

# **Designing Smell Games, Learning from Animal Play**

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## **Introduction**

Humanities' and natural sciences' growing interest in animals themselves rather than on the study of animals for the sake of understanding the human has been suggested to have already resulted in an 'animal turn' in academic inquiry (Ritvo 2007). Such a major change in our thinking of other living beings results from a variety of scientific discoveries as well as wider awareness and care towards the status and role of non-human animals in human societies and in the so-called wilderness.

While health and human wellbeing partially motivate a move away from 'factory farming' for instance, ethical considerations play a major part in prevailing conversations, too. That non-human animals have complex emotions (e.g. Marino and Colvin 2015), understand other individual's emotions (e.g. Parr 2001), show altruistic behaviour (e.g. de Waal 2008), have a sense of fairness (e.g. Brosnan 2006; Range et al. 2008), feel pain (e.g. Braithwaite 2010), and are generally more intelligent than humans have previously been able to prove or grasp contribute to a whole new perspective on them. These 'discoveries' have gained wide visibility across media, which shows that our relationship with non-humans is of great interest.

This paper is linked to the outlined paradigm shift as follows:

- 1) more interest and care is targeted toward animals in captivity and their wellbeing,
- 2) the existing needs for environmental enrichment are getting more articulated and sophisticated and often addressed with digital technologies, and
- 3) species-specific and cross-species designs call for new approaches that respect the capacities of animals in question since existing human-centered technologies and solutions prove insufficient in addressing alternative abilities and preferences.

Two major design implications can be drawn from here. Firstly, new designs should be not only species-specific, but also take into account the location and other contextual aspects of the non-human that may influence the use of enrichment designs. Among others, Clara Mancini has voiced out the importance of acknowledging differences between species in the design of animal-computer interaction (Mancini 2011). Elsewhere, Wirman (2014) has discussed the challenges that can be associated with uncontrolled research settings with non-human animals. Secondly, experimental and groundbreaking work is needed in order to cater for different bodily compositions of the users of these designs. In the following we discuss humans and animals, specifically orangutans – their play and uses of smell – side by side in order to consider possibilities for cross-species play and to understand to which extent results from one are applicable to the other.

This paper focuses on one such design consideration. Namely, as entirely new approaches in sensory input and output need to be defined and examined for their efficient use among non-human animals, there is a move away from ocularcentrism. Meanwhile, smell, among others, can be considered as one of the key mechanisms in creating new kinds of affordances, hints, clues, challenges, and rewards in environmental enrichment.

Here a parallel development in the study of humans becomes an integral vehicle for theory building: the so-called ‘sensory turn’ which draws our attention from vision and hearing to full bodily experiencing and senses like smell. “The emergence of sensory studies . . . has come at the end of a long series of turns in the human sciences. . . There was the linguistic turn of the 1960s and 70s inspired by Saussurian linguistics (and Wittgenstein’s notion of language games) . . . This was followed by the pictorial turn of the 1980s . . . The 1990s witnessed two new developments: the corporeal turn, which introduced the notion of “embodiment” as a paradigm for cultural analysis, and the material turn . . .” (Howes 2005b: 4).

The “sensory turn” that David Howes identifies has its roots in sensory anthropology, a discipline and set of practices that aim to articulate the influence of culture upon our sensory experience. Central to this approach is the acknowledgement that other cultures may conceive of the senses in a manner that is different from our own: “The senses interact with each other first, before they give us access to the world; hence, the first step . . . is to discover what sorts of relations between the senses a culture considers proper” (Howes and Classen 1991: 258). One task in doing sensory anthropology is to identify which senses are emphasized by a culture, and to recognize that sight, smell, hearing, taste, and touch thus become sites for negotiation—as well as transgression—of cultural norms. Interestingly, through studies of unfamiliar cultures, sensory anthropology also helps to enlarge our understanding of what it means to experience the world through the human sensorium.

Trying to find solutions for non-human animal enrichment in the crossroads of sensory turn and animal turn, the following seeks help from game design and from designing play as the latter frames unique autotelic experiences and meaningful cross-species interaction. Since this paper serves as the first glance to the study of smell-enabled games for non-human animals, it provides the following major contributions: We outline some of the reasons and possibilities of smell in game design for humans and non-human animals; establish key challenges in applying smell-based systems; and, finally, suggest further avenues for smell in game design regardless of species. As exploratory research, we propose that smell-enabled game design for orangutans as one chosen species can improve quality of life for animals, provide terms for extending sensory anthropology to animal cultures, help establish appropriate limits for the usefulness of semiotic approaches to play, and ultimately contribute to our understanding of what it means to be human.

