

The Living Library

The search for novel nature-derived fragrance and flavor notes

It takes me back home," says Subha Patel, surrounded by more than 500,000 square feet of rare and unusual aromatic plants in IFF's Union Beach botanical garden. "Instantaneously I am back home [in Kenya]. I smell my mother's garden. I have recreated my Nairobi here. At the end of the day, everything is about emotion. You see that vanilla orchid over there? Some of these plants take you back to your mother's kitchen, her cooking, her baking. This one smells like crème brulee."

For the past 30 years, Patel, director of IFF's nature-inspired fragrance technology, has parlayed her emotional and scientific passion for naturals into the exploration of new and novel notes for flavor and fragrance applications. "In today's world, we are looking for ingredients that can give market advantage," she says. Patel explains that when IFF founded its current naturals program in the mid-1980s, the industry was "not as close to nature as we wanted to be."



"At the end of the day, everything is about emotion," says Subha Patel, director of nature-inspired fragrance technology; Patel is pictured with Nicolas Mirzayantz, president of fragrances.

The Collection

IFF's botanical garden, a living library founded in 1990, boasts a collection of more than 1,500 plants—some of which date back to the 1960s—including more than 1,000 fragrant orchids. "They range from very sheer, very light, to very animalic," says Patel. "There could be a very gourmand note that could be used anywhere." The collection is a constantly evolving project assembled by numerous staff, notably the late naturals expert Braja Mookherjee. To this day, Patel and even some perfumers have returned from travels with the seeds of novel species that might one day bear a signature for a fragrance or flavor application.

The process of cultivation is predictably hit-or-miss: some species will not grow at all, while others can take several years to reach maturity. Meanwhile, there are prophylactic considerations—one diseased plant coming into the facility could undo years of work. Stepping into the greenhouse, visitors are asked to sanitize their

hands with a cloth. In addition, the greenhouse garden is constantly monitored by the nature-inspired technology team, including an on-staff botanist, to maintain proper temperature and humidity conditions, all of which are computer-controlled. Given the delicate nature of the library holdings, Patel's team is on IFF security's speed dial.

Reconstituting Nature

The greenhouse plants are routinely monitored to determine the moment at which their olfactive power is at its height. Headspace sampling can last anywhere from 15 minutes to overnight. The qualities of these samples are affected by temperature, humidity, time of day or season, age of plant, biorhythms, etc. The trapped scents are then reconstituted in the adjacent R&D labs using a combination of nature-identical and natural materials.

The process allows the chemists to capture very faint scents that can then be magnified for the perfumer's pallet. Patel explains that these reconstitu-

tions are used either whole or in perfumer-modulated forms in fragrance formulations, depending on desired effects. IFF senior perfumer Laurent Le Guernec explains, "You can use it as is or just a beautiful piece of it.

You can analyze 'what's that green note'?" In some cases, Patel adds, single molecules with interesting effects may be isolated, which the company's synthetic chemists can recreate for commercial use.

Senior perfumer Laurent Le Guernec formulated Christina Aguilera's Inspire using hydroponic freesia and gardenia (his favorite flower), combining Living Flower scents with natural extracts provided by IFF's Laboratoire Monique Remy subsidiary.



“Headspace really gives you the top notes,” says Patel. “It does not give you new molecules, but the relative ratio of each ingredient within the profile is very different.” The program allows IFF researchers to obtain natural profiles without harming the plant itself, a key facet when working to capture the essence of endangered plant species.

The program has netted more than 500 headspace-derived fragrances. The full library includes around 1,600 accords, but many of these are no longer permitted under European Union and/or International Fragrance Association guidelines. A number of these materials have flavor applications, particularly in imparting freshness or a point of difference.

Aromatic Plants

Each plant in the Union Beach collection is cataloged in a secure database with notes as to applications (personal wash, fine fragrance, flavors, etc.), botanical info and country of origin. The orchids are typically edible, though they tend to have a garlic or onionlike flavor rather than a floral profile. During a tour of the library holdings, which included such whimsically named specimens as Jacquelyn Thomas (from the Australian outback) and Dragonfly Puff (Venezuela), Patel and her team pointed out a wide range of unusual aromatic plants.

