THE INSTITUTE FOR ART AND OLFACTION

BASIC PERFUME PRIMER

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ABOUT THIS DOCUMENT

This document was prepared by staff and instructors at the Institute for Art and Olfaction, with a view of providing some foundational knowledge for IAO students and curious minds just coming to perfumery. Contributors include Ashley Eden Kessler, Minetta Rogers, Saskia Wilson-Brown and Timothy Van Ausdal, as well as online sources such as The Fragrance Society, The Perfume Expert, Mandy Aftel, Michael Edwards, Wikipedia and Science for New Students.

ABOUT THE IAO

MISSION STATEMENT

Founded in September 2012 in Los Angeles, The Institute for Art and Olfaction is a 501(c)3 non-profit devoted to advancing public, artistic and experimental engagement with scent. We do this by initiating and supporting experimental projects that utilize the medium of scent, by providing accessible and affordable education in our laboratory as well as in partnership with institutions and community groups, and by celebrating excellence in independent, artisan and experimental perfumery through our yearly award mechanism, The Art and Olfaction Awards. Through these efforts, we extend the world of scent beyond its traditional boundaries of appreciation and use.

OUR PHILOSOPHY

We believe that there is no one right or wrong way to work with scent. As such, we try to present a variety of philosophies and methodologies, and keep an open mind about the many clever ways people can wield a pipette.

However, when it comes to safety and basic terminology, there are a few industry standards upon which we can agree. This document is designed to help you familiarize yourself with those very basics, and will give you a nice foundation. Read on, and enjoy!

PERFUME TAXONOMIES

TOP, MIDDLE, BASE

When referring to top, middle, and base notes, we're talking about a technical measurement of a scent's volatility (or tenacity). In other words, this refers to how long it lasts on a scent strip, our skin, or any other surface.

Most perfumers determine the tenacity of any material by testing it themselves. We encourage you to do the same! Dip a scent strip into the material and check it over the course of time (after 5, 15, 30 minutes, after 1, 3, 6, and 12 hours). The material is considered "gone" when the defining character has disappeared. For example, the juicy sparkle of a citrus essential oil will last 5-30 minutes. After this point, there may be a slight residue of odor on the strip, however this odor is not the defining character of the material. So the citrus will have "disappeared", and thus be considered a top note.

- Top notes: The most volatile and pronounced when first smelling a fragrance. They can last anywhere from a couple of minutes to about a half-hour. Citrus, green and some spices are usually top notes.
- Middle notes: The half-way point between top and base notes. These generally form the heart of the fragrance and usually last anywhere from 1-3 hours. Heavier spices and lighter florals are usually middle notes
- Base notes: These form the base of a fragrance and a foundation for the shorter-lived and more dynamic top and middle notes. These notes can last anywhere from around 4 hours to a couple of weeks. Heavy florals, woods, musks, and resins are usually base notes.

These time frames are relative: The boundary separating top from middle from base is a sliding scale, not a hard cutoff. Some top notes last only a few minutes, whereas others last up to an hour. Some base notes last 3-6 hours, and others last for weeks.

In addition to the strictly technical definition of volatility that creates the categories of top, middle and base notes, it is also useful to consider when a material reveals itself in a blend. Generally speaking, the most volatile top notes appear strongly in the first minutes of the fragrance, which then give way to the middle notes, followed by the base notes. However, there are some materials which have long tenacity (technically these would be middle or base notes) that nonetheless have a pronounced presence at the top or middle of a fragrance.

For example, aldehydes are a class of molecules that give tremendous lift to the top of a fragrance and impart a long lasting freshness. You will smell the presence of aldehydes at the outset of the fragrance (along with the top notes), however the tenacity of those aldehydes will keep them doing their thing long after the top notes have evaporated. We like to say - in this case - that the material is a base or middle note that works on the top. Similarly, Hedione is a

molecule that works to create a sheer floral jasmine note which fills out the middle of a fragrance where the other florals tend to live, but has the tenacity of a base note.