### **Culture-Specific Smell in Humans and Non-Human Animals**

In animals, smell is considered to ‘serve’ specific purposes for it is far harder to study how non-human animals would enjoy odors or find pleasure in leaving smells. For non-human animals, “odor may influence feeding, reproductive, territorial, predatory and predator avoidant, navigatory, and many aspects of social behavior” (Hepper and Wells 2010: 263). Within the

same species, smell can be used to identify an animal's relation to another animal. It can also be used as a crude form of self-identification by dogs that will mark other dogs scent markings but are reluctant to mark their own (e.g. de Waal 2009). Such self-identification reveals a sense of self-awareness through the use of smell. "Odor cues in the social context may provide information on group and family membership, relatedness, dominance, reproductive status, and individuality." (Hepper and Wells 2010: 263) Communication is another area in which smell is used by animals. Scent and smell can be used to communicate various pieces of information to other animals (e.g. Balcombe 2010, Safina 2015, Wynne 2002). "Olfactory signals can be used by animals to discriminate species, individual identity, sex and the physiological state." (Zinkevich and Vasilieva 2001: 53) Scent can be used to mark territory or to communicate personal information between rival males, or potential female mates, for instance (e.g. Bekoff 2013). Dogs can communicate fear through odor, which will be picked up by other dogs informing them that something bad happened there. Animals use smell in navigation as well. From birds to mammals, animals use odor maps for navigating spaces (e.g. Wynne 2002). However, "the chemical nature of mammalian olfactory signals and the mechanism for their recognition and biological functions are unresolved problems of chemical communication." (Zinkevich and Vasilieva 2001:53) We seem to know some of the likely non-human animal uses of smell, but a lot remains uncertain.

For us humans, "one of the oldest beliefs about human perception is that we have a poor sense of smell" (Shepherd 2004). 'Poor' here is relational and refers to a comparison with non-human animals. Despite strong evidence on the relative strengths and sophistication of human smell, smell remains a widely accepted marker of the assumed differences between humans and other animals. We tend to think that animals have a more sensitive sense of smell and also utilize smell more.

In terms of cultural meaning making, this means that "smelling and sniffing are associated with animal behavior" (Corbin 1986: 6), which, in turn, is a "sign of lower social strata, lesser races and base animals" (Adorno and Horkheimer 1947/1997: 184). Smell has therefore been used to signal a meaningful difference not only between humans and non-humans but also to distinguish 'civilized' from 'less-civilized' among us humans. For example, while small children use smell and touch a lot before they can talk, they 'grow out' from the need to use such 'primitive' senses and undergo a kind of 'culturization' into the human world. Given the cultural history of hygiene or the lack of it, we are reminded of smell when we consider underprivileged 'lower' classes, developing countries, societies undergoing disease outbreaks or wartimes, for instance. Meanwhile, the possession of an extremely refined and particular sense of smell, such as the skillset of a sommelier or a chocolate enthusiast, signals a way in which smell can be transformed to serve some of the 'most cultured' human behaviors. Yet, such practices are different from the use of smell in everyday casual contexts.

The negative cultural connotations of smell (as a warning sign) seem very hard to overcome merely by the means of design. Smell is more closely linked to our basic needs through eating, defecation or sex (one can think of both the use of perfume and specific smells related to having sex) and therefore, as suggested, brings us closer to other animals rather than marks a difference to them. Traditionally, this has been a reason to set ourselves free from the need to smell. However, a whole another approach is to accept our similarity and take it a step further. Just like

play helps to overcome asymmetry between individuals (Bekoff and Pierce 2009), smell provides an equalizing ground for humans and non-human animals to learn more about each other. As a tool of communication, we probably use it already.