The blooms of a purple orchid from Venezuela impart a vanilla scent, though this is not the variety from which vanilla actually originates. Everything Nice First Love is a South American hybridized orchid that combines several Amazonian species. Perhaps the rarest plant in the collection, the Grecham orchid (Queen of the Night), hails from Madagascar. This endangered plant, like many white flowers, is most fragrant at night. *Catasetum expansum*, smells of mint, while the maroon-blossomed Chocolate Drop Kodama orchid hybrid from Brazil imparts a chocolatelike scent.

The Encyclia Nursery Rhyme orchid is a hybrid native to Latin America. The blooms impart a scent that is sweet, powdery and diffusive.



The yellow flowers of the ylang-ylang tree have a typical ylang scent, while the greener, younger buds have more of a cucumber note. Right before they fall off the tree, the flowers are said to have an almost scotchlike smell. This highlights the potential of sampling a flower at different stages of development—rosebuds will smell different when they first open than when they’ve matured.

The noni plant (*Morinda citrifolia*) produces a fruit that is high in antioxidants. Already popular in Hawaii and Asia, this could prove to be the next superfruit. Patel’s tour also includes plants such as hydroponic lemon (many of the botanicals in the greenhouse are hydroponic), lantana leaves, cashew nut flower and a gardenia with nutmeg notes.

The Romance of Flowers

Patel explains that, by taking two distinct plants and growing them side by side under the canopy of a flask, her group can achieve new and different variations of fragrances. This manipulation of proximity for olfactive effect is known within the company as the Romance of Flowers.*

These experiments, which can involve three or more plants at a time, feed off of the biological interaction between botanicals. Patel’s group has combined elements such as ginger lily and spearmint, or two varieties of roses, to create these novel scents. “There’s an energy transfer,” says Patel. “The molecules don’t change—the ratios [of components] do. Osmanthus is a very tiny, very peachy, fruity [flower], but when you put it with rose, it takes over. Osmanthus has tremendous power around other flowers.”

If Patel’s team members detect something worth capturing based on these interactions, they examine it analytically. “This is a natural way to create a unique combination,” she says. “It’s like a bouquet.” Sometimes, she adds, it’s about finding background fragrance materials—some of which might be unpleasant—that will add depth and character to final applications. Le Guerneck points out that he formulated Christina Aguilera’s *Inspire* using hydroponic freesia and gardenia (his favorite flower), combining Living Flower scents with natural extracts provided by IFF’s Laboratoire Monique Remy (LMR) subsidiary (which is celebrating its 25th anniversary this year). He adds that touring the greenhouse can prove invaluable to perfumers and their clients—even for the most mundane materials. “Sometimes you may forget a side of a flower,” he says, recalling the velvety raspberry notes in flowers he had at one point forgotten.

The Flavor Factor

Patel’s team shares its data not only with perfumers, but also with flavorists, particularly in the area of tea. She mentions an occasion in which she presented a honeysuckle flavor to some Chinese customers who, used to flavors based on dried honeysuckle buds, were at first perplexed by a Living Flower reconstitution of the fresh buds. “They had never seen honeysuckle flowers the way we had.” After her presentation, she says, “Then they wanted the true honeysuckle in their products. So we gave the flavorist our formula to work it out.” Patel notes that

* Romance of Flowers is a trademark of IFF.



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flavor customers tour the botanical gardens, for instance looking at white, green and floral varieties of tea. “When you look at all the varieties out there, it’s the floralcy plus the tea and you get that data to flavorists,” a process IFF calls Living Flavors.** “When you open the package, you get the true feel [of the named food]. We put the top notes back in.” Oral care, too, is a focus for the program; specifically mints and cinnamon, are in the oral care category.

“There is a fine line [between flavor and fragrance] and it does cross over,” Patel adds. “For some of the work flavorists create—gourmet products—our perfumers will approach the flavorists who will share formulas so the perfumers can put them in a fragrance.”