FRAGRANCE FAMILY

Another common fragrance taxonomy is what is commonly known as a fragrance family. As The Perfume Expert explains it: "A Fragrance Family is a term used to denote particular groupings of scent notes. Notes that are either similar or complementary are grouped into a Fragrance Family which can then be used to easily label a particular perfume."

In the natural world, these families can be fairly easy to define, and are somewhat intuitive: bear in mind, though, that sometimes materials do not fall into what one could assume would be their natural fragrance family. Parsley seed essential oil, for example would be expected to have an herbaceous or seedy aspect; which it does in part. However, it is a very complex material that is mostly defined by a powdery character.

With synthetic materials, the traditional fragrance family classification can be a lot harder to use. At the IAO we've put in considerable efforts trying to come up with new classifications, things like "urban landscape" and "electronic". But for the sake of everyone's sanity, and until a new series of words and classifications has been created, the industry tends to defer to the natural world. Thus Allyl Amyl Glycolate is defined as fruity / green, whereas it also has a strong note of hot vinyl.

Also: Consider that fragrance families designed with marketing in mind often differ from fragrance families designed with the materials themselves in mind. Thus a citrus note like bergamot becomes an important part of the chypre fragrance family. It's enough to make the mind boggle!

Regardless, here are some common fragrance families, some geared towards marketing and some geared towards the chemicals themselves (definitions adapted from works published by The Fragrance Society, The Perfume Expert, Mandy Aftel, and Michael Edwards):

- Fresh: This is a marketing term most often used to describe a broad varity of other categories, including green, herbal, citrus, aquatic, and fruity families.
- Fougère: A classic marketing term used to describe "ferny" green smells. Fougères often feature lavender, geranium, vetiver, bergamot, oakmoss and coumarin.
- Floral: A functional term that is used to describe single floral notes (soliflores) or scents that primarily feature a floral "bouquet".

- Woody: A functional term used to describe earthy scents that often include notes of wood (obviously), moss, dirt and damp leaves.
- Chypre: Another name for mossy woody scents, chypres focusses more specifically on mossy notes in contrast with citrus notes. As an example, a classical construction relies on the combination of Bergamot and Oakmoss, whereas a more modern construction will often substitute other woody and earthy notes in place of Oakmoss.
- Aldehydic Floral: This refers to a group of molecules (that can be naturally or synthetically derived) that when combined with florals give a more metallic, sharp, citrus zing to the fragrance.
- Gourmand: Sweetly edible, gourmands often include caramel, chocolate, milk, coffee, cognac, toffee, almonds, vanilla, and any other variation of sweet and cavity-inducing. There may be spices in there, too, or amber.
- Aromatic: These materials are strongly reminiscent of herbs we're familiar with - sage, thyme, lavender, rosemary. Along with this herbaceousness, they have a bright, almost citrus-like, quality to them.
- Ozonic: Used to refer to the smell of ozone in the air after a thunderstorm, ozonic materials have a transparent, watery, shimmeringly bright quality combined with a somewhat rough static texture.
- Aquatic/Marine: Materials that evoke a sense of wetness or water are generally described as aquatic; if the note has a saline nuance to it, bringing to mind images of fresh sea air, the material is more specifically classified as marine. These salty notes often have green cucumber and melon facets as well.
- Green: Living up much to its name, green materials are reminiscent of plant matter - torn flower stems, wet leaves, mown grass, broken twigs, and vegetables amongst others.

There are many, many more of these terms, and what they are and how they can be applied depends on who you ask.

We enjoy working with two fragrance wheels: Mandy Aftel's wheel for naturals, and Michael Edwards that explores perfume taxonomies. Please do not hesitate - if you're very ambitious – to try to make your own!

MATERIALS

AROMATIC CHEMICALS

In layman's terms, an aromatic chemical is, simply, a chemical - or combination of chemicals - that has aroma. Remember that the term chemical does not apply only to materials created in a laboratory: Most of the natural world is made up of chemicals.