Therefore we believe that smell design has a great potential in bringing humans and non-humans closer together. Yet this requires thinking and understanding as well as designing beyond the bipolar animal (involuntary) ‘use’ of smell versus human (conscious) ‘symbolism’ of smell. For us all, smell is crucial for communication and identification. Essentially the two exemplify the ‘sending’ and ‘receiving’ sides of smell where smell is both a way to signal about something (i.e. of personality, sexual interest, emotional state) and a way to learn more about something (i.e. of a place, individual, object). Just like in humans, sending the signals of smell can be both voluntary and involuntary.

In an attempt to find common theoretical ground for thinking about smell in humans and non-humans, we turn to a field of study that recognizes cultures in animals. Alongside sensory anthropology, primatology is another of the “human sciences” that currently occupies the ragged edge of culture. The scientific study of primates, our nearest relatives, has traditionally been the carrier of implied attitudes towards the animal “Other.” Donna Haraway’s 1989 *Primate Visions: Gender, Race and Nature in the World of Science* argues that “the history of primatology was linked to the production and reproduction of differences along the power axes of race, class and gender” (Deuber-Mankowsky 2015: 24)—that is, we can read as much about our own culture in primatology as we can about the lives of animals. Moreover, primatologists have extended the concept of culture to non-human animals. If we define culture as socially-constructed knowledge that is not explained by genetics or environmental adaptation, then the nut-cracking practices of chimpanzees in Cote d’Ivoire qualify as evidence of culture (Riechelman 2015). Finally, as sensory anthropologists would be quick to note, we impose our own Western sensory hierarchies through our animal studies: a search of articles in the University of Wisconsin PrimateLit database turns up 64 hits for “olfaction,” and 5,525 for “vision” (Heyman 2006). The study of primates often affords us a mirror for better understanding ourselves.

There are several reasons for the general neglect of primate olfaction, rooted in the physical and cultural domains. First, the physical sensing structures of smell are proportionally smaller in primates than other animals, leading to the assumption that primate olfaction has somehow “atrophied.” However, recent arguments have questioned that assumption: size does not determine function (Heyman 2006). Secondly, there are challenges in understanding smell stimuli and conducting olfactory fieldwork with primates: “The optical properties of an object . . . and acoustic signals . . . can be measured and quantified, even under field conditions. However, there is as yet no easy way to ‘record’ and quantify the olfactory properties of objects” (Heyman 2006: 520). Wirman has also noted difficulties in observing and identifying orangutan sniffing behavior, which can be subtle. However, Wirman’s research with orangutans also suggest that new objects are immediately sniffed (through smelling a hand that has touched the item) prior to other explorations. Finally, however, there are also cultural attitudes at play: “While the high status of sight in the West makes it possible for studies of vision and visibility, even when they are critical, to be taken seriously, any attempt to examine smell runs the risk of being brushed off as frivolous and irrelevant” (Classen, Howes and Synnott 1994: 5).

## Smell in Play

The human olfactory system offers powerful opportunities for play. As smell stimuli are processed by the brain, impulses move in an unmediated path to the limbic system, the core of emotion and memory (Higgins 2002). Smell has the intimacy of a chemical sense; when you smell something, you are detecting molecules of that substance that have entered your body. Scents also have the potential to access emotional responses that are unique, such as disgust (Liberman and Pizarro 2010), as well as other powerful attraction and avoidance mechanisms (Wrzesniewski, McCauley and Rozin 1999). The primal evolutionary functions of the sense of smell—mate selection and toxic food aversion—can encode smells with powerful forward and backward impulses, bidding us to draw closer, or to withdraw. These urges can be mapped—through smell-enabled objects of interest—onto play mechanics related to navigation and exploration, meditation and recollection, as well as to penalty and reward systems.

Examining the influence of smell in non-human animal play, meanwhile, provides ideas not previously addresses in game studies that focus on human play. Among others, “some animals, to indicate the start of play, release distinctive smells and odors. They act as a signals, letting other animals know that what follows is play and not serious.” (Burghardt 2009: 2) This is a noteworthy play initiation sign and easily unnoticed by humans studying animal play. In fact, one of the key challenges in creating games for other species or possibilities for cross-species play is the lack of mutually understood play initiation signals (Wirman 2014). Previously, the use of smell has not been considered as an option.

