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SCAN ME

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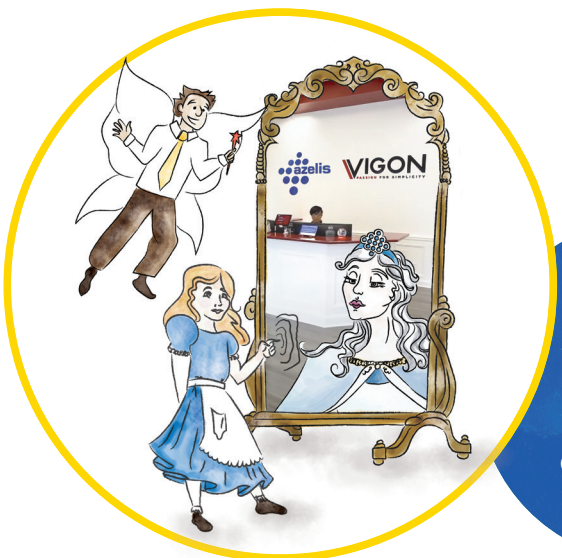
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Emerging Trends Driving Innovation in Fragrance



The June 2023 issue is dedicated to highlighting the latest in fragrance innovation.

Tech innovation in the fragrance realm has been among the top headlines. From digital technology debuts to functional fragrance reveals, readers are itching to know what the future holds for the industry and what strides are being made by key players.

According to Mintel Global Beauty analyst Clotilde Drape fragrances will have to adapt to new macroeconomic contexts by offering escapism and driving value perceptions.

Drape explains, "Climate change will impact ingredient quality. Fragrances still lag behind other categories in terms of sustainability, and for longevity in the category, brands will need to go beyond sustainable packaging. Lab-grown, synthetic and molecular ingredients have the potential to remedy the sourcing and extraction of scarce natural resources while rethinking formulations as a whole could offer new ways to tackle the sustainability issue."

The June issue is dedicated to highlighting the latest in fragrance innovation. In the pages ahead we've tapped industry experts to weigh in on updates in fragrance technology, trends and a deep dive into neuroscience. *P&F+* has also asked the International Fragrance Association (IFRA) to discuss the impact of climate policy on the F&F palette (page 36).

Flavorcon 2023

Have you had a chance to register for *Flavorcon* 2023 yet? Be sure to visit *www.flavorcon.com* to secure the best rates for your ticket to the two-day event scheduled for November 8-9 in Cincinnati, OH.

Unfamiliar with the event? *Flavorcon* is hyper-focused on sensory and taste solutions for flavor chemists and flavored product innovators across all applications. This niche event is the only place where flavor chemists and product developers convene to learn, discuss, collaborate and network with their peers. Prepare for a lineup of fresh sessions, speakers and expo hall wares. Discover more about the upcoming event on **page 32**.



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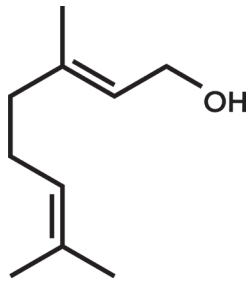


Being pioneers in biotechnology and experts on natural lactones, Mane created Melbatone (FEMA# 2360, CAS# 706-14-9). This EU natural molecule has a delicious aroma of peach and whipped cream with nutty undertones, ideal to enhance the taste and aroma of various products such as baked goods, candy and beverages.

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Indesso Aroma

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While possessing the typical brightness of many lily and iris flowers, Mugetanol (CAS# 63767-86-2) brings a gleaming and radiating effect in the world of flowers. A perfect candidate for richness, body and volume, wherever it requires performance and stability.



