

HUBER THE NOSE.



PASSION FOR SCENTS

The Company

Residence

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Switzerland

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Business Activities:

Research and development, creation and manufacture of fragrance oils for the perfume, cosmetics and toiletries, soap and detergent, pharmaceutical and technical industries.

Research and development, creation and manufacture of flavors for the food and beverage, and pharmaceutical industries.

Custom analyses of fragrances and flavors.

Why “The Nose”

The Nose is a Most Miraculous Thing!

It may not always be the most beautiful, but it is certainly a dominant feature of the human face. Did you ever try to visualize a person familiar to you without his or her nose?



Did you know we eat with our nose? Actually, we taste the food, or beverage as sweet, sour, salty or bitter in the cavity of our mouth mostly on the tongue. But the real heaven of delicious gourmet dining is a very small (one to two square inch size) area in the nasal mucous membrane where about ten million smelling nerve cells tell you the difference between a wonderfully grilled steak, a broiled fish, a Chateau Petrus, a single malt whisky or a beer.

Did you ever have sex with somebody that smelled bad? (We are not talking about that heavenly attractive clean sweat odor of the skin that drags you towards her or him like a black hole...).

Do you remember the day you nearly fainted in the elevator because she or he was wearing a very seductive special perfume?

In the animal world the capacity to smell has become enormously specialized during evolution. Fish such as salmon swim thousands of miles to find their breeding grounds; wildcats track their mating partner over long distances by their nose; and insect pheromones play a vital role in courting rituals and basic survival.

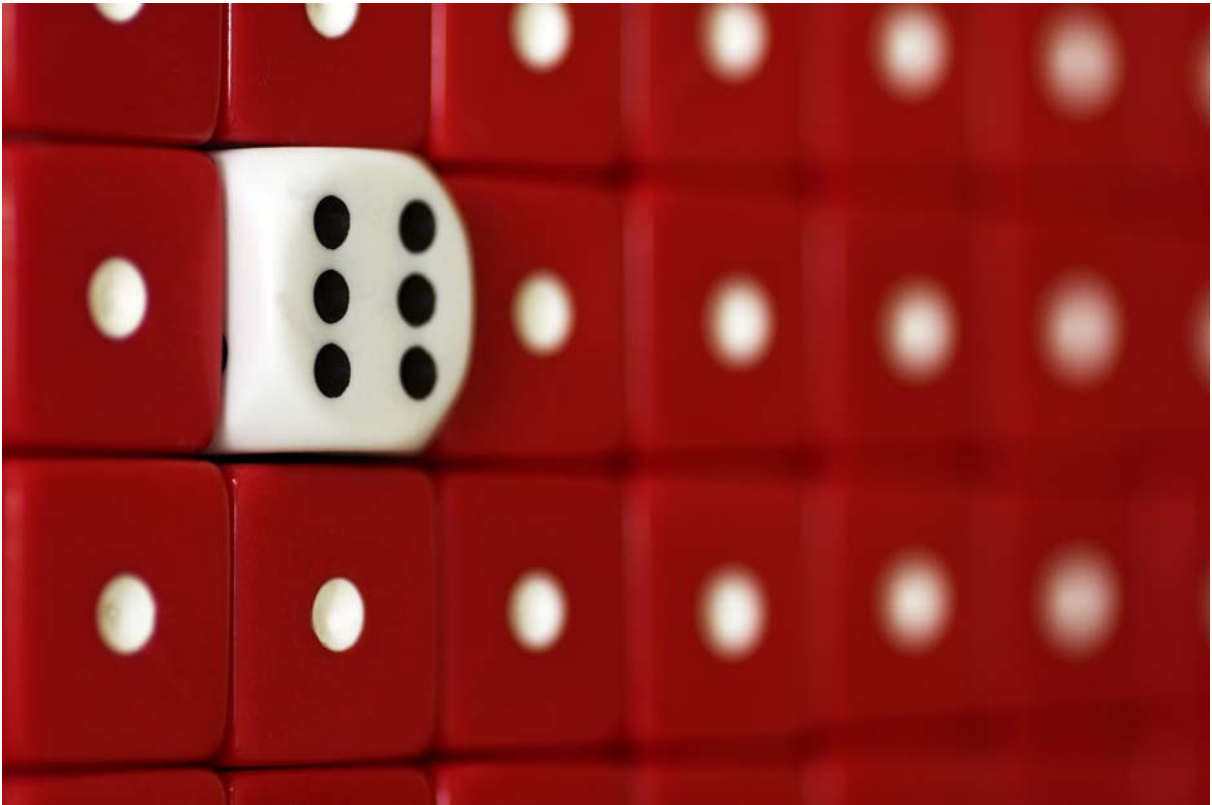
Here is the good news: Our human nose - or sense of smell - is not that bad after all. OK, a dog has more than a hundred times more smelling nerve cells than we have, but he is a real smelling giant...