What stands out in the study of animals’ use of smells in general is that it is sometimes considered a form of ‘tool use’, such as in the case of hippopotamus manipulating and applying its feces. “Scent marks can be considered tools only when the substances are actually held and applied by the animal, for example, some scent marking by lemurs” (Shumaker, Walkup and beck 2011: 209). These scents are intended as social signals, for instance. Here we see an interesting example of a smell originating from an individual becoming an object that holds further meaning and application. That smell can fall under tool use is significant, because tools are considered aspects of culture and markers of cultural behavior. The tool use of feces, for instance, marks an aspect of animal culture.

Furthermore, for some species smell is directly linked to competitive situations such as rival mates. Male Ring Tailed Lemurs engage in ‘stink-fights’ by rubbing their tail between glands on their forearms and then waving or shaking their tail to direct the scent at their rivals (Shumaker, Walkup and Beck 2011). While such a competitive situation may not be straightforwardly categorized as play, it suggests a conscious use of smell in direct communication between individuals and therefore allows us to consider similar uses in more strictly playful settings.

While other use of smell in various species’ play behavior is informative, our exploration takes captive orangutans as examples of non-human species to whom olfactory gaming could be introduced. The orangutan is a special case among primates when it comes to ape culture. Ranging over vast expanses of forest in an essentially solitary manner after weaning, the orangutan has fewer opportunities for social contact and thus the shared knowledge development that constitutes culture. There is evidence that olfaction plays an important role for these far-

flung creatures, as a means of allowing for improvised, individual—not socially learned—identification of edible, non-toxic plant materials in the dynamic forest ecosystem (Gustafsson, Krief and Saint Jalm 2011). The sensory experience of the orangutan can be understood as a deep probe into primate culture.

As a phenomenon rooted in culture and sensory experience, and shared by humans and animals, play holds an important place in mapping the identity of the species. Definitions of play from animal behavior studies have similarities to those found in game studies, though they rely more upon observable conditions than felt experience: “Play is repeated, seemingly non-functional behavior differing from more adaptive versions structurally, contextually, or developmentally, and initiated when the animal is in a relaxed, unstimulating, or low stress setting” (Burghardt 2014).

Animal play has always held an important relationship to the study of human play. Huizinga’s *Homo Ludens* begins by sketching an analogy between puppies and people: “Animals play just like men. We have only to watch young dogs to see that all the essentials of human play are present in their merry gambols” (Huizinga 1938: 46). Although Huizinga’s topic is the manner in which human play helps shape human cultural institutions, it follows conversely from his argument that animal play is also an important means for shaping animal culture. Animal play is even seen as signifying a kind of proto-language. Brian Massumi writes: “The prehuman, preverbal, embodied logic of animal play is already essentially language-like. It is effectively, enactively linguistic avant la lettre, as humans say in French” (as quoted in Franke 2015: 19). Play is thus an important constituent of culture, and a site where human and non-human primates can meet (e.g. Wirman 2013).

From the point of view of practical implementation, the use of digital enrichment using touch screens has been studied by Wirman (cf. 2013; 2014) during the past four years. Direct sunlight, easily destroyed technology, obstructions to visibility (food, dirt on screen), general poor visibility in extreme conditions, and varying viewing angles of individuals have proven as challenges to such design. Meanwhile, experiments applying sound have proven that the existing sound scape often shadows sounds originating from a game. Meanwhile, filling the research center with sounds considered ‘unnatural’ that would also be heard by various other species does not offer a solution either. Hence, the use of odors in play may prove to be one of the easiest sensory inputs to embed into such a special environment. Arguably ‘smell noise’ is not an easy issue to overcome, but the benefits of easy and affordable odor application are noteworthy.

In terms of existing technologies, there is a relative paucity of smell-enabled games designed for humans, and, given the absence of any common technology for digital synthesis and distribution, they generally involve physical smells as experienced through reproduction processes (such as Scratch n’ Sniff) or directly (as in the Japanese Kodo incense ceremony). Digital games that have a smell dimension often include Scratch n’ Sniff cards. *Leather Goddesses of Phobos* (1986) and *Leisure Suit Larry 7: Love for Sail!* (1996), are campy sex farces that draw upon on the cultural power of ’50s cinematic smell systems (in manner of John Waters’ affectionate pastiche in his Odorama system for the film *Polyester* (1981)) and further risqué associations with Larry Flynt’s 1977 *Hustler Scratch ’n Sniff* centerfold (see Niedenthal 2012 for an overview of smell games). Linking scent affordances with sexual themes in gameplay content draws upon the primal

associations of smell and mate selection, though in these games smell becomes part of an elaborate spoof. More recent game examples include Niedenthal's rosewater-filled eggshells at DiGRA 2011 and Heather Kelley's recent smell game experiments.