Here are some helpful explanations:

- Chemical: A chemical substance is a form of matter having constant chemical composition and characteristic properties. It cannot be separated into components by physical separation methods, i.e., without breaking chemical bonds.Chemical substances are often called 'pure' to set them apart from mixtures. A common example of a chemical substance is pure water; it has the same properties and the same ratio of hydrogen to oxygen whether it is isolated from a river or made in a laboratory. *(Wikipedia)*
- Aromatic Chemical: An aroma compound, also known as an odorant, aroma, fragrance, or flavor, is a chemical compound that has a smell or odor. A chemical compound has a smell or odor when it is sufficiently volatile to be transported to the olfactory system in the upper part of the nose. Aroma compounds can be found in food, wine, spices, floral scent, perfumes, fragrance oils, and essential oils. For example, many form biochemically during the ripening of fruits and other crops. In wines, most form as byproducts of fermentation. Also, many of the aroma compounds play a significant role in the production of flavorants, which are used in the food service industry to flavor, improve, and generally increase the appeal of their products. *(Wikipedia)*
- Compound: A compound is a substance formed from two or more chemical elements united in fixed proportions. For example, water is a compound made of two hydrogen atoms bonded to one oxygen atom. Its chemical symbol is H2O. This is often used as a synonym for chemical. (*www.sciencenewsforstudents.org)*
- Molecule: An electrically neutral group of atoms that represents the smallest possible amount of a chemical compound. Molecules can be made of single types of atoms or of different types. For example, the oxygen in the air is made of two oxygen atoms (O2), but water is made of two hydrogen atoms and one oxygen atom (H2O). (*www.sciencenewsforstudents.org)*

Don't worry about this too much right now. However, what IS important to understand is that most common smells – the smell of a (generic, Platonic) rose, for instance – are composed of many aromatic chemicals that together create the complex aroma we know as "rose". Thus you might come across something called Geranyl Acetate, or Geraniol, or even Beta Ionone: These are components of rose, as well as some other flowers. Think of them as Lego bricks which – together – combine to make a Lego house.

NATURALS + SYNTHETICS + ACCORDS

Whether a material is considered Natural or Synthetic is a complicated discussion. Just look it up online to see the breadth (and tone!) of the conversation. Many aspects of perfumery are defined differently from one practitioner to the next, so let's begin by laying out our working definitions.

- Natural materials: Derived from a plant or animal origin and are complex blends of molecules. These materials can consist of tens to hundreds of different individual molecules. These materials are extracted using multiple processes, namely: Expression or Cold Pressing, Hydro or Steam Distillation, Solvent Extraction, and CO2 Extraction.
- Synthetics: Synthetics are single isolated molecules. Most synthetics are derived from a petroleum origin (petroleum is rich in the four elements, hydrogen, oxygen, nitrogen and sulfur, that compose all fragrant molecules). These materials are created in a lab through a set of chemical reactions, such as heating and enzymatic reactions. (Please note that similar molecular processes take place in the processing of natural materials).
- Other: There is a class of synthetics called Natural Isolates or Hemi Synthetics, which are single molecules that have been extracted from raw material that is plant or animal (instead of petroleum) in origin. For example, Phenyl Ethyl Alcohol which is a molecule naturally occuring in Rose, can be isolated from Geranium Leaves or Rose Petals (a natural isolate) or the exact same molecule can be constructed from rearranging the elements derived from petroleum (a synthetic).
- Accords: Also known as bases (and not to be confused with base notes), these represent a combination of materials (both natural and synthetic) that create another whole. Much like a musical chord when several notes are played simultaneously, perfumers will combine several materials to evoke a concrete object or abstract feeling - a dewy rose, the fullness of a new moon, a burning tree, the smell of a lover after showering. When working with commercially available accords, make sure to do your due diligence and take note – where possible – of the formula. The last thing you want is to use someone's work and then lose track of the components when that someone no longer makes it available for your use.