In our work the nose is crucial. The fragrances and flavors we create and manufacture are what you smell when you consume the final product.

That is why *HUBER THE NOSE* is the appropriate creative name for our company.

Our Strength

- Creativity
- Knowledge and Experience
- Flexibility
- Personal Contact
- Custom made Quality
- Complete Traceability
- Batch Size Quantity Orders
- Legislation and Documentation



Creativity:

Our perfumers and R&D chemists work with over 2500 raw materials of natural and synthetic origin. New fragrance oils are created or adjusted for many different applications. Thorough knowledge and experience with the traditional and the newest raw materials are the necessary prerequisites to satisfy our customers' requests. New interpretations of known and traditional themes, or creation of future trend fragrances require knowledge, experience, talent and imagination. This is how new products are successfully realized.

Knowledge and Expertise:

Our experience in research and development of fragrance oils over the past five decades provides us with years of accumulated expertise. This enables us to meet any challenge or special need our customer may have.

Flexibility:

All our departments will do everything possible to fulfil your requirements as best as we can, and on time.

Personal Contact:

We work with our customers in a very direct and personalized way. We create and manufacture fragrance oils of high quality at very competitive prices.

Custom Made Quality:

We provide individual services and effectively resolve your problems.

Complete Traceability:

Our raw materials and formulations as well as the batch management are computer-supported and documented.

Our laboratory and manufacturing sites are fully operational under strict barcode control. In-process batch control and computer-assisted data storage allow a full historical traceability of raw materials used, time of production, time scale, operator and other informative parameters.

Your Batch Size Quantity Orders:

We can provide you with the exact amount of product you need for your batch. No more excess fragrance oil to be paid, to be transfilled, to be stored, to be re-analysed before use after prolonged storage (aging!). No more unnecessary logistics and storage rooms filled with half-empty containers. Ask the price for your exact batch size quantity of your favorite fragrance oils!

Legislation and Documentation:

We are fully aware of existing and planned legislative protocol in our field. We will assist by supplying the information, product data sheet, safety data sheet or other certificates required.

Our Quality Assurance

We aim at constant improvement of our quality assurance. Our enterprise was certified on October 8, 1994 according to the standards of ISO 9001, including the creation, manufacturing and sales departments. This certification is reconfirmed every year.



Certificate

SQS herewith certifies that the company named below has a management system which meets the requirements of the normative base specified below.

HUBER THE NOSE.

Dr. W. Huber AG
CH-8126 Zumikon

Certified area

Whole Company

Field of activity

**Creation and manufacture of fragrance oils
for the perfumery, toiletries, soap and
detergent, and technical industries.
Creation and manufacture of flavours
for the food and beverage industries.**

Normative base

ISO 9001:2008 **Quality Management System**

Swiss Association for Quality and
Management Systems SQS
Bernstrasse 103, CH-3052 Zollikofen
Issue date: October 8, 2009

This SQS Certificate is valid up to
and including October 7, 2012
Scope numbers 12, 23
Registration number 11260

