PERFUME

INTRODUCTION

Perfumes are usually complex combinations of natural materials, such as essential oils from plants and synthetic products that increase the lasting power and heighten the smell.

CLASSIFICATION OF PERFUME

According to the elements of the *fragrance notes* of the scent or the *family* it belongs to.

A) Concentration of Perfumes

Perfume types reflect the concentration of aromatic compounds in a solvent, which in fine fragrance is typically ethanol or a mix of water and ethanol. The concentration by percent/volume of perfume oil is as follows:

- Perfume extract (Extrait): 15-40% (IFRA: typical 20%) aromatic compounds
- Eau de Parfum (EdP), Parfum de Toilette (PdT): 10-20% (typical ~15%) aromatic compounds.
- Eau de Toilette (EdT): 5-15% (typical ~10%) aromatic compounds
- Eau de Cologne (EdC): Chypre citrus type perfumes with 3-8% (typical ~5%) aromatic compounds
- Splash and After shave: 1-3% aromatic compounds

B) Fragrance notes {Note (perfumery)}

Perfume is described in a musical metaphor as having three sets of 'notes', making the harmonious scent accord.

- **Top notes (Head notes)**: The scents that are perceived immediately on application of a perfume. Top notes consist of small, light molecules that evaporate quickly. They form a person's initial impression of a perfume and thus are very important in the selling of a perfume.
- **Middle notes (Heart notes)**: The scent of a perfume that emerges just prior to when the top notes dissipate. The middle note compounds form the "heart" or main body of a perfume and act to mask the often unpleasant initial impression of base notes, which become more pleasant with time.

- **Base notes**: The scent of a perfume that appears close to the departure of the middle notes. The base and middle notes together are the main theme of a perfume. Base notes bring depth and solidity to a perfume. Compounds of this class of scents are typically rich and "deep" and are usually not perceived until 30 minutes after application.

C) Olfactive families

Classification by olfactive family is a starting point for a description of a perfume, but it cannot by itself denote the specific characteristic of that perfume.

1) ***Traditional:*** includes 1900 different categories.
   - Single floral aromas that stem from flowers
   - Floral bouquets from a variety of flowers
   - Ambery aromas feature scents such as vanilla with the smells of animals, flowers and woods.
   - Woody fragrances are rustic and consist of woody scents
   - Leather consists of honey, tobacco and wood tars
   - Chypre includes aromas of oakmoss, patchoilu and labdanum
   - Fougere consists of lavender, coumarin and oakmoss.

2) ***Modern***
   - Bright floral that combine single floral with floral bouquets
   - Green which is lighter and more modern
   - Oceanic/ozone is clean and modern
   - Citrus or fruity has a low citrus aroma

Class	Type	Other fragrances
Almondy	Bitter almor	Laurels, peach kernals, mirbane
Amber	Ambergris	Oak moss
Anise	Aniseed	Badiane, caraway, dill, fennel, coriander
Balsamic	Vanilla	Balsam of Tolu, balsam of Peru, benzoin, styrax, tonka
Camphoraceous	Camphor	Rosemary, patchouli

