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Career of the Month

January 2004

Science in the Workplace

Perfumer

The bonds between chemistry and perfumery are considerable. To understand the whys and hows of perfumery—the interactions that occur within the nose and among the molecules within a fragrance itself—one must understand the essence of substances and how they behave in different conditions. But perfumery is not just a science, it is an art, and it allows Christophe Laudamiel (a fine fragrance-toiletries perfumer with International Flavors and Fragrances, Inc.) to creatively engage his passion for chemistry and fragrances. Laudamiel bottles inspiration and makes it tangible. Even people interacting every day with perfumers know little about how this transformation transpires.

What inspired you to become a perfumer?

My nose was unconsciously trained from a young age. Cooking in my family was always a ritual. We spent hours searching wild forests and mountains for berries, fruit, mushrooms, and edible flowers to make family recipes. Our garden itself bore an extensive collection of tulips and roses. I recall reading magazines and books on the 100 different varieties of heirloom apples in ancient France, the benefit of Orange Bigarade buds (terrible taste, great scent), and which tulip to plant where. Raised in France with this foundation of ingredients and fragrances, throughout my childhood I wanted to become a chef.

At age 14, I started chemistry classes in school. I became passionate for the subject—it encompasses everything one touches on this Earth. The study of matter and the changes it undergoes reminded me of cooking. But chemistry was no day in the kitchen; it was very rational and powerful. I went on to receive a master's degree in chemistry from Strasbourg, France, and then began an internship at Procter & Gamble in flavor chemistry (developing flavors with natural and artificial ingredients). Everything crystallized together. After a few months at the company, I was drawn to perfumery because of the greater variety of fragrance aromas (for example, musky, woody, floral, and ozonic scents). I received my perfumer-creator degree from Procter & Gamble in 1997 and became a senior perfumer there.

What does a perfumer do?

Perfumers tend to specialize in one of two categories: fine fragrance-toiletries or functional. Fine fragrance perfumers create perfumes for fashion houses (such as Ralph Lauren or Clinique). Functional perfumers design scents for products such as shampoos, detergents, and antiperspirants. Most fashion houses today do not have perfumers in-house, rather, different fragrance houses (such as International Flavor and Fragrance, Inc.) compete for the opportunity to create a product, much like interior designers make a design bid for a project.

A perfumer has several clients to compete for simultaneously. Each project involves creating a fragrance formula, be it for a perfume found in department stores or a detergent used to wash clothes. A formula contains 40 to 100 ingredients of both natural and new (manufactured) molecules. Designing a fragrance and combining the molecules is comparable to composing sheet music—writing it, playing it (for example, smelling it on various mediums and testing the diffusion of materials), starting afresh, reviewing it, and challenging it until both the creative team and client are pleased and the fragrance does the job. Some creations are very commercial, some more original; the inspirations differ as much as the clients' desires and dreams differ.

Participating in and leading strategy meetings with a laboratory (an entire lab is needed to support a perfume's creation) or clients is also part of the job. I must always keep my creativity and inspiration alive. Therefore, I study and research natural ingredients and new molecules to compare and evaluate them hedonistically (to determine how pleasurable or interesting a scent is) and for performance. Perfumers must also be well informed of fluctuations in supply or cost of materials. For instance, an Indonesian crisis created a drop in supply of patchouli oil, and the little oil available became outrageously expensive. There are no manufactured molecules currently available to replace patchouli oil, which contains in itself around 200 molecules.

How do you use science in your job?

A strong background in chemistry works miracles. The mystery and myriad of scents found in perfumes actually have very rational explanations based on concepts such as volatilities, Van der Waals interactions, hydrogen bonds, and chemical reactions between alcohols, aldehydes, and amines. My science knowledge is also useful when observing diffusion theories on paper, skin, and fabrics. A chemist-perfumer can more thoroughly participate in research programs with chemists to discover new molecules that result in innovative scents for the 21st century. I am actually one of the rare perfumers to have patents on manufactured molecules and new diffusion techniques.

The biggest challenge of perfumery is the lack of prediction. The explanations are always found after the facts. Traditionally, scents are classified as notes based on their olfactory character. Top notes are detected and fade first providing freshness (such as light scents that are usually citrus or wet greens lasting 5–30 minutes). Middle notes last sometimes a few hours and are the most prominent within the fragrance (usually combinations of floral, spicy, or fruit scents). Base notes give a perfume depth, last the longest, and are generally musky or woodsy notes. This classification of top, middle, and base notes designed to give a particular harmony is presently being challenged with a more exact approach.

In music, a "ti" note will always sound like a "ti," independently of the note played before and the one played after. This is close to impossible in perfumery. Even after 30 years of successful creations, experienced perfumers are down to trial and error when combining notes. This is explained by basic chemistry principles such as the second principle of thermodynamics. To predict the influence of a material in a mixture containing 60 other ingredients is difficult because of the real versus ideal chemical potentials in thermodynamics. The possibilities are endless, 1000 to 2000 scents are available to use in a fragrance, and they may be dosed at different magnitudes within the fragrance depending on the desired effect. Also, a molecule from one supplier smells different than the same molecule from another supplier due to the smallest amount of impurities derived from different synthesis routes or starting materials. In terms of natural molecules, a bergamot from South Eastern Italy smells different than a bergamot from South Western Italy. The nose, even a layperson's, is very sensitive.

The complexity and molecular design of chemistry triggering a scent perception in the nose is as elaborate as the chemistry necessary for a drug to trigger a response on a specific organ. Specifically, whether an isomer is cis, trans, or chiral is crucial because one structural difference of a molecular formula can completely change the olfactive or diffusive character; it could mean the difference between a vanilla scent and the odor in a dentist's office.

What educational background and skills are needed to be perfumer?

Today, a background in chemistry is often required to enter a perfume university program or a perfumery school within a fragrance company. The bottom line is to work hard to learn all the materials, train your nose, and learn how to create. Then, as in any art, a certain sensibility, curiosity, humility, passion, and some would say a little gift, is absolutely necessary to make a difference. Just like the ear, the nose gets trained with practice.

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