

Smells for the Paris Agreement

using smell to influence our perception of temperature in the context of an art installation

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In this paper I will describe an artwork that departed from the simple question "Can smells contribute to solving the problem of global warming?". The work allows the viewer to experience the interaction between the sense of smell and the sense of temperature. I will explain the process of research and development from an olfactory artist's point of view. The project was indirectly commissioned by Mazda, a major Japanese car manufacturer, as a part of their presentation "Mazda 100 years" in Paris.

Additional Keywords and Phrases: olfactory art, installation, the sense of temperature, the sense of smell, trigeminal nerves, global warming, Paris Agreement, SDG's

1.MOTIVATION

Since ancient times, fragrance has been used as a means to achieve goals like healing, seducing the opposite sex or creating a sensation of luxury. I use scent for artistic expression, but I have always been wondering if scents could be used more universally to help solve global and social problems.

When I was approached to create a new installation for the anniversary party of MAZDA EUROPE, a Japanese car manufacturer, I thought it would be interesting to do some research and see if smells could help stop global warming. For example, if smells can make us feel cooler on a hot day, we might eventually be able to reduce our energy consumption. In other words: smell might be useful to make mankind more resilient.

This project started as a research-based art project, with no guaranteed outcome, but it was meaningful as self-reflection from the automotive industry in a time where the SDG's (Sustainable Development Goals) are being questioned as a corporate benchmark.

2.RESEARCH & DEVELOPMENT

The realization of the work was divided into four main parts. Let's look at them one by one.

2.1. Selection and composition of fragrance materials

At first, I selected and compared the "warm" and "cool" fragrances known in the genealogy of perfumery.

Warm Fragrances: cinnamon, sandalwood, labdanum and clove

Cool Fragrances: mint, eucalyptus, lemon, and camphor

I observed and studied what I perceived when I smelled these fragrances, but gradually lost track of what I was experiencing. I couldn't get rid of the initial genealogy I had been taught at the perfumery school.

Then I asked around my friends what scents made them feel warm, and there wasn't much of a difference from the list above.

What I noticed is that when we say "warm scents", we generally mean "warm" in the sense that they evoke imagination that is "warm". For example, when a scent is associated with Christmas, such as cinnamon, we say "warm". This means a big part of the interpretation is cultural. In other words, other cultures may have a different interpretations of the same scents. Smelling a "warm" scent does not necessarily make you physically warmer (i.e. raise your body temperature).

However, we know from experience that it is good to drink ginger tea when we are cold. I should focus my research aspects closer to how the body functions.

I decided to ask my friend Jas Brooks (PhD student in the Department of Computer Science at the University of Chicago) if there were such molecules that physically affect the sense of temperature. He referred me to a paper about chemosensory properties on the trigeminal system [1]. According to this paper, scent stimulates not only the sense of smell, but also the trigeminal nerve. As a stimulus, scent also has a complex effect on receptors for warmth, cold and pain.

I experimented composing fragrances with the materials listed in the paper.

Table 1: The Warmer Fragrance composition: mainly with V1 (burning hot) & V3 (warm)

	Ingredient	Chemical agonist	Odour life (h) [2]	Note	Receptor [3]	Concentration	Gram
1	Black Pepper	Piperine	10	Top	V1 > A1	100%	50
2	Camphor	Camphor	2.5	Top	V3, V1	50% DPG	30
3	Eugenol	Eugenol	48	Middle / Last	V3, V1, A1	100%	15
4	Red Chilli Pepper Extract	Capsaicin	n/a	n/a	V1	Self Extraction in Ethanol	5
5	Methyl Salicylate	Methyl salicylate	2	Top	A1, V1	10% DPG	5

Table 2: The Cooler Fragrance composition: mainly with M8 (cooling) & A1 (burning cold)

	Ingredient	Chemical agonist	Odour life (h) [2]	Note	Receptor [3]	Concentration	Gram
1	Menthol	Menthol	18	Top	M8, A1 > V3	50% DPG	45
2	Eugenol	Eugenol	48	Middle / Last	V3, V1, A1	100%	30
3	Thymol	Thymol	30	Middle	V3, A1	50% DPG	30
4	Citral	Citral	5	Top	M8 > V1 > A1 > V3	100%	15
5	Linalool	Linalool	10	Top / Middle	M8 > V1 > A1 > V3	100%	15
6	Cinnamaldehyde	cinnamaldehyde	75	Last	A1	100%	3
7	Methyl Salicylate	Methyl salicylate	2	Top	A1, V1	10% DPG	3

Camphor [4], eugenol and methyl salicylate are both cold and warm sensitizers. It is therefore necessary to combine them with menthol for a cooling effect. This is similar to perfumery. For example, linalool has a warm tone when combined with a sweet fragrance, but a cool tone when combined with a clean fragrance. Depending on the combination and the balance of the ingredients, the characteristics of the fragrance will change. This is the magic of perception. This experience in perfumery has been used in the formulation of the fragrance.