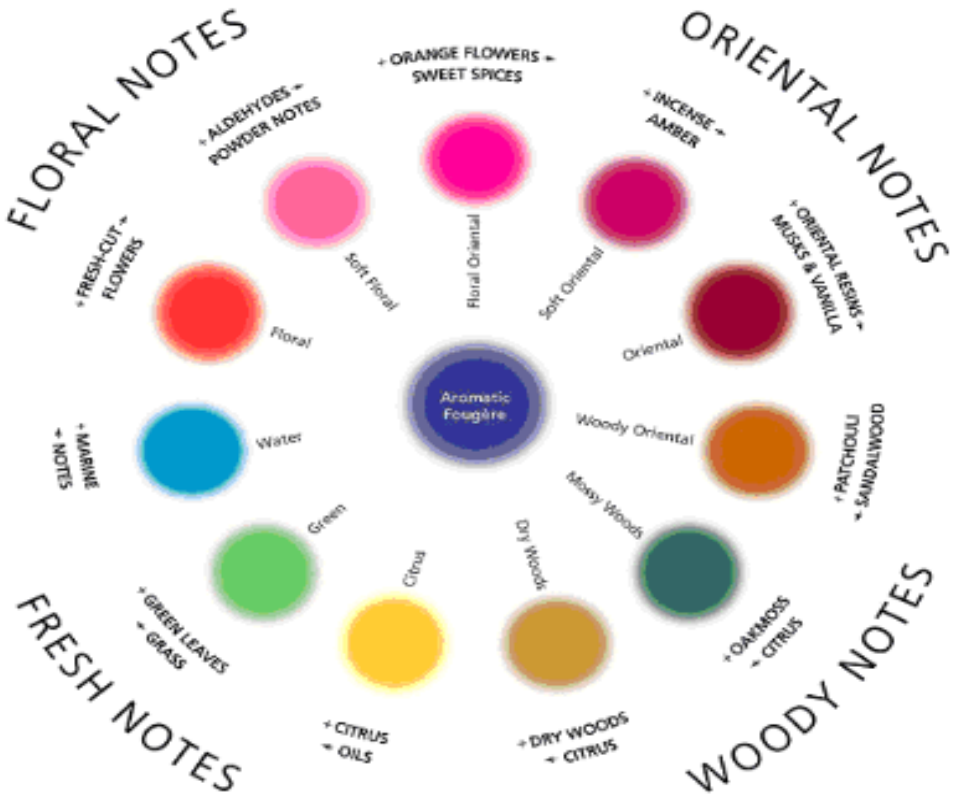
Caryophyllaceous	Clove	Carnation, clove-pink
Citrine	Lemon	Bergamot, orange, cedrat, limes
Fruity	Pear	Apple, pineapple, quince
Jasmin	Jasmine	Lily of the Valley
Lavender	Lavender	Spike, thyme, serpolet, marjoram
Minty	Peppermint	Spearmint, balm, me, sage
Musky	Musk	Civet, ambrette seed, musk plant
Orange flower	Neroli	Acacia, syringa, orange leaves
Rosaceous	Rose	Geranium, sweet briar, rhodium
Sandal	Sandalwood	Vetivert, cedarwood
Spicy	Cinnamon	Cassia, nutmeg, mace, pimento
Tuberose	Tuberose	Lily, jonquil, narcissus, hyacinth
Violet	Violet	Cassie, orris-root, mignonette

D) The Fragrance Wheel

A new classification of perfumes that is usually used in the fragrance industry is The Fragrance Wheel developed in 1983 by Michael Edwards, a well-known consultant in the perfume industry.

The purpose of this new relatively classification system was initiated to make simpler the fragrance classification and naming scheme, as well as to show the relationships between each individual fragrance family.

The four standard families which consist in ***Floral, Oriental, Woody*** and ***Fresh*** are are divided into three sub-groups and arranged around a wheel circumferences. The fifth family that makes exception from the rule is the **Fougére** family which being more "classic" stands in the center of **the Fragrance Wheel**:



How to use the Fragrance Wheel:

- **Step One**: Studying **the Fragrance Wheel**, learn the five main fragrance families represented: ***Fresh, Woody, Oriental, Floral*** and ***Fougere*****. Fougere** is the only family that does not sub-divide and stands at the center being more classic having a more universal appeal and it combines elements of the other four. The others are arranged around the wheel's circumference.
- **Step Two**: Examine the sub-groupings in each family. The four other families have each three sub-families in the outer wheel that result when their essence is combined with the family on either side of it. These are: ***Floral, Soft Floral, Floral Oriental, Oriental, Soft Oriental, Woody Oriental, Mossy Woods, Dry Woods, Citrus, Green and Water.***
- **Step Three** Look up which family four your favorite fragrances belong to. This will help you to learn your own preferred scent family.
- **Step Four** Use a **Fragrance Wheel** to help you blend your own scents, as you like. Combine scents from families that overlap to create harmonious perfumes.

SOURCES OF PERFUMES

1) Plant sources

Plants have long been used in perfumery as a source of essential oils and aroma compounds. These aromatics are usually secondary metabolites produced by plants as protection against herbivores, infections, as well as to attract pollinators. Plants are by far the largest source of fragrant compounds used in perfumery. The sources of these compounds may be derived from various parts of a plant. A plant can offer more than one source of aromatics, for instance the aerial portions and seeds of coriander have remarkably different odors from each other. Orange leaves, blossoms, and fruit zest are the respective sources of petitgrain, neroli, and orange oils.

