



# Formula of Love (English Translation)

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Perfume, dabbed behind the ear, or sprayed over the clothes is the sign of the modern age. But traditionally, perfumes were rubbed on the body, elbows or knees. Let's imagine a medieval dancing couple — beautiful girl in a long dress and her handsome partner. Her young body is hot from dancing, and in agreement with laws of physics, warm air between the body and clothes rises toward the opening in the dress, picking up the body smell blended with the scent of perfume. Not only her closeness, but seductive smell of her warm female body spiced with sweet perfume make the partner's heart pound and his blood run faster. No doubt, many romances of those days started just like this, with a whisper of long dress, the a smell of young body, the sweet aroma of fragrances.



## Eternal quest for the “Formula of Love”

The composition of aroma that could make a person more attractive to the opposite sex has been one of the main goals of the art of perfumery since the dawn of time. For this purpose, perfumers used ingredients with the reputation of aphrodisiacs — musk, amber, some essential oils and other natural materials. But at the end of the '60s, the eternal quest for a “Formula of Love” made a new turn with the discovery of mysterious chemical signals traveling by the air — pheromones. Since then the perfume industry has been trying to use pheromone science to create a perfume capable of increasing sexual attractiveness and set fire on human hearts.

## Do they really exist?

The first question that many potential buyers of pheromone perfumes usually ask is, “Do they really exist?” and the second question, “Do they really work?” The answer to the first question is “Yes”, but to answer the second one, we should look deeper into the biology of pheromones. In the 19th century French naturalist Jean-Henri Fabre found that a female emperor moth (*Saturnia pavonia*) could attract dozens of males to the room where she was kept. Fabre was convinced that the female produced some chemical signal, but at this time it was very hard to prove. Only in the late 1950s a German team led by Adolf Butenandt was able to purify this chemical signal, using female gland of silk moth (*Bombyx mori*), and demonstrate that it alone, even without female present, makes a male silk moth display mating behavior.

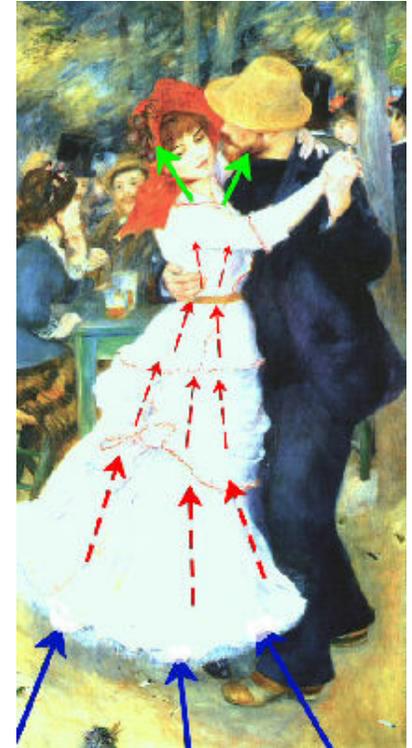
The word “pheromone” (from the Greek *pherein* — to transfer, and *hormone* — to excite) came from two entomologists, Peter Karlson and Martin Luscher. According to their definition, pheromone is a substance secreted outside by an individual and received by a second individual of the same species in which it releases a specific reaction [1]. The word pheromone was accepted and quickly became quite popular not only among the scientists, but among the layperson as well. Pheromones of reptilians were discovered in the late 1960s; then came fish and

mammalian pheromones. Recently evidence of the existence of human pheromones has emerged as well.

### What exactly are “Pheromones”?

How do you can tell, if a chemical is a pheromone? First, you have to purify this chemical from a complex biological mixture. Second, you have to prove that this chemical indeed causes an animal to react in a particular way, and finally you have to prove that it is this very substance, not some other stimuli, that causes this reaction. Obviously, the more developed the animal, the more complex its behavior, and the more difficult to study its pheromones. Human pheromones are particularly hard to study, because our instincts are suppressed by our intellect, and because odor may elicit responses simply due to some associated memories. Also, it is difficult to “hunt down” pheromones, because not only individual chemicals, but a mixture of several chemicals may be necessary for the reaction to occur. For example, an elephant and some 140 species of moth share the same chemical as female pheromone, but they don’t get confused, because to the moth other complementary chemicals must be present as well, and to elephant a signal from a moth is too minute.