As the fragrance is intended to be evaporated in space, I have tried to use mainly top notes. In addition, the fragrance was created in an abstract way, so as not to evoke a concrete scent, such as the scent of lemon.

2.2. Simulation by diffusing

The resulting fragrance was diluted to 50% with a solvent (DPG) and simulated by diffusing it in a room at home.

As it was in the middle of a very hot summer, I first tried to diffuse the "cooling fragrance" in our room. It did not feel as cool as I would have expected. It turns out that the menthol ingredient works best when the temperature is below 25 degrees Celsius. In Okinawa, where I live, the summer heat is particularly intense, but with the air conditioning turned up high I managed to get a cooling sensation. It was a direct coldness, not on the skin, but in the lungs and bronchial tubes. I felt cold, so I stopped the experiment.

Next, I tried to diffuse the "warming fragrance" into the room. I felt dusty, drowsy and took a nap. I woke up with a dry throat. Although it did not raise my body temperature, I thought that the fragrance might have a physiological effect of increasing blood flow and consequently my thirst.

2.3. Examination of the method of diffusion

In the past, I have made my own tools for spatial diffusion in my own installations, but recently in Japan, we have many very good products on the market. Several diffusers were considered.

(a) AROMORE (Tree of Life): compressor system

(b) AROMIC AIR (AROMIC STYLE): absorption and evaporation system by fan

After testing, I chose (a). The good thing about this product is that it does not always evaporate the fragrance at a constant rate, but sprays it instantaneously after a certain period of time. This takes into account the nature of the sense of smell, which is prone to olfactory fatigue if it is always evaporated at the same concentration. It results in saving on fragrances and increasing the intensity of perception.

2.4. Creating spaces

In order to design the space, the following requirements were made to the organizer in Paris from the point of view of space perception and the function of fragrances.

- To create two rooms, a "Warmer Room" and a "Cooler Room", so that visitors can move back and forth between them and compare their experiences.
- The two rooms are identical in shape. The two rooms are the same shape and are located next to each other.
- The temperature and humidity of the two rooms should always be the same. (with some kind of controller, such as a portable air conditioner).
- The space needs to be perceived as a closed space. i.e. the visitor should be able to feel that the space is filled with fragrances and that their whole body is immersed in them.
- The space should not be too big or too small, and should be able to accommodate two or three people at the same time.
- The space should be airtight so that the scent can be 'trapped' and people can enter and leave easily by means of curtains.
- The two rooms will be constructed of transparent materials so that the reactions of the people inside can be seen from the outside.
- The floor will be covered with artificial grass and the grass will be sprayed with a fragrance.

The organizer in Paris has prepared a small green house made of plastic material. The entrance is covered with a PVC curtain.



Figure 1: The final installation setup

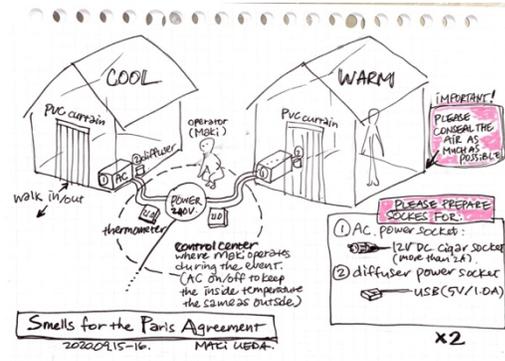


Figure 2: The final installation setup in drawing

3.RESULT AND ANALYSIS

Opened to the public on 15-16 September 2020, the exhibition was unfortunately not viable during the day, as the venue was directly affected by the extreme weather conditions of 37°C during the day. By the time the temperature dropped after sunset, we were able to maintain the temperature in the green house at around 25°C, which was ideal for the experience. Due to the spatial characteristics of the venue, the Cooler Room was always a degree higher than the Warmer Room, but everyone was surprised to find that the Warmer Room felt warmer.

In the Cooler Room I received the following reactions:

- It's like being in a forest. Moisturizing.
- It feels good. I feel refreshed.

In the Warmer Room, I received the following reactions:

- The temperature is lower here, but it feels warmer.
- I feel like I'm in the desert.
- It smells like a campfire.
- It reminds me of a dry sauna, dry wood and cork.
- Itchy throat.



Figure 3: A spectator in the Cooler Room



Figure 4: A spectator in the Warmer Room

I think I can conclude that the work seems to have offered "warm" and "cold" sensations that are pretty much common to all human beings. It is interesting to note that smell can evoke a sense of "humidity", which in turn is perceived often as a perception of "temperature".

ACKNOWLEDGMENTS

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