- **Bark**: Commonly used barks includes cinnamon and cascarilla. The fragrant oil in sassafras root bark is also used either directly or purified for its main constituent, safrole, which is used in the synthesis of other fragrant compounds.
- **Flowers** and **blossoms**: Undoubtedly the largest source of aromatics. Includes the flowers of several species of rose and jasmine, as well as osmanthus, plumeria, mimosa, tuberose, narcissus, scented geranium, cassie, ambrette as well as the blossoms of citrus and ylang-ylang trees. Although not traditionally thought of as a flower, the unopened flower buds of the clove are also commonly used. One orchid hybrid named "Miss Udorn Sunshine" is extracted for perfume. Other orchid flowers are not commercially used to produce essential oils or absolutes, except in the case of vanilla, an orchid, which must be pollinated first and made into seed pods before use in perfumery.
- **Fruits**: Fresh fruits such as apples, strawberries, cherries unfortunately do not yield the expected odors when extracted; if such fragrance notes are found in a perfume, they are synthetic. Notable exceptions include litsea cubeba, vanilla, and juniper berry. The most commonly used fruits yield their aromatics from the rind; they include citrus such as oranges, lemons, and limes. Although grapefruit rind is still used for aromatics, more and more commercially used grapefruit aromatics are artificially synthesized since the natural aromatic contains sulfur and its degradation product is quite unpleasant in smell.
- **Leaves** and **twigs**: Commonly used for perfumery are lavender leaf, patchouli, sage, violets, rosemary, and citrus leaves. Sometimes leaves are valued for the

"green" smell they bring to perfumes, examples of this include hay and tomato leaf.

- **Resins**: Valued since antiquity, resins have been widely used in incense and perfumery. Highly fragrant and antiseptic resins and resin-containing perfumes have been used by many cultures as medicines for a large variety of ailments. Commonly used resins in perfumery include labdanum, frankincense/olibanum, myrrh, Peru balsam, gum benzoin. Pine and fir resins are a particularly valued source of terpenes used in the organic synthesis of many other synthetic or naturally occurring aromatic compounds. Some of what is called amber and copal in perfumery today is the resinous secretion of fossil conifers.
- **Roots, rhizomes and bulbs**: Commonly used terrestrial portions in perfumery include iris rhizomes, vetiver roots, various rhizomes of the ginger family.
- **Seeds**: Commonly used seeds include tonka bean, carrot seed, coriander, caraway, cocoa, nutmeg, mace, cardamom, and anise.
- **Woods**: Highly important in providing the base notes to a perfume, wood oils and distillates are indispensable in perfumery. Commonly used woods include sandalwood, rosewood, agarwood, birch, cedar, juniper, and pine. These are used in the form of macerations or dry-distilled (rectified) forms.

2) Animal sources

- **Ambergris**: Lumps of oxidized fatty compounds, whose precursors were secreted and expelled by the Sperm Whale. Ambergris is commonly referred to as "amber" in perfumery and should not be confused with yellow amber, which is used in jewelry.
- **Castoreum**: Obtained from the odorous sacs of the North American beaver.
- **Civet**: Also called Civet Musk, this is obtained from the odorous sacs of the civets, animals in the family *Viverridae*, related to the Mongoose. The World Society for the Protection of Animals investigated African civets caught for this purpose.
- **Hyraceum**: Commonly known as "Africa Stone," is the petrified excrement of the Rock Hyrax.
- **Honeycomb**: From the honeycomb of the Honeybee. Both beeswax and honey can be solvent extracted to produce an absolute. Beeswax is extracted with ethanol and the ethanol evaporated to produce beeswax absolute.

- **Musk**: Originally derived from the musk sacs from the Asian musk deer, it has now been replaced by the use of synthetic musks sometimes known as “white musk”.

3) Other natural sources

- **Lichens**: Commonly used lichens include oakmoss and treemoss thalli.
- **"Seaweed"**: Distillates are sometimes used as essential oil in perfumes. An example of a commonly used seaweed is *Fucus vesiculosus*, which is commonly referred to as bladder wrack. Natural seaweed fragrances are rarely used due to their higher cost and lower potency than synthetics.