X. Edelmann, President SQS

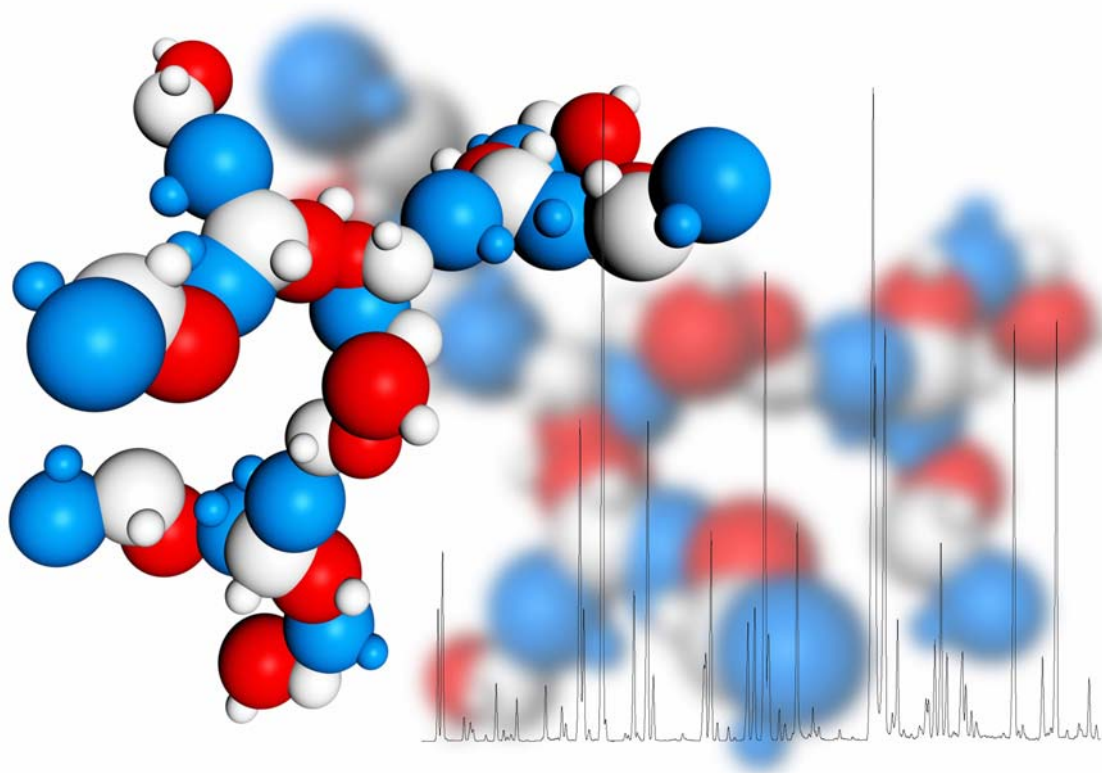
T. Zahner, Managing Director SQS



Our Laboratories

Highly trained laboratory personnel blend fragrance oils following the perfumers' instructions. Our laboratory sites are fully operational under strict barcode control. In-process batch control and computer-assisted data storage allow full historical traceability of raw materials used, time of production, time scale, operator and other informative parameters.

The newly created fragrance oils are incorporated in cosmetics or other products according to the client's briefing. The samples of the corresponding finished products are then subjected to various tests, like temperature stability, etc. Once a fragrance has passed all necessary tests it is ready to be evaluated by the customer. For reference purposes we store a laboratory-batch sample tightly sealed at 4°C and in the dark during three years.



Analytics

Our laboratories work with the most advanced analytical equipment. Since fragrances mostly consist of volatile compounds gas chromatography coupled with mass spectroscopy (GC/MS) is the most important tool for fragrance analyses. We use this technology for research and quality control.

Custom Analyses

For more information please ask for our list of analytical services.

Our Manufacturing

Careful and Precise

Specially trained production personnel ensure careful and precise manufacturing of our fragrance oils. Our manufacturing sites are fully operational under strict barcode control. In-process batch control and computer-assisted data storage allow full historical traceability of raw material lots used, time of production, time scale, operator and other informative parameters.



On Time

Our scheduling department attaches great importance to being on time and within the time frame set by our customer.

Flexible

Our staff members show great flexibility whenever changes of delivery dates, quantities or other adjustments of the order are requested.

Our Customers

We serve customers worldwide.

Our Aim:

To provide the highest quality products with a good quality / price relationship.



Why you should become one of our customers, too:

We are highly customer focused: You are Number One!

We are very flexible

We have new products and ideas

We are competitive

We base our work on newest technologies

We are fast

We are "lean"

We are dependable

We are eager to assist you

We combine experience from many different scientific areas

We would be pleased to add you to our pool of satisfied worldwide customers!

More About Us

Shareholding Company

- 1949 Foundation of family-owned company by Dr. Ernst Huber senior
- 1969 Foundation of a shareholding company
- 1980 Foundation of Dr. W. Huber AG as succeeding shareholding company with its registered trademark **HUBER THE NOSE**.™
- 1994 Management system ISO 9001:2000 introduced for the whole company

History

Dr. Ernst Huber (1901 – 1979) founded his family enterprise in 1949 in Zumikon near Zürich, Switzerland, where he was born and raised as one of five children. He studied Chemistry at the Eidgenoessische Technische Hochschule in Zurich (ETHZ). After finishing his Ph.D. in 1922 he joined an Italian flavor company “Ditta Soave” in Torino where he developed flavors for beverages like Martini, Rossi, Campari, Vermouth, etc. In 1929 he joined “Du Pont de Nemours” in New Jersey, USA where he worked in the fine chemicals division, synthesizing ionones and other fragrance raw materials on large scale. At “Van Ameringen & Haebler” in the same area he developed and implemented new analytical standards and methods to detect adulteration of essential oils. At “Polak & Schwarz” in Hilversum, Netherlands he refined his analytical skills and became head of this department. The latter two companies eventually merged to become IFF in the fifties.

In 1939 Dr. Ernst Huber returned to Switzerland where he became technical director of “Flora” (later “Esrolko – Givaudan”) which he left ten years later to found his own company.

In 1970 his son Dr. Willy Huber joined the family enterprise. His education in chemistry began at the ETHZ in Zurich and was completed at Harvard University in Cambridge/USA as a specialist in the field of organic synthesis of complex molecules like vitamin B12 and optically active prostaglandins.

In 1973 the company consolidated its operations about five miles outside Zurich into a new facility of 50'000 square feet. Onsite are both the R + D facilities and its manufacturing operations.

Dr. Willy Huber received a thorough perfumer’s education before he became technical and managing director of the company. The daily work and the problem-solving during the following years added to his expertise in the highly specialized field of fragrances and flavors.