When it comes to materials, it often comes down to a matter of preference and aesthetic choice, and all materials offer their own sets of pros and cons. There are very fine and expensive naturals and synthetics, there are very inexpensive naturals and synthetics. Some of the inexpensive materials smell amazing, and some of the very pricey materials aren't so lovely, although many times the higher priced materials are quite fine. It all depends on your preference and supplier (as materials will be different depending on the producer). That being said, a natural isolate will usually be much more expensive than its synthetic counterpart.

We believe, at the IAO, that nothing is inherently more valuable than anything else in this weird, wonderful, multiplicitous world. In other words, no one way of working is superior to another: However, we tend to encourage people to try everything; to work with both naturals AND synthetics, to make use of accords if they want to, but always be open to changing their minds.

ESSENTIAL OILS, ABSOLUTES, CO2 EXTRACTS AND MORE

The process used to extract the material accounts for the naming of the resulting product. Some raw natural materials can be extracted using multiple processes, and some will only yield a product from a single type of process. For example, Rose and Orange Blossom petals can be extracted by both steam distillation (yielding essential oil) or solvent extraction (yielding an absolute), whereas jasmine petals can only be processed using solvent extraction.

Essentials oils (EO) are extracted from plant materials through two processes: Expression/cold pressing and steam/hydro distillation.

- Expression/cold pressing: Used mostly on the peels of citrus fruits, which contain an incredible amount of oil, so much, in fact, that the peels need only to be pressed to yield the product.
- Steam/hydro distillation: A process which requires the soaking of the raw matter in water. Heat is then added causing the fragranced oil and steam to rise up out of the mixture. Then as the steam condenses into water, the oil and water separate, the oil produced by this process is called an essential oil. The water which is a by product of the process contains trace amount of fragrant molecules, and is often sold for use in beauty care and cooking, for example, rose and orange blossom water. The water can also be concentrated to produce a Hydrosol.

Absolutes (ABS) can be created through several processes.

- Enfleurage: A traditional process where the raw material is pressed into fats spread over panes of glass into which they are allowed to infuse their scent. This is repeated until the fat is redolent with the raw material's fragrance (known as a concrete). This mixture is then rinsed with alcohol to remove the fats and waxes, thus producing an absolute.
- Solvent Extraction: Today, Absolutes are generally created through hydrocarbon solvent extraction. After adding the raw aromatic material to the solvent, it is further washed with ethanol to yield an absolute. The solvent used in this process is incredibly effective at pulling a wide array of molecules out of the raw material. The material's absolute - extracted using this method - will be richer and more tenacious (base heavy) than the same material's essential oil processed through steam distillation.

CO2 extraction involves adding the raw matter to supercritical carbon dioxide. The resulting extraction preserves some of the more fragile and volatile compounds of the raw material. As this is a very cold process, it yields very life-like renditions of materials. A Black Pepper CO2 smells distinctly like fresh cracked peppercorns, whereas a Black Pepper EO has some of that familiar piquant aspect, but is also very woody and floral.

WORKING WITH SCENT

WORKING WITH MATERIALS

When purchasing perfumery materials, they are usually bought in their undiluted form. In other words, the material is just itself with nothing else added.

Pure materials can be diluted in a solvent (for example ethanol, DPG, IPM, benzyl benzoate, jojoba oil, fractionated coconut oil, etc.) yielding a "dilution", sometimes also known as a "solution".

Working in dilutions is more efficient, cost-effective, and easier than working with the pure materials.

Dilutions thus allow you to save funds while experimenting, but they also help perfumers pick up on or make use of finer nuances of materials. A 1% solution of Guaiacol is a lot easier to use with finesse than, say, a 100% pure version of the same material.