### **Design #1: Fragrant toys**

The most promising avenue for exploring smell-enabled play within and across animal species is through prototyping fragrant toys. As Miguel Sicart (2014) notes, playthings are objects that are central to the ecology of play, and engage open-ended behaviors that are expressive, pleasurable and appropriate. Toys are a traditional focus for animal and cross-species play, and it is perhaps easier to observe animal play with toys than to understand how animals engage games. Further, it is a relatively straightforward task to infuse physical objects with odors. Sicart identifies two main characteristics of toys: their filtering and material natures. The filtering characteristics of toys are their formal affordances, as well as the way in which they engage their context. Material characteristics refer to the physical nature of the toy and its appeal to the senses.

Through studies of animal olfaction, we have examples of how to identify the interest that animals pay to scented objects. Matthias Laska's team was able to isolate the olfactory component of blood that was of greatest interest to a range of carnivores in Swedish zoos simply by painting chemical compounds onto wooden boards, throwing them into animal enclosures, and observing the resulting interactions (Nilsson et al. 2014). They coded the behaviour of the animals according to the activities of, among others, sniffing, licking, biting and 'toying' (which, according to Laska, was defined as prolonged interaction that involved manipulation such as shaking and throwing). Based on these studies, we can identify a series of discrete concerns that form the basis for identifying animal interest in smells and the creation of effective fragrant toys for animal and cross-species play:

- 1) Artifact prototyping: creating simple objects that have playful, toy-like affordances. This is what Sicart refers to as the 'filtering' characteristic of toys.
- 2) Materials exploration: Seek to find out which scents attract the most interest from animals. Food-related odors would be an obvious place to start, but wider explorations could lead to interesting insights.
- 3) Technical prototyping: Consider various solutions to tracking the physical interaction between animals and artifacts. These could include using embedded radio frequency ID (RFID) tags, or Bluetooth technologies.
- 4) Methodological exploration: Combining direct observation of animal behavior with ongoing location data to make sense of animal interest in, and engagement with scented playful artifacts.

### **Design #2: 'Can You Smell This?'**

Traditionally, humans have been thought to possess a relatively weak sense of smell compared with other animals. Recent research, however, indicates the opposite: on many measures of olfactory thresholds, humans outperform animals. "Based on these comparisons, and contrary to traditional textbook wisdom, humans are not generally inferior in their olfactory sensitivity compared to nonhuman mammals" (Laska 2015, n.p.). In this playful experience, humans and

animals conduct their own common experiment on olfactory capabilities, by passing fragrant objects back and forth, and interpreting each another's reactions.

### **Design #3: Towards Digital Enrichment and Cross-Species Play**

Smell is one of the many areas in which the lives of captive animals are deprived. A small enclosure lacks the variety and range of odors available in natural environments especially when linked to communication between a number of individuals or in relation to natural sources of food. We have observed that orangutans in captivity show great interest in obtaining objects belonging to their keepers or visitors of the rescue centers. These objects, often clothes, are repeatedly smelled and orangutans' attempts to wear them are not unusual. The observed orangutans also enjoy touching human clothes and typically smell their hands if they have been able to touch a human or an object that belongs to a human.

Therefore, we suggest tied balls to be made of human clothes of different individuals and embedded with location tracking technology (such as RFID tags, Bluetooth device, or iBeacon). These items can be introduced to the orangutans and the orangutans' interest in specific items can be tracked based on how much the items are being moved or 'used' in their enclosure. Later, humans try to include smells that they suspect orangutans would enjoy. Such a design would also provide an example in which animal's pleasure and enjoyment in regard to scents is foregrounded instead of any instrumental use. This would allow an alternative point of view for the study of non-human animals and smell.

### **Conclusion**

The consequences of the 'sensory turn' for game design and game studies have yet to be fully explored. Despite the prevalence of mainstream gestural interfaces and the growing interest in embodiment in game scholarship (e.g. Ekman, Poikola and Mäkäräinen 2008, Westcott 2008), very little research explores non-visual sensory input (and output) mechanisms in play, let alone game design.

