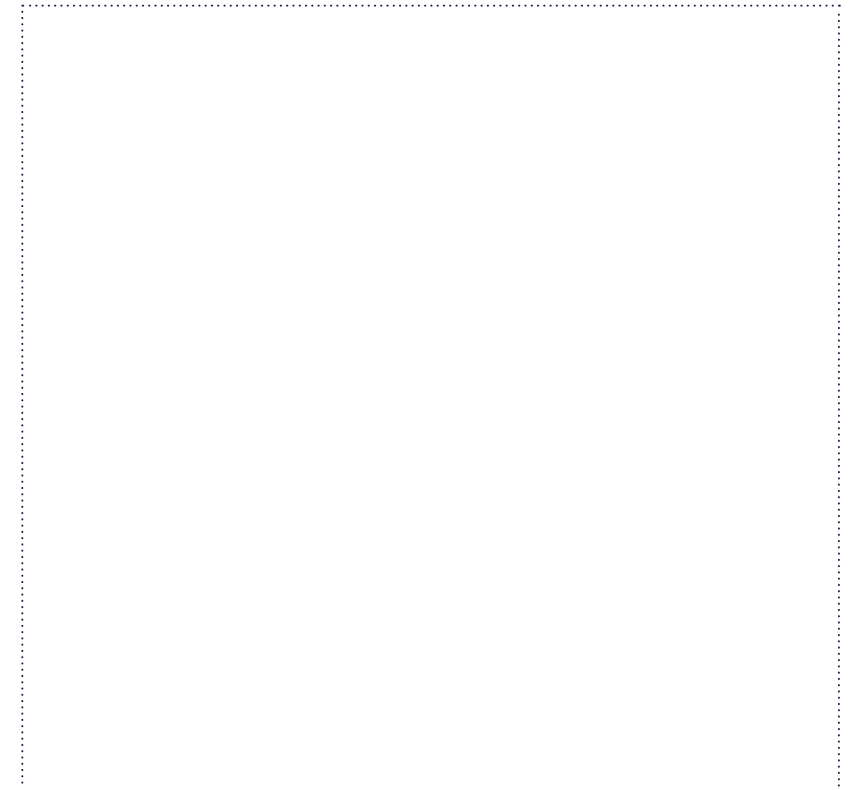


Result

The model triggered lots of curiosity among students and professors. Most people felt the urge to touch and smell the models, turn them around or press on them. The tactile aspect of the walls was described by a student as an “irrepressible need to feel the composition.”

While this urge caused two walls to be destroyed (for science, I guess), it also questions the affect those experimentations provoke in human beings! What do those experiences generate in the users?

Smell and try associating each sample to the correct wall!



In January 2019, we were asked to write a theory thesis on a subject of our choice. Sensitized by a person of my close circle, I found myself particularly interested in the experience of space of the visually impaired. At that stage of the research, I was looking for multisensorial answers to how the built environment can be perceived, which promptly led me to our sense of smell.

And while the subject passionated me, the more books I read, the more research I did, the more I realized how unfamiliar I was with this sense. Though smells are everywhere around us, in every activity and place we participate in during our lives, in my experience of architecture, sight and touch prevailed. So much so that I realized how little I used my nose. While there is a sociological aspect to why we, humans, don't trust our noses anymore, I recollected memories of me not being able to smell moments others could. I remember then going through the kitchen cabinet and specifically thinking "Oh no... It's true! I have a terrible sense of smell!" This little fear I always carried in me, this semi-joke about not being able to really smell the delicate scent of a flower, or the stink bombs thrown in High School, was, in fact, true.

This personal awareness led me to direct my research on smells in the built environment, and this six-months research paper of the first year of Master became my fascination, a subject I found so thrilling I could not stop exploring. But quickly came disappointment and frustration. Indeed, the amount of literature on the subject isn't exactly impressive and while too many of my questions were left unanswered, I decided to find professionals of the field to satisfy my curiosity.

This is how I contacted the perfumer Fredrik Dalman of the Maison Mona di Orio, in Amsterdam, a man of great creativity, talent, and patience, who guided me through the rudiments of perfumery, discussed the potentials of scents for designers and gave me exercises to train my sense of smell.

But I knew there was much more to discover which led me to start my graduation at the ExploreLab, a place of curiosity and fascination where I was able to pursue my need for knowledge. The first year's research being on the descriptive side of the spectrum, we decided, Stavros Kousoulas, Roel van de Pas, and I, to follow a more speculative approach for the graduation. There were two parts of the research, a theoretical and an experimental one. As I was fascinated by the power of smells to manipulate people, we looked into the theories of affects with the texts of Deleuze and Guattari, Spiniza, Mallgrave, Massumi, Grosz and others, wondering how do smells affect architecture and the humans inhabiting it. Parallel to that, I focused on 1:1 experiments, researching the interactions between the space outside of the body and the body itself, studying the alterations of materials, construction techniques, spaces but also bodies and minds.

This approach made the relation between research and design quite evident, as the design assignment follows the understanding of the site's specificities (material, odorous and affective) acquired through the research part of the project. The experiments also were a first hands-on application to the potentials of smells for me as an architect, by emphasizing a multisensorial approach of the project.

The proposed project explores the smellscape potential of the area, both in its natural (flora, seasons, weather) and material way (constructions, activities) and aims at enhancing it through different interventions. The choice of a site helped contain the different materials, plants, and construction techniques to study and brought new representation tactics to the project, such as smellmaps making. The design methodology looks into existing smellscape markers and social challenges and explores how a future intervention could be envisioned as a development of series of landscape designs and architecture(s).

The participation of different professionals and students greatly helped understand the various aspects of the graduation. I continued discussing with perfumer F. Dalman throughout the year, who provided great expertise to the understanding of scented molecules on a physical and psychological level. In Lyon, I met with landscape gardener Pauline Renault, of Sémiramis Paysage, who advised me about plant choices and their different properties. Last but not least, a panel of students and friends accepted to test each of my experiments, allowing me to understand the intimate and personal aspect of this sense and providing with data useful to the progress of the graduation.

Overall, I'd say that this graduation project taught me not only about smells, but about our relation to our environment, the attention we pay to details, the place we give to invisible poetics. I also learned to invent new architectural solutions to a subject I had never encountered before, which I believe made me more resourceful towards designing.

Please note that all the designs elaborated were considered as *some* of the architectural answers to the question of smells in the built environment and are, therefore, non-exhaustive. Another person would approach the matter in a different way, or explore different options than I did. This graduation research is just a start to a greater innovation!

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