Working with dilutions also has some pragmatic advantages: Just try getting a crystallized powder into a pipette and this will become obvious. Solutions also allow materials to blend more easily, saving you, for instance, from shedding frustrated tears when your powdery material and your thick resinous material don't get along. There's more to it than that (safety, sensitization, etc), but we'll leave it at this: You get the idea. Working in dilutions is a smart way to work.

Please note however that not all materials are soluble in all carriers, or will only be soluble up to a certain percentage. A proper solution once mixed, will not separate out into multiple phases.

LAB SAFETY: THE BASICS

Safety is absolutely key when working with aromatic materials. Though these are generally pleasant smelling chemicals, they are chemicals nonetheless and can do harm, if you're not careful.

Do not think that working only with naturals saves you from having to worry about safety: Many natural things contain deadly poisons (bitter almonds, for instance, contain hydrogen cyanide), and moreover can trigger allergies, sensitivities, etc.

Here are our very basic safety tips for working with scent. This is by no means meant to be an exhaustive list, so please do further research.

- Raw materials: Pure materials shouldn't be smelled directly from the bottle, for many reasons to do with fatigue and our delicate human bodies. If you need to check a pure material, it's best to smell the cap of the bottle - or better yet, dip a scent strip in it.
- Gloves and eye masks: Gloves should always be worn when working with the materials directly - such as with blending or making dilutions. Some, if left on the skin, can cause chemical burns. Eye masks are often added, for extra safety from unintentional splashes.
- Fire safety: Ethanol (also sometimes called Perfumer's Alcohol) is extremely volatile and highly flammable. Work with it in a well ventilated area, and never put it near flames or any electrical source. Also, never leave a container of ethanol open for an extended period of time.
- Materials disposal: Sometimes you make mistakes while blending or diluting - it's best not to toss your mistakes down the drain. Doing so may damage your personal piping or make the job harder of the treatment plant that takes care of your sewage. Place it in a stable container, and take it to a chemical treatment facility so that they may properly process and dispose of it.
- Spills: Spilled something? It happens all the time. If the spill happened on the table, close any open materials, clear the area, and take a moment to clean it up. If the spill happened on your body, wash yourself off immediately before addressing any other other spill-related concerns. And if the spill happened near your eye or – god forbid – in your mouth, immediately wash your eye and/or mouth out with water, and contact a doctor. But, seriously, don't keep your mouth near your blending station, ok?
- Human fatigue: If your nose is becoming fatigued,or if you're feeling weak and tired, just stop. Don't push yourself. This is not a football match, and pushing yourself won't make you a better perfumer. At the bare minimum of negative impact, you'll be unable to pick out the nuances of a fragrances. Smelling stamina comes with time so until then, take a break and allow yourself to recuperate.
- Skin safety, regulations, etc: We can't cover all the intricacies of skin safety, materials safety and regulations here, so please do your research. IFRA keeps an updated list of regulated

materials (and explains why they're regulated), and your suppliers will be able to provide Materials Safety Data Sheets (a.k.a. MSDS or SDS sheets).
- Note also that some materials benefit from the addition of anti-oxidants, which helps with shelf life and can help preserve the formulations, in addition to other important potential safety advantages.

PIPETTES, SCENT STRIPS, BEAKERS, OH MY!

Here's a basic run down of the tools most commonly used in perfume laboratories.

- Pipettes: Essentially miniaturized turkey basters, pipettes are used in the lab to transport liquids from one container to another in smaller, more precise amounts than simply pouring.
- Scent Strips: Sometimes called scent blotters, scents strip are nifty little pieces of paper cut in a peculiar shape to facilitate smellings of liquid scents. The thinner length of the strip is dipped lightly into the material, bent at the meeting point of the thin and wide lengths, and labeled with the material name on it's wide base. Essentially, you're creating a 45-degree angle with the material-soaked part in the air so that it isn't touching and contaminating your work surface.
- Scales: Any number of variations of scales can be used, depending on the intricacies of each perfumer's practice. At the IAO we use a digital scale that accommodates a minimum measure of 0.001 grams, and allows up to 200 grams of liquid. A scale that goes to 0.01 is acceptable, too!
- Beakers: Beakers are lab glassware that are heat-resistant and marked to show the amount of milliliters of fluid contained within it. Beakers are generally used to mix aromatics, or to make dilutions.