In this paper we have suggested that non-human animal and human olfaction are largely separate fields of study and hold different sets of assumptions, needs and theoretical frameworks. The so called animal and sensory turns hopefully bring the two closer to each other in the coming years. While non-human animals are largely studied in terms of how they 'use' smell, and humans from the point of view of what kind of symbolic meaning we attribute to smell, experimental design can help to see new overlaps and possibilities. An approach of sensory anthropology provides one way to merge the two approaches.

Key proponents of sensory anthropology hold a decidedly anti-semiotic stance. Howes argues that applying analytical models derived from linguistics to our understanding of sensory experience is patently absurd:

“From a sensory standpoint, the rhetorics of logocentricity do seem unbearably artificial and rigid. Philosopher Michel Serres notes that he wrote his book *Les cinq sens* . . . in reaction to the sensorial poverty of contemporary theory. Serres describes reading the following line in Merleau-Ponty's classic *Phenomenology of Perception*: ‘At the outset of



the study of perception, we find in language the notion of sensation . . .’ Serres immediate response—not a carefully worded critique, but a laugh! . . . Laughing breaks the spell of language and discursive reason” (Howes 2005a, 4).

By the same token, Massumi’s contention that animal play is evidence of language may be compelling to a certain group of theorists, but may equally seem a stretch to many who study animal play, and know that the immediate richness of the phenomenon goes well beyond its usefulness to academic contentions.

Howes’ skepticism of semiotics is particularly relevant to the sense of smell, which, by its nature, resists linguistic analysis. Sensory anthropologists have noted the inherently transgressive nature of odors: they “cannot be readily contained, they escape and cross boundaries...” (Classen et al. 1994: 4). Odors communicate, but are not easily analyzed as a form of language: “smells offer a primary form of experience; they occur ‘in between the stimulus and the sign, the substance and the idea’” (Higgins 2002: 45). The elusiveness of smell can also be traced through the psychophysiology of the sense in humans. Brain processing of smell stimuli bypasses centers of linguistic processing, with a straight shot to the limbic system. There is a growing body of research indicating that “olfactory processing is relatively incompatible with linguistic processing” (Herz 2005: 104). This manifests itself in the commonly experienced “tip of the nose” phenomenon, in which a person is unable to name a familiar odor but senses that it will be imminently recalled, the olfactory equivalent of something being on the “tip of one’s tongue.”

Looking at how animal studies addresses questions of olfaction hold great potential for the study of human smell games. For instance, what would thinking of smell as a tool change? Sensory anthropology in animal studies, specifically, helps us to unpack how smell is already constructed in cultural patterns, including those related to tool use. In the everyday lives of captive orangutans, close observation of how routine practices related to feeding, use of structural enrichment (i.e. hanging devices), communication between individuals and with humans as well as the patterns related to healthcare serve as starting points for design as part of existing cultures.

The study of smell use in animals reveals a multitude of ‘natural’ ways in which odors can be incorporated into design. We suggest further research of non-human animal uses of smell can inform innovative new designs for non-humans as well as humans. We also believe that even though according to recent research humans may not prove to be straightforward underdogs as scent gamers, some of the human insecurities in respect to smell and its negative connotations could be challenged through smell design.

Currently, challenges such as noise smell and human inability to easily recognize smells exist in regard to all presented designs for animal smell play. However, smell gaming may not be as difficult to implement as one would imagine and particularly play with objects infused with scents are relatively easy to implement and even digitize. While the concepts presented in this papers have not been tested, more iterations is needed once the designs are brought to orangutan players.

Studying captive animals who live according to human cultural arrangements can help in better understanding the meaning of odor in the lives of ‘wild’ species that are typically hard to access.

Animal Rescue Centers typically situate in the same or very similar smell environment as the animals' natural living space and hence serve better for the study of olfaction than, say, zoos abroad.

In this paper we have suggested that just like play is considered to do, smell can help in crossing the bridge between species and serve as a meaningful starting point for the study of cross-species interaction. Similarly to play, smell enables the departure from human symbolism. If we are to find common ground to connect animals and humans through play, or to compare the play of humans to that of animals, smell-based design is a useful starting point.

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