In 1980 Dr. Willy Huber became the sole owner of the family enterprise which was then reorganized and restructured under the name Dr. W. Huber AG with its trade name **HUBER THE NOSE**.

HUBER THE NOSE today is known as creative partner for fragrances and flavors, for its high analytical standards and quality control as well as for its flexibility and dependability as a business partner.

On a voluntary bases, Dr. Willy Huber has been the president of the Swiss Society of Cosmetic Chemists for six years (1979 - 1984). He is also member of the US and French Societies of Cosmetic Chemists.

Interesting Facts in our Field.



Scientific Facts about the Nose

Introduction

In certain animals, the capacity to smell has become enormously specialized during evolution. Fish such as salmon swim thousands of miles along gradients of certain lead substances to find their breeding grounds. Wildcats track their mating partner over long distances by their smell. Finally, in the insect kingdom pheromones play a vital role in courting rituals and basic survival.

The human sense of smell¹ is located in the nose. As a sense it is often considered inferior to the sense of hearing, touch or vision. At a closer look, however, we find that the sense of smell rivals the others in complexity and enriches our lives substantially. We eat and drink with the nose², we judge our environment and our partners with it and are led by it in many other circumstances. In fact, the sense of smell still plays a key role in the search and control of food and is an important factor in human relationships, choice of partners and social behavior³.

Biological and Biochemical Facts

Fragrance, or the perfume⁴ is not easy to define. As an ethanolic⁵ solution of essential oils, plant extracts, natural and synthetic compounds it assumes visible almost graspable characteristics. The perception of a fragrance, however, is the result of many complex interactions between the individual components of the fragrance and "smell antennas" (called cilia) in the nose, more precisely in the nasal mucous membrane⁶ while we are breathing in and out.

The sense of olfaction is a chemical sense⁷. The biochemical interaction between the single smelling molecules in the air and the receptor proteins on the cilia stimulates the olfactory nerve cell^{8,9} which triggers further reaction.

Olfactory Transmission

The human nose has about ten million olfactory nerve cells and one thousand different receptor protein types^{10,11}. Thus there are about ten thousand copies of each receptor type spread over the nasal mucous membrane more or less evenly.

Through the process of breathing, drinking or eating, smelling molecules pass through the nasal chamber and are exposed to the cilia in the nasal mucous membrane. As they drift by they are matched with their corresponding receptor proteins, thereby stimulating the nerve cell associated with the particular receptor type. An electrical impulse is generated and travels from the peripheral nasal end to the brain¹², more precisely to the olfactory bulbs¹³. Equal receptors lead to one and the same site in the olfactory bulb, the so-called "glomeruli". Thus, the olfactory bulbs in the brain is home to one thousand specific glomeruli which are the specific target areas corresponding to the thousand different nerve cell receptor types in the retronasal mucuous membrane.

One could visualize a fragrance impression as a three-dimensional map generated in the olfactory bulbs. Two dimensions would relate to the receptor types stimulated (quality). A third dimension would correspond to the intensity of the stimulation (quantity; amount of stimulated receptors of the same type). Such a "fragrance character map" could be compared to a sky at night with one thousand fixed stars with distinctive brilliance. This fragrance character map in the olfactory bulbs is like a unique fingerprint which is then transferred¹⁴ to the limbic system in the brain where it evokes sensations, recollections and emotions¹⁵.

[More accurately, a fragrance should be represented as a one thousand - dimensional vector where the numerical magnitude represents the intensity (0 - 100%) and the thousand dimensions correspond to the one thousand receptor types].

Chemically, a fragrance is a mixture of odiferous molecules. Its impact on the brain may be described as the sum of the qualitative and quantitative influences of its individual smelling components on the receptors of the cilia in the nasal mucous membrane. The electrical impulse generated by this action creates a fragrance character map in the olfactory bulbs which is transmitted to the limbic system of the brain where it generates specific feelings, emotions and evokes corresponding behavior.

Raw Materials

Today a perfumer has a choice of over four thousand smelling raw materials from natural sources, biochemical pathways and chemical synthesis, be it nature-identical or artificial (substances not yet found in nature). However, many of those are somewhat exotic in character. They may be scarce, or their supply may not be guaranteed. Sometimes insufficient toxicological or dermatological data are available. In many cases their olfactory character is similar to competitive products. Therefore, only about one thousand different odiferous raw materials are used on a regular basis by most perfumers.

Odiferous raw materials may be natural essential oils and extracts of flowers, fruits, leaves, stems, barks or whole plants, or synthetics of the fine chemicals industry¹⁶. Today, animal products like amber, musk and civet are not used anymore for reasons of respect and protection of animals. Frequent adulteration, irregular supply and exorbitant prices also played an important part in the disappearance of animal products in fragrances.