When speaking of reactions, one should clarify if they are instant responses or delayed processes (for example, hormonal changes). Usually, pheromones that cause an instant reaction are called releaser pheromones, and those that cause delayed responses — primer pheromones [ii]. Most authors prefer to use the word "pheromone" only when speaking of species-specific signals, which cannot be "eavesdropped" by other species. But today it all gets mixed up, and some scientists use a broader definition extending it to all signals of chemical communication.



### Can you smell pheromones?

All odorants are registered by sensitive receptors of the olfactory epithelium in the nasal cavity. If we omit some details, we may say that each olfactory receptor is a neuron with one end sticking out from olfactory epithelium, and other end (axon) extended to the brain. Simply put, the olfactory nerve is collection of single axons from all olfactory receptors. Olfactory nerves go into the olfactory brain, which is one of the most mysterious parts of brain — the limbic system, where emotions, feeling, fears and desires reside. Thus, from the olfactory brain the impulses go into other parts of limbic system and into the cortex. We perceive as smells only those stimuli that reach the cortex, and we can only guess what other reactions the smells create. Most mammals have other structures in their noses — the vomeronasal organ, or VNO, the tubular cavity, that is specialized to smell pheromones. From the VNO. nerves carry impulses into the accessory olfactory bulb, and afterward, to the sub-cortical areas. The VNO does not have any connections to the cortex, so we cannot smell with it [iii].

The existence of human VNO is still debated. But recent studies show that the non-existence of VNO does nothing with the human ability to communicate with pheromones, because olfactory epithelium also detects pheromones, and in turn, VNO may register some non-pheromonal odorants [iv]. There is also the possibility that some pheromones are proteins and are transferred by body contact. The desire for being held, or “cuddling” for instance, is very strong in women, and men soon learn its importance for a smooth relationship with their wife. Thus, in humans, pheromones may elicit a two-stage phenomena: (1) airborne smells provide the initial attraction, and (2) body contact over a longer time produces bonding. From a marketing point of view it is important that pheromones elicit some reaction while producing no smell. Cosmetic ingredients that you cannot smell or detect in the products, but which theoretically are capable of producing some "magic effects", are indeed a gold mine for the producers.

## **Something about men**

One of the most studied mammalian pheromones is androstenone, metabolite of testosterone, found in the boar (male pig) urine and also in urine and sweat of men. Sow reaction to the smell of androstenone is very clear — she arches her back demonstrating her willingness to mate. Therefore a boar, smelling of androstenone, wouldn't have any problems with the opposite sex. Well, it is not so simple in human world — so far no study managed to demonstrate that androstenone might have similar effect on woman, although some slight changes in mood were observed [v, vi].

## **Why men are attracted to large breasted women?**

The relationship of a mother rabbit with her youngsters is business-like — only for 4-5 minutes a day does the female nurture her pups; she leaves them alone most of the time. To survive, they have to find very quickly where the milk comes from, which they do with the help of pheromones. And this was the masterpiece of a scientific study carried out by a French team: The volatiles in milk were extracted, trapped, and then desorbed into a gas chromatograph. The newborn pups responded to milk by the characteristic searching motion of their head or sucking attempts. Only one component of the milk, the substance they named 2M2B (2-methylbut-2-enal), produced the same reaction. To verify that the response to 2M2B is not learned by instinct, scientists deprived newborn pups from the mother's touch and milk right after their birth. Yet, the pups still were eager to seize and suck the probe dipped in 2MB2 [vii].

It is very likely, that human milk contains the same kind of chemical signal. Studies show that newborn infants follow the breast odors emanating from their mother's nipple/areola region. Within minutes after birth, the mother's breast odors cause a "head turning" of the baby for the nipple and helps guide the baby to successful sucking for milk. Nipple pheromones also may explain the irrational obsession of men with women's breasts. It may be that this is a natural bonding pheromone that men require for their emotional stability and helps tie them to women [viii].

