

# AromAtom, an olfactory approach to science communication and public engagement

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Not that long ago, the term science communication would have merely implied communication between scientists, but nowadays the term has a much wider context. Science today needs to be made accessible to a more diverse and inclusive audience; it needs to be presented in a way that is engaging, innovative and fun. The formal talk and slides combination favoured by academia is not necessarily the best way to communicate with the public. We need to rethink the way in which we engage with non-scientific audiences who have little interest in what we do, and especially with those with very low science capital. How can we ignite their curiosity and encourage them to ask questions about science? How can we help them to feel involved and interested in our work?

## Using the olfactory sense in science communication

As humans, we rely mostly on our vision and hearing in order to learn: we read books, attend visual presentations and listen to speakers at events or on television and radio programs. However, we can make use of other chemosenses to provide context for our learning experience, to make it more holistic and include additional cues that may help us process and later recall what we have learnt. The sense of smell, which is also of primary importance to how we perceive flavour, can provide such context.

Olfaction is a primitive sense and is underestimated nowadays, yet it allows us to make important everyday decisions without noticing. Is the milk in the fridge spoiled? Do we smell gas or something burning? Does a flower smell so good that it makes us smile? Does the smell of the ocean bring up forgotten childhood memories, or the smell of an old building remind us of a favourite trip abroad? When we detect a smell, an immediate reaction is produced, our brain tells us to act: don't drink the milk; leave the building; call the fire brigade; get closer to somebody; inhale deeply and remember happy times with our loved ones. This intimate relationship between olfaction, memories and actions can be exploited in

science communication that targets disengaged audiences. While there are studies which indicate that olfactory processing and memories are linked, olfaction in humans is poorly studied and much of what is known is based on research conducted on rodents and non-human primates. Experiments indicate that the mammalian brain is capable of fast learning when using odours associated with a reward, and that the learned behavioral cues induce synaptic changes. There also appears to be a relationship between a weakened sense of olfaction and neurodegenerative disease. On a psychological level, odours can trigger vivid emotional responses and bring up long forgotten memories due to the connection between the olfactory bulb with the amygdala and the hippocampus, both directly involved in emotion and memory.

How can this be applied to the teaching and communication of scientific subjects? First, scent can make scientific subjects fun and engaging. Many children and adults have negative attitudes towards science: science is boring, it is only for exceptionally intelligent people, it is difficult. Here, the sense of olfaction can be used to reinforce a positive experience of science, which can become an interactive, fun and participative



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activity that everybody enjoys. Specific odours can also provide context for what is being learned, facilitating a holistic and inclusive learning experience in which anybody can participate regardless of background. Additionally, the act of smelling something can produce intellectual and emotional responses such as like, dislike and curiosity about an odour, that encourage discussion and questioning amongst participants and facilitators. Most importantly, individuals with visual and auditory impairments rely on their other senses to learn, understand and memorise new concepts. Here, the use of smell and taste (we often taste what we smell) can compensate for visual or hearing limitations. In all cases, chemosenses and emotions work together to provide context for what is being communicated, reinforcing the learning process and aiding the recollection of memories. The learning experience changes from reading or listening to an isolated concept, to understanding that concept in a wider context and in ways that relate to everyday life.

**AromAtom: a case study**

As a former perfumer and educator, I am very aware of the response that scent elicits from people. As somebody who had no involvement with science until a decade ago for the reasons previously mentioned, I am particularly interested in innovative ways of attracting non-scientific audiences to STEM, especially those from creative backgrounds. I was one of them.

In *AromAtom: The Smell of Space*, I have combined my perfumery and communication skills with my academic studies in space science and astrobiology, to create a public engagement project and spread the message: “science is not just for scientists, science is for everyone”. During this olfactory encounter with space, participants learn about space exploration, the solar system, the origin of life and the kind of life that we are searching for beyond

the Earth. Using the sense of smell as a guide, anybody can participate in the experience regardless of age, background, education or disability.

The space-smells used during the activity have a number of functions. They are not arbitrary, and although they act as hooks and ice-breakers, they are the vehicles for the science being discussed. These hypothetical odours are based on the composition of planets, moons, molecular clouds, metabolic processes, laboratory smells, and the accounts of Apollo and International Space Station astronauts that mention the smells they have experienced.

The AromAtom tour has several stops. At each stop participants are surrounded by images of their location while experiencing the corresponding space-smells. I explain why such odours might be found there, and weave basic chemistry and astronomy concepts into the story. For example, at the Mars stop, we discuss the smell of oxide when explaining the reasons for the rusty colour of the Martian surface, and the smell of sulfur to talk volcanic gases. When learning about extremophiles that may inhabit other planets, we relate the smell of salt and methane to the metabolisms of halophiles and methanogens. We also use the smell of aromatic molecules detected on meteorites, comets and within gas clouds, to explain that the building blocks of life can be found in space, and to consider how they ended up on Earth. The space-smells we use enhance the learning experience and engage the imagination of participants, prompting them to ask questions and participate in the discussion, which makes the experience both inclusive and interactive.

Since its launch in December 2017, events for adults have been held in London, Madrid and Barcelona, with podcasts recorded and published in English and Spanish. AromAtom has also visited Somerset schools during 2018 and 2019 to break down science stereotypes and inspire the next generation of STEM professionals. I have also delivered the activities whilst working with children with learning difficulties at a Spanish school. The feedback received from every event and school visit has always been positive, with the highest impact observed amongst young female students, and adults from creative backgrounds.

As a PhD student my time is limited, but I am deeply committed to science communication and I feel very passionate about reaching non-scientific audiences. Future work includes AromAtom activities for families at the Science Museum in London during the month June, and at the Bluedot Festival at Jodrell Bank Observatory in July. ■

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**Further reading**

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