Today modern analytical methods have revealed most of the secrets of these "magic" products and many of their characteristic components can be manufactured synthetically. At the same time nature-identical blends can replace the animal products efficiently and economically.

The Perfumer

A perfumer's main occupation consists in the creation of fragrance oils¹⁷. By blending the various components in the right proportions, he is able to evoke specific emotions or sensations in the person that smells it. He is capable of varying the character of a theme in finest nuances. The only limit for his creations is his own fantasy and the fragrance cost per unit the customer may impose.

Creativity

Three attributes are essential for a perfumer:

- . a good nose as basic tool for his work with fragrances¹⁸
- . a good memory of odors characteristics of odiferous raw materials as an important tool for the translation of a fragrance idea¹⁹ and for the translation of emotions and feelings into a fragrance composition
- . a high creativity as the powerful source of ideas for existing and future projects

“Hard work and exertion, toughness of thought and integrity of judgement, persistence in the pursuit of ideas and an open mind towards new experiences are prerequisites for creative or even ingenious achievement”²⁰.

Functional Products

Perfumes^{4,21} , Eau de Perfume, Eau de Toilette or Eau de Cologne are pure fragrance products. Their only function and purpose exists in making the consumer smell good.

Besides perfumes there exists an overwhelming variety of so-called “functional” products manufactured by the cosmetics and toiletries, detergents and soaps, pharmaceutical and technical industries. These products have been developed for special applications (e.g. to clean hair and make it soft and shiny, to humidify dry skin, etc.). They contain only small dosages of concentrated fragrance oil.

The purpose of using a fragrance in functional products is:

- . a pleasant perception of the product (cream, shampoo, etc.) during the application
- . masking the otherwise sometimes disagreeable odor of the product
- . to underline the efficacy of the product by emotionally convincing the consumer of its value (“smoothes” the skin, “decreases itching”, makes hair “more shiny and brilliant”, etc.).

Technical Knowledge and Expertise

The reaction of fragrance raw materials and their mixtures in various media (alcoholic, water-based, emulsions, shampoos, soaps, detergents, etc.) or in technical products (room sprays, cleaners, etc.) is very complex. Physico-chemical parameters (partial vapor pressures, partition coefficients, etc.) play an important role. Aging processes like e.g. maceration or oxidation and other chemical reactions between the fragrance raw materials or the product ingredients may take place. This will influence the characteristics of the fragrance, its intensity, head space composition, etc. quite considerably, and over time. An experienced perfumer knows about these phenomena and uses his expertise to fulfill the requirements of the finished product.

A harmonious interaction of the fragrance and the product base are the prerequisites for successfully marketing and selling of the product. The olfactory impression and function of the product must perfectly match, as well as the color, the packaging, the product name, etc.

References:

Endnotes:

- 1 Generally, we speak of five senses: seeing, hearing, touching, tasting and smelling. Today science tends to add more: the sense of warmth and cold, the sense of pain, the sense of equilibrium and the sense of positional and motional perception and awareness of the body and its parts. This adds up to nine senses altogether.
- 2 The sense of taste is located on the tongue and allows us to differentiate sour, salty, sweet, bitter and Umami sensations. Most other flavor characteristics, however, are perceived by the sense of smell in our nose.
- 3 It is known that in addition to the olfactory organ in most mammals (and probably in humans as well) another organ sensitive to smelling substances exists. This so-called "vomero-nasal" organ is specifically stimulated by pheromones and known to control innate social and emotional behavior. It also communicates sexual messages like readiness for mating, etc. During evolution the vomero-nasal organ developed independently from the sense of smell. It is strictly separated from the olfactory organ.
- 4 Derived from "per-fumum" (Latin), "through the smoke".
- 5 More rarely, in other solvents like diethyl phthalate, for religious or other reasons. For example in Muslim countries where the use of (drinkable) ethyl alcohol is strictly forbidden, even in cosmetics.
- 6 The human nasal mucous membrane is an area of about five to ten square centimeters in the upper back part of the nose.
- 7 Contrary to vision (optical) or touch (pressure) or hearing (waves/frequency).
- 8 Olfactory nerve cells are primary cells, i.e. they lead directly to the brain without the help of other (secondary) nerve cells.
- 9 Olfactory nerve cells are constantly regenerated during a entire life time (about once a month). This is a very peculiar feature which may be due to the extreme exposure to extraneous matter. According to the present knowledge all other nerve cells are not regenerated, i.e. their number is constantly decreasing during a life time.
- 10 Dogs are mammals which are highly specialized in smelling. Their nasal mucous membrane contains more than one billion olfactory nerve cells. Therefore, even if a dog's sight or hearing is not too good he can find his way around quite dependably with his nose. The quality of a dog's nose is not so much the result of a bigger number of different receptor types, but much more a factor of the absolute number of nerve cells per specific receptor type. This is more than one million per type compared to ten thousand in men, i.e. more than one hundred fold difference.
- 11 The production of a specific receptor protein is originated by the corresponding gene. For one thousand receptor types one thousand respective genes are needed. The cell nucleus of mammals generally consists of about 35'000 genes for the complete organic building plan. This means that about three percent of all the genes of mammals are reserved for olfactory response: a very astonishing fact which clearly demonstrates the very importance of the sense of smell in mammals.
- 12 The receptor for fragrance molecules is an integral part of the olfactory (primary) nerve cell which at the other end leads directly (without synaptic translation) into the brain (olfactory bulbs). The sense of touch has a similar scheme, whereas in vision, hearing and taste the receptors are highly specialized epithelial, non-neuronal cells which are connected to the corresponding nerve cell only in a second step (similar to synapses).