4) Synthetic sources

Many modern perfumes contain synthesized odorants. Synthetics can provide fragrances which are not found in nature. For instance, Calone, a compound of synthetic origin, imparts a fresh ozonous metallic marine scent that is widely used in contemporary perfumes. Synthetic aromatics are often used as an alternate source of compounds that are not easily obtained from natural sources. For example, linalool and coumarin are both naturally occurring compounds that can be inexpensively synthesized from terpenes. Orchid scents (typically *salicylates*) are usually not obtained directly from the plant itself but are instead synthetically created to match the fragrant compounds found in various orchids.

CHARACTERISTICS

Natural and synthetics are used for their different odor characteristics in perfumery

	Naturals	Synthetics
Variance	Vary by the times and locations where they are harvested. It's much more difficult to produce consistent products with equivalent odor. The perfumer has to manually balance-out the natural variations of the ingredients in order to maintain the quality of the perfume.	Much more consistent than natural aromatics. However, differences in organic synthesis may result in minute differences in concentration of impurities. If these impurities have low smell (detection) thresholds, the differences in the scent of the synthetic aromatic will be significant.
Components	Thousands of chemical compounds.	Depending on purity, consists primarily of one chemical compound.
Scent Uniqueness	Bears a somewhat similar scent to its originating material, depending on the extraction method.	Similar to natural scents if the compounds are the same. Novel scent compounds not found in nature will often be unique in their scent and dissimilar to the scents of any naturals.
Scent Complexity	Deep and complex fragrance notes. Softer with subtle scent nuances.	Pure and pronounced fragrance notes. Structural and defined.
Price	Perfumes composed of largely natural materials are usually much more expensive.	Perfumes using largely synthetic aromatics can be available at widely-affordable prices. However, synthetic aromatics and perfumes are not necessarily cheaper than naturals. Some synthetics can be more costly than most natural ingredients due to various factors such as the complexity of synthesis or extraction procedure.

METHODS OF PREPARATION

Before perfumes can be composed, the odorants used in various perfume compositions must first be obtained. Synthetic odorants are produced through organic synthesis and purified. Odorants from natural sources require the use of various methods to extract the aromatics from the raw materials. The results of the extraction are either essential oils, absolutes, concretes, or butters, depending on the amount of waxes in the extracted product.

All these techniques will, to a certain extent, distort the odor of the aromatic compounds obtained from the raw materials. This is due to the use of heat, harsh solvents, or through exposure to oxygen in the extraction process which will denature the aromatic compounds, which either change their odor character or renders them odorless.

- **Maceration/Solvent extraction**:

This is the most used and economically important technique for extracting aromatics in the modern perfume industry. Raw materials are submerged in a solvent that can dissolve the desired aromatic compounds. *Maceration* lasts anywhere from hours to months. Fragrant compounds for woody and fibrous plant materials are often obtained in this manner as are all aromatics from animal sources. The technique can also be used to extract odorants that are too volatile for *distillation* or easily denatured by heat. Commonly used solvents for *maceration/solvent extraction* include hexane, and dimethyl ether. The product of this process is called a "concrete".

  - *Supercritical fluid extraction*: A relatively new technique for extracting fragrant compounds from a raw material, which often employs Supercritical CO_2. Due to the low heat of process and the relatively nonreactive solvent used in the extraction, the fragrant compounds derived often closely resemble the original odor of the raw material.
  - *Ethanol extraction*: A type of solvent extraction used to extract fragrant compounds directly from dry raw materials, as well as the impure oily compounds materials resulting from solvent extraction or enfleurage. Ethanol extraction is not used to extract fragrance from fresh plant materials since these contain large quantities of water, which will also be extracted into the ethanol.

- **Distillation**:

A common technique for obtaining aromatic compounds from plants, such as orange blossoms and roses. The raw material is heated and the fragrant compounds are re-collected through condensation of the distilled vapour.