2-Acetylthiazole, Natural

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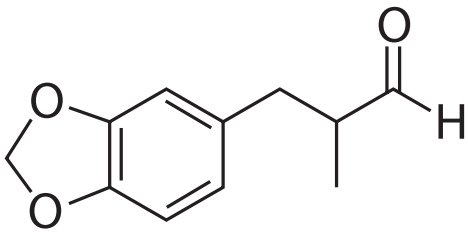
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Now offering 2-acetylthiazole, natural (FEMA# 3328, CAS# 24295-03-2, JECFA# 1041). Containing a flavor base as nutty, cereal, hazelnut and popcorn. Odor notes corn chip with a bready nuance. Our material is food grade, kosher, halal and EU and U.S. Natural. Custom dilutions are also available in a variety of diluents.

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α-Methyl-3,4-methylenedioxy-hydrocinnamic aldehyde (FEMA# 4599, CAS# 1205-17-0). It features a fresh floral odor with melon top-note. Suggested applications include fine fragrance, personal care, fabric care and home care.



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Linalool Natural ex Bois de Rose

Berje Inc.

www.berjeinc.com/products/aromatic-chemicals/linalool-natural-ex-bois-de-rose/

Linalool Natural ex Bois de Rose (FEMA# 2635, CAS# 78-70-6) imparts a light and floral aroma with woody and citrusy undertones. The material offers the same benefits and versatility of common linalool, though it maintains a natural status and contains some of the pleasant underlying qualities of rosewood oil.

Citral, Natural

Aurochemicals

https://www.aurochemicals.com/

Calling all lemon lovers! There is nothing better than the fresh taste of lemon to perfectly balance your favorite treats. Citral, natural (FEMA# 2303, CAS# 5392-40-5; 106-26-3; 141-27-5) is a must-have for all your citrus flavorings needs. Its strong, fresh citrus characteristics work well in many products including candies, dairy products, beverages and baked goods.



Bergamot FTNF Citrus Spark

Agrumaria Reggina Srl

https://bit.ly/masterofcitrus

Bergamot FTNF Citrus Spark is obtained from bergamot essential oils and extracts. Our extraction technique allows us to capture the essence of fresh bergamot, offering unique taste and aroma. It is suitable for food and beverage applications, to fortify traditional flavor extracts with a sparkling bergamot note.

Givaudan x IFRA UK Create Smell & Tell Mood Boosting Memory Game

Givaudan and the International Fragrance Association Foundation UK (IFRA UK) worked together to develop Smell & Tell, a two-in-one mood-boosting game, comprising a board and memory game, that has been designed to be played by care home residents with varying abilities.

Smell & Tell falls under the umbrella of an initiative created by IFRA UK called Changing Lives Through Fragrance, which brings together people from across the industry to highlight and promote the importance of our sense of smell. This year the focus of the program is on well-being and dementia.

A YouGov survey commissioned by IFRA UK showed that two-fifths (42%) of UK adults value their sense of smell more now than they did three years ago, pre-pandemic. It also revealed that for 60% of UK adults the main feeling evoked by their sense of smell is nostalgia.



The game uses fragrances as a conversation stimulus, and each scent has been carefully selected to remain familiar to UK residents, sparking memory and creating a moment of pleasure.

How It Works

The game uses fragrances as a conversation stimulus, and each scent has been carefully selected to remain familiar to UK residents, sparking memory and creating a moment of pleasure. Smells associated with food such as chocolate, toast and cinnamon feature, along with location and situational-based smells.

Solène Cauvin-Wirz, Oral Care flavorist and Zoe Cogger, Oral Care marketing manager from Givaudan came up with the idea, after seeing the impact that isolation during the pandemic had on close family members who were residents in care homes. They created the game as a way to stimulate people's memory and as a way for them to interact and have fun. After a successful pilot, they were awarded funding to professionally manufacture 500 games from the Givaudan Foundation, whose mission is to make a difference within the communities where Givaudan sources and operates. The games will be donated to care homes in Kent, Surrey and Greater London this spring.

Rhian Slee, UK Fragrance Sales director at Givaudan and chair of IFRA UK said, "The COVID-19 pandemic really highlighted to us how important our sense of smell is and how not having a functioning sense of smell can really impact on your life—sometimes leading to feelings of isolation and depression.