- 13 There are two symmetrical so-called "bulbus olfactorius" in the brain, just across the mucous membrane of the nose.
- 14 The transmission proceeds via synapses and secondary, tertiary, etc. nerve cells.
- 15 This probably involves associations with earlier similar or identical fragrance sensations. How the olfactory information is coded and decoded in different parts of the brain is amongst the most difficult and challenging unsolved questions of neurobiology.
- 16 The number and quantity of natural products compared to synthetic raw materials used in perfumery decreases constantly. This is due to increasing costs of the naturals (land and labor costs), quality fluctuations in composition from crop to crop, availability, weather dependability and also for safety reasons (toxicology, immunology, dermatology).
- 17 Fragrance oils are sometimes called "blend", or "fragrance composition".
- 18 Of course, sophisticated and expensive analytical hard and software systems support the work of the perfumer substantially. However, the human nose is still the better "instrument" as far as smelling is concerned.
- 19 An idea can only be converted into a fragrance if the link between the fragrance raw materials and their odiferous profile is mastered reliably. During the progress of his or her work a perfumer must be capable to judge which component is missing or overdosed. In this process knowledge about specific properties and reactions of the many different fragrance raw materials are very important.
- 20 "Fleiss und Anstrengung, Zaehigkeit des Denkens und Unbestechlichkeit der Urteilskraft, Beharrlichkeit im Verfolgen eingeschlagener Wege und Offenheit gegenueber neuen Erfahrungen sind entscheidende Voraussetzungen fuer das Hervorbringen von Werken, die wir als kreative oder gar geniale bewundern" (R.W. Weisberg, Kreativitaet und Begabung, Verlag SPEKTRUM, 12 (1989)).
- 21 Perfumes are, with few exceptions, high percentage (18 - 30%) solutions of concentrated fragrance oils in ethyl alcohol. Eau de Perfume and Eau de Toilette are a less concentrated (EdP 12 - 18%, EdT 5 - 12%). Sometimes the Eau de Perfumes or Eau de Toilettes differ from the perfume in their composition. The former are mostly fresher, greener, and less heavy than the high percentage perfume.

General Literature:

- E.R. Kandel, J.H. Schwartz, et al.: "Essentials of Neural Science and Behaviour" (1995), Chapter 20
- H. Breer: "Biology of olfaction" (1995), Academic Press (London)
- W.J. Freeman: "Mass Action in the Nervous System: Examination of the Neuro-physiological Basis of Adaptive Behavior through the EEG" (1995), Academic Press (London)
- E.B. Goldstein: "Sensation and Perception" (1996), Chapter 12, Brooks/Cole Publishing, Pacific Grove

Musks in Perfumery

Natural Musk is an intensely smelling secretion of an abdominal gland ("musk gland") of the male musk deer (*Moschus Moschiferus* L.). This rare species lives solitarily in the Asian highlands (Central and East Asia like Tibet, Himalayas, etc.). Its secretion serves the purpose of finding a mating partner. For mankind musk has been associated with invulnerability, power and male potency for a long time. In some cultures this belief has persisted till today.

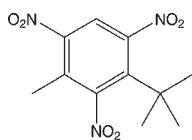
In the past the musk deer was killed to garner the valuable musk, a viscous brown liquid which becomes grainy after drying. Later, attempts were made to breed the animals in farms or to trap them in their natural habitat during the mating period and to obtain the secretion with the aid of a syringe. Fortunately, shortly before its definite extinction protection programs helped the musk deer to survive. In the past 20 years, the use of the natural musk for "medicinal" problems (i.e. potency, etc.) and in perfumery has decreased drastically and is, as a matter of fact, of no importance anymore. This is mainly due to the legal protection of this species, but also for the very high price of the genuine natural product and the fact that synthetic musks with similar olfactive properties and much lower prices have become available since the early beginning of the 20th century.

In perfumery musks have proven to be of greatest value. They normally exhibit a strong warm, sensual, velvety and long-lasting odor which makes them invaluable in perfumes, but also in fragrances for shampoos, fabric softeners, detergents, soaps and other products.