## **Pheromones and hormones**

One of the most intriguing effects of human pheromones is their ability to alter female menstrual cycles, either speeding or delaying them. In the experiments, armpit samples from healthy donor women were applied daily on the upper lips under the noses of other women. Depending of which phase of cycle donor women were, the menstrual cycles of recipient women either shortened, or lengthened [ix]. Other study demonstrated that armpit odor from males altered the menstrual cycles of women[x].

## **Biological ID swapping — Body odor revisited**

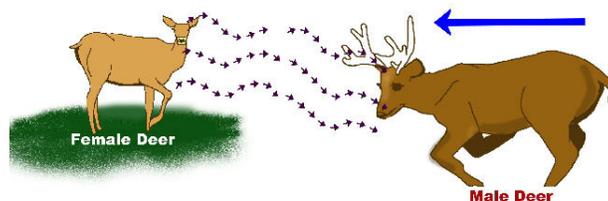
Western culture is obsessed with cleanness. The mere thought of body odor embarrasses my fellow citizens. According to modern standards, the human body must smell nothing natural, but like flowers. But it is possible, that too frequent washing, removing body pheromones, leads to the personal separation, increases loneliness, and disrupts family bonding.

The main sources of body odor in humans are skin, mucous membranes, nipples, and genital secrets. Two types of glands that bring chemicals on the skin surface are the sweat and oil glands. On the skin, bacteria decomposing the chemicals contribute to body odor. The smell of the human body is dependent on endocrine activity, health (many diseases have their odor), and other factors. It is possible, that the otherwise mysterious increase of the sebaceous glands size and the amount of skin oil producing during the puberty may be explained through the increase of pheromone production.

Olfactory research on humans has mainly focused on the underarm region, where sebaceous and apocrine sweat glands produce secretion into a warm and humid environment favoring bacterial growth. The axillary secretion gets trapped with the armpit hair, where bacteria decompose it, creating odor. Movement creates heat in underarm regions, and when the hand is lifted, the secretion quickly evaporates, sending odorous messages into the

air. It is very likely, that among other volatile molecules, the armpit region produces pheromones. For example, there are steroids, androstenol and androstenone, which give off a musky odor. Men produce up to 50 times more androstenone in their axillae than women. But other candidates are some volatile aliphatic (C6-C12), such as 5-methyl-2-hexenoic acid [xi].

The musky smell of androstenone and androstenone is similar to the musk of deer and some other animals. Some plants (for example, sandal) also produce this smell. This smell has been shown to affect mood, increasing a positive mood in women [xii]. No reliable study has demonstrated an increase of sexual attractiveness in response to any of above mentioned substances, and no scientist has been able to prove yet that these chemicals are indeed human pheromone [xiii].



However, given the importance of olfaction in all other species of animals, it is highly unlikely that we, humans are completely free of olfactory bonds. Animals use their noses to recognize their babies and the members of their group, to find the sexual partner and to evaluate each other, so humans may also do something similar. And why not speculate that odors play an important role in personal bonds formation? We kiss and hug our kids and lovers, and we dance so close to each other, allowing our bodies to work their magic. Is it coincidence that dancing, where partners stay close, when fast energetic sweat-producing movement follows by slow intimate dancing, and where the male so often lifts his arm and leads his dame by his armpit region giving her a reach opportunity to smell his pheromones, is so common in human culture? It is not so important whether we are reacting to some particular pheromone or to the complex mixture of individual odors — but what is important, is that the olfactory system, which sends signals directly to the subconscious brain, is the most probable cause of our feelings, emotions and desires.

### **Allow me to smell you**

We live in chemical world, where odorous substances enter our nostrils with every breath. And each time it happens, sensitive cells in our olfactory epithelium send the signals to the brain. It is a lot of information to analyze, isn't it? But not all information is equally important, and not all stimuli produce the same response. It has been shown though that normal breathing and active sniffing activate different parts of the brain. Also, sniffing brings odorants to the most remote regions of nasal cavity. That is why the use of perfumes makes so much sense — if you want your partner to detect your pheromones, make him sniff you by attracting his attention with a sweet aroma.