Yet our sense of smell is vital to our well-being because the olfactory receptors in the nose connect us directly to areas of the brain that create memories. That's why our sense of smell is so important to our well-being and to feeling connected as it links us to familiar aromas evoking feelings of nostalgia. We are delighted to have developed Smell & Tell through the Givaudan Foundation as we hope it is going to bring a sense of connection and enjoyment to the people in the care homes we are able to supply it to."

Alison Knight, front of house receptionist and the Lifestyle Activity coordinator from Park View Care Centre, Ashford, Kent shared, "This game is really good for all our residents whether they are mobile or not. The reactions of our residents when they smell something they recognize is priceless. We have had a lot of fun with the game!"

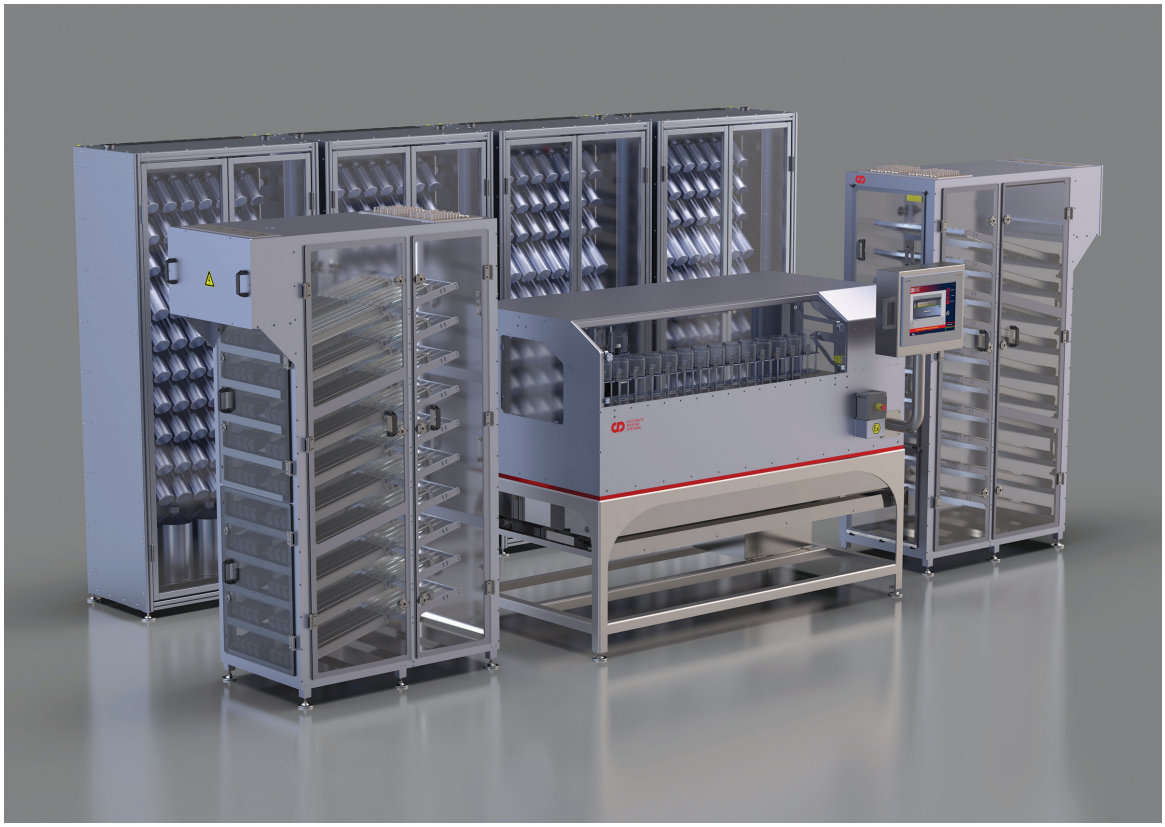
Ninety-six-year-old, Jean Downey said, "A very interesting game, which I thoroughly enjoyed. I think it will help people to converse with each other more."