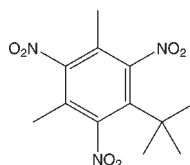
Synthetic musks are generally divided in three subgroups: nitromusks, polycyclic and macrocyclic musks.

Nitromusks

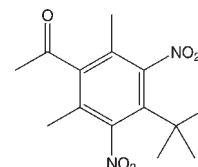
Nitromusks are artificial compounds, i.e. they are not produced in nature. The first member of this group was accidentally discovered in 1888 by A. Baur¹. Baur was working on explosives (by nitration of organic compounds) and perceived the sweet musky odor of one (1) of his reaction products. He later found Musk Xylene (2), Musk Ketone (3) and Musk Ambrette (4), all of them nitration products of aromatic compounds. Musk Tibetene (5) and Moskene (6) are also members of this group but are of little commercial importance. Due to its photosensitivity² and neurotoxic effects³ Musk Ambrette may not be used anymore since years. Only Musk Ketone and Musk Xylene are still used, mostly in older perfumes.



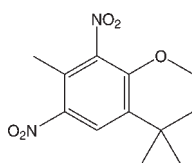
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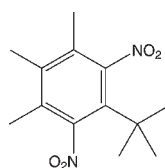
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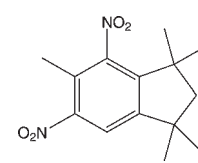
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4 (83-66-9)



5 (145-39-1)

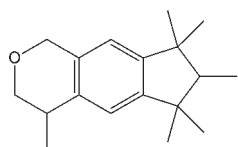


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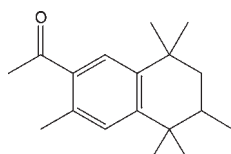
A number of disadvantages, e.g. the dangerous production of these compounds (over time many musk factories exploded) and the increasing availability and commercialization of the so-called polycyclic musks in the 60's led to a decreasing demand of this group of musks. Today, the use of nitromusks is highly undesirable since they are hardly biodegradable and therefore accumulate in nature. This is the same problem that polycyclic musks pose.

Polycyclic Musks

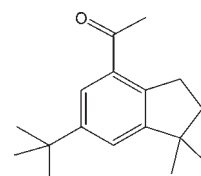
In the middle of the twentieth century the polycyclic musks were developed. A great number of musk-type components with an indane, tetraline or isochromane structure have been described in the scientific literature. But only few of them are of commercial and perfumistic interest. Compound 7 (HHCb, isochromane type) with its trade names Abbalide™, Galaxolide™, Musk 50™, Pearlide™, Astrolide™ etc. and 8 (AHTN, tetraline type) with trade names Fixolide™, Tetralide™, Tonalide™, etc are by far the economically most important ones. Compound 9 (ABDI, indane type) with trade names Celestolide™, Crysolide™, etc and 10 and 11 are also members of this subgroup but are less frequently used. Compound 12 (Versalide™) has not been used since many years due to its neurotoxic effects in animals⁴. 13-17 are some more polycyclic musks rarely used in perfumery.



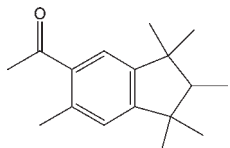
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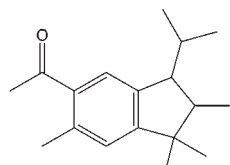
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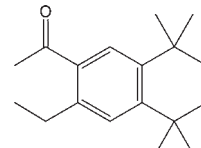
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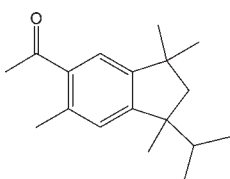
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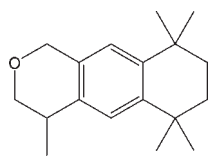
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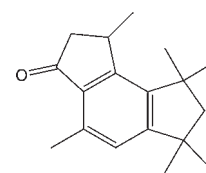
12 (88-29-9)



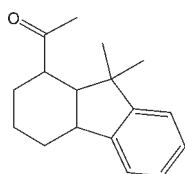
13 (92836-10-7)



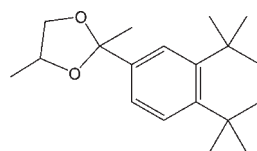
14 (1922-67-4)



15 (68298-33-9)



16 (96792-67-5)



17 (131812-67-4)

Environmental Concerns

Proof of the presence of nitromusks in the environment, more specifically in water and in fish, date back to the early eighties^{5,6}. Research on the contamination of surface water, supply and drain sites of water purification plants has intensified this decade^{7,8}. Musk xylene has been detected in human milk, fat⁹ and blood¹⁰. Polycyclic musks have been found in the environment¹¹, in human fat and milk^{12,13}.