SMELLING STRATEGIES

Some techniques for sniffing on scent strips with minimal burn-out:

- The Bunny Sniff: Try small rapid short inhales: our brains are wired to respond to smell as an early warning system against danger and to know from a distance if something is edible or poisonous, if another creature is a threat or a potential mate...first impressions count.
- The Long, Slow, Gentle Inhale: This helps move the molecules differently over the scent receptors. You may notice a change in the odor from the beginning of the inhale to the end. Breathing in this way also keys you into certain stimulations of the trigeminal nerve. In addition to the odor, you may notice a touch-like sensation in the nose, mouth or face, from the soft tickle of a feather to a rough scratching of sandpaper. You may also find activation of your salivary glands, or other sensations.
- The Fly By: Try moving the strip in a slow sweeping motion across the width of your face. Airflow can have a pronounced effect on scent, and can help you to detect harder to smell materials.
- The Mouth Breather: Try opening your mouth slightly while smelling (especially helpful if your nose is congested). We smell as air passes from the nostrils up to the olfactory bulb, but also from the back of the throat upwards (this retronasal smelling contributes to a large portion of what we perceive as taste).

And some tips on how to optimize your smelling experience

- Humidify: our ability to smell is directly relational to moisture. In order for an aroma chemical to reach our nasal receptors, it must first pass through the nasal membrane. This membrane must be moist in order for this to happen. A quick trick to rehydrate and refresh your nose is to wet a paper towel with water, hold it to your nose, and inhale a few times. If you find you have trouble smelling, please consult your doctor for information on keeping your nose healthy and hydrated.
- Refresh: People often ask if smelling coffee beans can help refresh a tired nose...it is our opinion that effectiveness here is primarily psycho-somatic. We all have a limited ability to smell acutely before our sense fatigues. Smelling coffee beans is simply adding another stimulus to a system that can only handle so much! However, there is validity to smelling by contrast...if you have just smelled six floral perfumes, and then you sniff coffee beans, the contrast between the odors may feel refreshing. Just be mindful of your nose's need for rest. The best way to support your nose is to smell something neutral to you, like your own skin, clothes or hair (it's like your own personal scent version of white noise). Or, better yet, step away from the scented environment altogether and get some fresh air.

Remember, any kind of excessive inhalation has the potential to make you lightheaded. If you experience dizziness (or other symptoms such as headache or stomach ache) for pete's sake: Take a break immediately! Let these unpleasant sensations pass! And when you return to smelling, be mindful of not over-inhaling or otherwise overtaxing your system.

IAO BEST PRACTICES

Here are some helpful tips and practices to ensure that you work consistently and efficiently so you have more time to engage with your creativity:

- While there is nothing wrong working with drops - especially when blending in smaller amount - it helps to translate this over to weight at some point when finalizing your formulas. Dilutions, however, should always be done by weight and not volume.
- Save your blending trials even if you don't like them; blends can, and usually do, evolve over time - something you don't like today may become your favorite blend a week from now.
- Take notes of everything; you think you're going to remember it, but we can assure you (from personal experience) you won't.
- It's best to work in dilutions based off of powers of ten - e.g., 10%, 1%, 0.1%, etc. This way it's easier when you have your finalized formula and are blending with pure materials.

Lastly, remember that this is an art form. Although there are many proven ways to succeed, we believe that – other than being rigorous about health and safety for yourself and for the people who get to enjoy your work - there is no "correct" way to make an aromatic blend.

In other words (and again, excluding lab safety), what we've listed here are helpful tips, not words of law. So: Listen to your own instinct, do your research, take opinions with a grain of salt, and enjoy exploring this beautiful and vast aromatic world.

Don't forget to have fun along the way!