- *Steam distillation*: Steam from boiling water is passed through the raw material, which drives out their volatile fragrant compounds. The condensates from distillations are settled in a Florentine flask. This allows for the easy separation of the fragrant oils from the water. The water collected from the condensate, which retains some of the fragrant compounds and oils from the raw material is called hydrosol and sometimes sold. This is most commonly used for fresh plant materials such as flowers, leaves, and stems.
- *Dry/destructive distillation*: The raw materials are directly heated in a still without a carrier solvent such as water. Fragrant compounds that are released from the raw material by the high heat often undergo anhydrous pyrolysis, which results in the formation of different fragrant compounds, and thus different fragrant notes. This method is used to obtain fragrant compounds from fossil amber and fragrant woods where an intentional "burned" or "toasted" odor is desired.
- *Fractionation*: Through the use of a fractionation column, different fractions distilled from a material can be selectively excluded to modify the scent of the final product. Although the product is more expensive, this is sometimes performed to remove unpleasant or undesirable scents of a material and affords the perfumer more control over their composition process.

- **Expression**: Raw material is squeezed or compressed and the oils are collected. Of all raw materials, only the fragrant oils from the peels of fruits in the citrus family are extracted in this manner since the oil is present in large enough quantities as to make this extraction method economically feasible.
- **Enfleurage**: Absorption of aroma materials into solid fat or wax and then extracting the odorous oil with ethyl alcohol. Extraction by enfleurage was commonly used when distillation was not possible because some fragrant compounds denature through high heat. This technique is not commonly used in the present day industry due to its prohibitive cost and the existence of more efficient and effective extraction methods.

FRAGRANT EXTRACTS

Although fragrant extracts are known to the general public as the generic term "essential oils", a more specific language is used in the fragrance industry to describe the source, purity, and technique used to obtain a particular fragrant extract.

Of these extracts, only *absolutes*, *essential oils*, and *tinctures* are directly used to formulate perfumes.

- **Absolute**: Fragrant materials that are purified from a *pommade* or *concrete* by soaking them in ethanol. By using a slightly hydrophilic compound such as ethanol, most of the fragrant compounds from the waxy source materials can be extracted without dissolving any of the fragrantless waxy molecules. Absolutes are usually found in the form of an oily liquid.
- **Concrete**: Fragrant materials that have been extracted from raw materials through *solvent extraction* using volatile hydrocarbons. Concretes usually contain a large amount of wax due to the ease in which the solvents dissolve various hydrophobic compounds. As such concretes are usually further purified through distillation or ethanol based solvent extraction. Concretes are typically either waxy or resinous solids or thick oily liquids.
- **Essential oil**: Fragrant materials that have been extracted from a source material directly through *distillation* or *expression* and obtained in the form of an oily liquid. Oils extracted through expression are sometimes called *expression oils*.
- **Pomade**: A fragrant mass of solid fat created from the *enfleurage* process, in which odorous compounds in raw materials are adsorbed into animal fats. Pommades are found in the form of an oily and sticky solid.
- **Tincture**: Fragrant materials produced by directly soaking and infusing raw materials in ethanol. Tinctures are typically thin liquids. [7]

Products from different extraction methods are known under different names even though their starting materials are the same. For instance, orange blossoms from *Citrus aurantium* that have undergone solvent extraction produces "orange blossom absolute" but that which have been steam distilled is known as "neroli oil"

PRESERVATION OF PERFUME

Fragrance compounds in perfumes will degrade or break down if improperly stored in the presence of:

- Heat
- Light
- Oxygen
- Extraneous organic materials

Proper preservation of perfumes involves keeping them away from sources of heat and storing them where they will not be exposed to light. An opened bottle will keep its aroma intact for several years, as long as it is well stored. However the presence of oxygen in the head space of the bottle and environmental factors will in the long run alter the smell of the fragrance.

Perfumes are best preserved when kept in light-tight aluminium bottles or in their original packaging when not in use, and refrigerated to relatively low temperatures: between 3-7 degrees Celsius (37-45 degrees Fahrenheit). Although it is difficult to completely remove oxygen from the headspace of a stored flask of fragrance, opting for spray dispensers instead of rollers and "open" bottles will minimize oxygen exposure. Sprays also have the advantage of isolating fragrance inside a bottle and preventing it from mixing with dust, skin, and detritus, which would degrade and alter the quality of a perfume.