Nitromusks as well as polycyclic musks were present at easily detectable levels in all of these studies. Their abundance in the environment, in animal or human fat and blood relates to the quantities manufactured and used world wide. I.e. 2 > 3 and 7 > 8. Since both polycyclic and nitromusks are highly lipophilic substances, they are easily absorbed by fat tissue where they are found in higher concentration than elsewhere. Eel, known for its high fat content, has shown 5 - 10 fold the amounts per kg than brass⁶.

The most widely used polycyclic and nitromusks have been tested intensively in the past. Toxicological and dermatological data show no harmful effect on humans, animals or the environment. However, high levels of use, extreme chemical stability and very low biodegradability¹⁴ make polycyclic and nitromusks potential environment contaminants due to their bioaccumulation.

Whereas chemical stability, i.e. resistance to chemical or biological degradation, was a highly desired property in the past, for modern ecological perfumery a fragrance has to be stable enough not to change during a product's life time, but biodegradable enough to disappear swiftly once the product has been used. Lately more and more companies using fragrances wish to receive oils containing neither nitromusks nor polycyclic musks. This development seems ecologically far-sighted.

A third subgroup of musks offer themselves as replacers:

Macrocyclic Musks

This subgroup consists of partially artificial and partially nature-identical members. With the structural elucidation of Muscone (18), the macrocyclic component of the secretion of the musk deer in 1926 L. Ruzicka started the epoch of macrocyclic chemistry¹⁵.

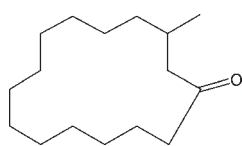
Macrocyclic musks are not only found in animals but also in plants. Compound 19 (trade names CyclopentadecanolideTM, ExaltolideTM, PentalideTM, ThibetolideTM, etc.) may serve as an important example as it is found in angelica root oil. Together with Ethylene Brassylate (20) with its trade names AstratoneTM, Musk TTM, etc. it is the most often used macrocyclic musk. Ambrettolide (21) and Civetone (22) are used rather rarely. Compounds 23-29 are some more members of this group.

The chemical structure of macrocyclic musks suggests an easy microbial decomposition which has been confirmed in single cases¹⁶.

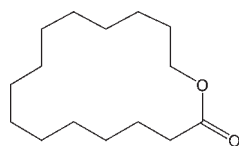
Replacements of Nitro- and Polycyclic Musks

Several problems arise when replacing nitromusks or polycyclic with macrocyclic musks. First, the odor profiles (intensity, tonality, odor threshold, tenacity, etc.) are different. As a matter of fact, some nitromusks, e.g. musk ketone with its powdery sweet strong musky odor, are very difficult to replace, even by a mixture of compounds¹⁷. Secondly, some of the macrocyclic replacers do not show the same stability behavior in certain media (e.g. strong alkaline or acidic). Thirdly, some of them are simply too expensive to be used in low-cost functional products.

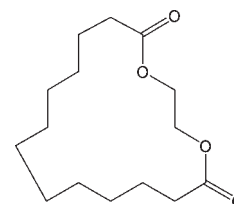
Fragrance companies and perfumers will have to overcome these drawbacks with new inspirations. Upon increasing demand the desirable macrocyclic musks may become cheaper. Or - as a more distant possibility - new groups of musks will be found and launched in the future.



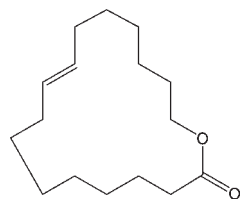
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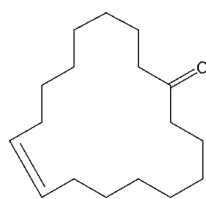
19 (106-02-5)



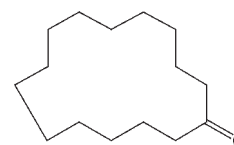
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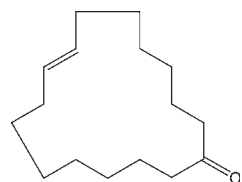
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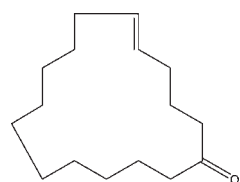
22 (542-46-1)



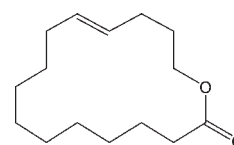
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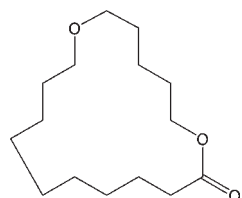
24 (3100-36-5)



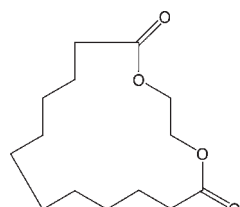
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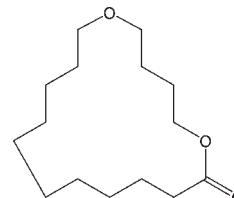
26 (34902-57-3)



27 (3391-83-1)



28 (54982-83-1)



29 (6707-60-4)

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