Smelling Session

“The use of naturals in fragrances often gives them a point of difference,” says Matt Frost, IFF’s global marketing director of fine fragrance and beauty care. That difference, he adds—subtle or not—results in repeat purchases by the consumer. One need only look at the many fine fragrances with high natural profiles that have proven staying power on the market. Frost is quick to point out, however, that companies with a serious stake in naturals must take a long view as some materials, such as orris, can take about five years to produce. Meanwhile, partnering with local growers in a fair trade context can mean payouts for crops that aren’t always needed.

“I love naturals,” says Clement Gavarry, IFF’s perfumer liaison with IFF’s LMR.*** “If I can afford them [in my



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costing out of a formula], I’m going to use them. They’re beautiful, a big asset for fragrances. You just need a few drops to make a difference.”

During the discussion, Gavarry passes around blotters of several materials, beginning with rose oil and absolute. “The oil is very fresh, a little bit greener, airy, volatile,” he says. “The absolute seems to be more rich and bitter—more like the heart of a flower.”

“Narcissus is a very unique flower,” he says, passing around samples of a molecular distillate (MD) of narcissus absolute. “It was used a lot in the 1950s and 1960s ... It’s not as feminine [as other florals]. I like to use it in masculine fragrances to give that floral connotation. It blends very well with mimosa, tuberose, white flowers like jasmine.”

Next up is jasmine sambac absolute from India, which was featured in *Armani Code*. “This variety is a little greener and more animalic and indolic.”

“This is part of the amber notes in [the original] *Prada*,” Gavarry explains, handing out tonka bean absolute. “I wish we could use it more, but it’s quite expensive. You don’t need a lot. If you mix it with coumarin, it gives you a very natural effect, a nice creaminess.”

Gavarry passes around blotters of mandarin oil MD and vanilla Bourbon CO₂ extract, explaining, “Molecular distillation is great for citrus because orange and bergamot [for example] have a lot of color. It’s nice to use a colorless version [for water-white formulations].” These types of formulations, Frost adds, are increasingly sought out by clients around the world.

Next up is osmanthus absolute from China, a material with flavor applications. “It has some apricot notes, a rich, deep flower scent,” says Gavarry. He follows this with a patchoulol heart, a fractional distillation that represents one of LMR’s biggest successes. “This is a key part of [the original] *Prada*, part of the amber note,” Gavarry says.

The company’s efforts for sustainable and fair trade with local growers are highlighted when Gavarry passes around blotters of ginger CO₂ from the Ivory Coast. “Sometimes when you get a bad quality of ginger it can

** Living Flavors is a trademark of IFF.

*** Gavarry’s father, Max Gavarry, a *Grasse* perfumer with a rich naturals background, spent many years working with LMR in Grasse, France.



"Naturals are beautiful, a big asset for fragrances," says perfumer Clement Gavarry. "You just need a few drops to make a difference." Gavarry is pictured with Veronique Ferval, director of IFF's New York creative center.

get a little bit fishy, or like a cheap lemon," he says.

Next to be handed out is a black-currant HFC cold extraction. "It's a much cleaner blackcurrant absolute," says Gavarry. "With typical blackcurrant you have that sulfuric note on top. Here you keep that nice, fruity cassis note."

As the basil verbena oil is passed around, Frost explains that the company, in the search for new materials, collects about 100 samples of essential oils a year from around the world. The viability of the materials is then assessed via fragrance aesthetics (perfumer's perspective) and agricultural requirements (sustainability perspective). Likely less than 5% of gathered materials will pass these qualifications. This basil verbena, which has more of a citrus than basil character, is grown in Vietnam by local farmers. "It's very nice when you mix it with citrus oils," says Gavarry. "It adds some freshness on top that will last all day."

Finally, Frost passes around bottles of the limited edition scents Givenchy *Very Irresistible* and Givenchy *Organza*. He explains that they provide a window into how brands are marketing naturals to consumers. *Very Irresistible* and *Organza* are "vintages" in that they each highlight a single specific crop that has been selected specifically and exclusively for these scents. *Organza* features a jasmine absolute from Egypt's Nile Delta. *Very Irresistible*, meanwhile, features a damask rose from

Morocco, which Frost says was a very cold harvest year. The unique conditions led to rare effects.

"The fact that they're promoting the natural to the consumer as an ingredient ... highlights the beauty of the natural material," says Frost. "There is a justification as to why this is special."

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