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ADS Lands Contract to Provide First Hybrid Dosing Robot to Firmenich



The high-tech robot is designed to automate the process of accurately measuring out hundreds of flavoring solutions, which go on to determine the taste profile of food and beverages.

Australian-based automation company Accurate Dosing Systems (ADS) has landed a key contract with Firmenich, to supply and service a purpose-built robot for its creation lab in Belgium.

The high-tech robot is designed to automate the process of accurately measuring out hundreds of flavoring solutions, which go on to determine the taste profile of food and beverages.

The Tonsley Innovation District-built robot will include hybrid technology, combining two different methods of dosing that are said to ultimately achieve faster speeds and a higher automation rate.

ADS co-founder and managing director Masoud Bahmai said his business was one of just five companies in the world offering the specialized dosing technology, allowing scent and flavor formulas to be compounded on the machine in minutes instead of hours.

"The hybrid technology will be the first dosing robot in Firmenich's Taste & Beyond flavor division," Bahmai said. "Usually our competitors do either gravimetric or volumetric dosing but by offering an optimized combination we can now meet the demands of mid-to-large-size operations that often need speed [of processing] and high automation rates."

The hybrid robot is also said to reduce Firmenich's use of plastic pipettes during its trial and testing phase.

"As a part of our ongoing commitment to sustainability and ambitious ESG commitments on nature and climate, we are constantly striving for ways to reduce our environmental impact. We are dedicated to deriving the best from nature sustainably", Annemarie Steffl VP of Eurotech Taste & Beyond at Firmenich said, "This new digitalized dosing system will allow us to achieve an even greater level of precision, efficiency and speed, while eliminating raw materials waste and enhance our ability to provide precise value chain data to our customers."

Moodify Launches First AI-based Algorithmic Malodor Control Application

Moodify has announced the official launch of its Moodify White software solution for malodor control. Said to be the world's first artificial intelligence-based (AI) algorithmic malodor control formulation application, Moodify White is designed for masking bad smells that enable a quick, highly effective and component-flexible malodor control formulation process.

Moodify White is designed to be utilized by a wide range of industries, including home care, personal care, household and industrial product manufacturers.

The application was developed based on 15 years of academic research and development of Moodify's AI-based algorithms, which are said to select the best combination of odor neutralizers, creating a customized formula matching the target customer's malodor requirements.

Moodify CEO Eyal Maor shared, "We are extremely excited to launch this innovative solution at in-cosmetics Global 2023. Our customers who already receive help from Moodify White generated formulas, are reporting the significant impact on the efficiency to mask malodors. Our advanced technology and commitment to delivering high-quality solutions make us a trusted partner for companies looking to enhance their customers' experience. With Moodify, bad smells are no longer a problem."

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Moodify White is designed to be utilized by a wide range of industries, including home care, personal care, household and industrial product manufacturers.

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Firmenich Names Steve Guo as Fine Fragrance Perfumer

Firmenich has named Steve Guo as a perfumer to its Fine Fragrance team in China.

With nearly a decade of experience in the industry, Guo was born in Beijing and moved to France to pursue a bachelor's degree in Chemistry at the University of Strasbourg and a master's degree in Engineering of Cosmetic, Flavors and Fragrances at the University of Montpellier 2. He trained in Grasse then moved to Paris, staying for three years working as a perfumer, and relocated back to China in 2021 before joining the Firmenich Fine Fragrance atelier in Shanghai in 2023.

In 2017, Guo created Chypre 24, his fragrance that won The International Perfumer's Prize, a competition organized by the Société Française des Parfumeurs (SFP). First established in 1957, the prize recognizes a perfume whose olfactive form is distinguished by its original character.

"In our continuing efforts to elevate creativity in the perfume industry, we are very happy to welcome such a talented perfumer to our Firmenich Fine Fragrance team in our Shanghai atelier," said Jerry Vittoria, senior vice president, Fine Fragrance. "Steve's knowledge and insights on the perfumery market in China, the highest growing region in terms of rising local brands, will give added value to our clients. It will also reinforce our pioneering leadership in this market, since we opened our Fine Fragrance atelier in Shanghai in 2019."