### **From theory to practice**

For me, the use of aromatic plants oils, such as Body Perfumes was just an idea. Women who had been buying my experimental cosmetics with copper-peptides kept asking me about perfumes so I read everything that I could find.

My conclusions were:

1. If pheromones are species specific, humans wouldn't be able to detect animal derived pheromones. But even if they could, what reaction might we expect from this? Taking into account that many animals become more dangerous during the mating period, humans wouldn't be attracted to the smell of a ready-to-mate boar; they would feel fear or aggression.
2. Human interactions are much more complex and the social element is very important to take into consideration. Also, there could be 100 human pheromones that affect different aspects of behavior.
3. Even if a purely sexual human pheromone, similar to the pig androstenone, were discovered it couldn't be used in a perfume — inducing typical pheromone-induced mating in humans would get people arrested!

4. Some musk smelling plant pheromones are very similar to animal pheromones. Nature uses the same systems over-and-over again.

5. Dreaming of pheromone perfumes with aphrodisiac effects, the cosmetic industry doesn't take into account the individual odors, which might be even more important in social bonding and sexual attraction. (Many pure essential oils have a long reputation as behavior modifiers — especially in South Asia. They are used in weddings, family gatherings, and religious ceremonies. Even the Bible speaks of women increasing their beauty by perfume oil).

Many commercial perfumes just use the molecule with the chemical smell — but not the original essential oil. But we don't know which component of complex mixture is able to "speak" with our brain, and it might even be an odorless component. By throwing this away as something "unimportant" for the odor-formation substances, we might also be throwing away part of the magic.

Then it was time for the experiment. Certain essential oils have a historic reputation as both sexual attractants and oils that improve human social interactions and friendliness during family gatherings, social functions, and religious ceremonies. So we mixed various pure essential oils, choosing those with reputation of mood-modifiers, and gave them to people to use as body oils. To be certain, we also purchased a variety of very expensive human pheromones from other companies and gave these to volunteers for testing as well. I wasn't really interested in purely sexual effects, so the volunteers were asked to record their results on whether other people were more friendly, talkative, and affectionate. Surprisingly, in every case our test subjects found few positive responses to the expensive human pheromones. On the other hand, all the volunteers reported positive responses to at least some of the tested plant pheromones (essential oils of jasmine, oud, ylang ylang, lavender, sandalwood, patchouli, and nutmeg). Many people said the products caused more people to interact with them or even stare at them. Both men and women often reported increased and very positive sexual interactions. I may not have controlled studies, but this type of observational science can be quite effective — depending on who is observing. Also, as far as the cosmetic industry is concerned, real user opinions might be much more reliable than data obtained from the laboratory setting.

The key to using pheromones and scents is to let them blend naturally into your own biological odor signature. So I choose squalane as the carrier for plant oils — it is one of the natural components of the skin oil, and it spreads easily over the skin. When plants oils are spread over the large area of the body, you will get an effect that is completely different from the perfume dabbed on a small spot. And the smell altered by your body heat, becomes individual; it will seem that the aroma naturally belongs to your skin. There are several possible explanations on how the oils work. They might produce pheromone-like effects by acting through the limbic system, they might modify mood so that people feel more calm and relaxed around you, or they might simply attract others people attention, making it easier for them to smell pheromones. Finally, there might be a placebo effect — just the pleasant aroma, blended with your personal smell, that may increase self-confidence and change the way the person acts during the conversation.

## **Conclusion**

When we see two people suddenly falling in love with each other, we say that there is “chemistry” between them. Well, if in the animal kingdom, for huge elephants as well as for small moths, love speaks with chemical messages, why should humans be any different? If so, the other question arises: Is it possible to control this chemistry, put it into a bottle, and create from its components the “Formula of Love”? Unfortunately, our knowledge in this field is still too limited for practical use. But the traditional way of increasing attractiveness with the pleasant aroma of essential oils does have its advantages — apart from the ability to attract other people's attention, natural oils have many skin-healing properties. Our experience shows that with pure, high quality essential oils mixed into the biological odor signature, one can achieve more satisfactory and reliable results than with existing perfumes containing human pheromones.

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