"He is our first Chinese fine fragrance perfumer who has worked in both France and China," shared Olivier Viejo, vice president, Fine Fragrance. "We have big plans for China involving future ingredients capabilities, immersive collaboration and co-creation opportunities for clients. He will be a strong asset for the Shanghai team, reinforcing the company's expertise with international brands that prioritize China."



Steve Guo shared, "It is such an honor for me to join the roster of exceptional perfumers at Firmenich and take part in fulfilling the company's creative vision."

Guo shared, "It is such an honor for me to join the roster of exceptional perfumers at Firmenich and take part in fulfilling the company's creative vision. Firmenich is known for its industry-leading palette of ingredients and I am very excited to explore all these new possibilities in fragrance creation."

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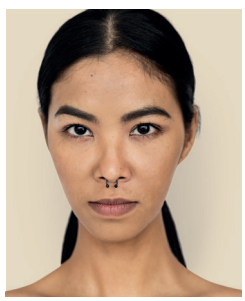
BE YOURSELF:

Trend concepts for a generation who believe in the power of self-fulfilment and self-presentation

Recognising your own true self, working towards it and presenting it with self-assurance – for young people in particular, these things are increasingly important. They don't want to be a tiny cog in a vast machine; instead, they aspire to be a complete and self-contained individual. Düllberg Konzentra has translated this groundswell into a new trend concept titled "Be yourself an original is worth more than a copy".









My house, my car, my yacht - a rapidly growing number of young people are turning their backs on these traditional status symbols. Instead of dreaming of a conventional career and a top salary, they are choosing to focus on a rewarding, meaningful life - one in which they set the goalposts. The generation of 25-34-year-olds in particular is pursuing this dream and fusing it with entrepreneurship that is driven by their personal passions. For example, they channel their imagination and passion into their own Etsy shop, a blog, a podcast or a YouTube channel.

This shift has been driven by the pandemic, explains marketing expert Lisa-Marie Achilles of Düllberg Konzentra: "In the past few years, flexible working models have emerged and the borders between work and leisure time have become fluid, particularly when working from home. Access to digital tools and resources offer us new options to create something, to present ourselves and our achievements and market them." For instance, it's easy to build a creative portfolio on Instagram, open a virtual store with Shopify without the expense of actually renting bricks-and-mortar space.

Self-presentation often goes way beyond the actual, 'real' status. People are using online media to express how or what they would like to be, bridging the divide between fantasy and reality. This fearless understanding of one's own identity, inspired by popular superhero characters, can be a great way of bringing your hidden inner self out into the open, ideally allowing you to grow into this ideal self by fusing fiction and reality. It's an exciting journey, one that Düllberg Konzentra wants to support with its new "Be yourself" trend concept. The new concept comprises five innovative and highly individual fragrances based on strong perfume oils and are ideally used in shower gels.

Be Brave

Be Brave is a sensory blast of motivation, and combines gourmand aspects with woody and balsamic notes; it is appetisingly euphoric thanks to lemon and tonka. Also included in the fragrance universe are vanilla, caramel, cedarwood, woody ambered notes and musk.

Be Yourself

Be Yourself is flowery, woody and sensual, opening with bergamot, mandarin and ginger, moving to gardenia in the heart and ending on vanilla and oakmoss. Other notes include tonka and sandalwood.

No Fear

No Fear is woody, spicy and aromatic. Here, mandarin, pink pepper and cardamom open up into heart notes of geranium and lavender, finishing with patchouli, cedarwood and ambergris singing together in a fearless finale. Also features marine notes and sandalwood.

Individual colours underscore the concept and signal self-assurance

To tie in with the expressive fragrances, the colour world of Be yourself is bold and very individual: dark natural shades from brown to dark red to aubergine and forest green make a strong statement in the shower gel segment. This means that the corresponding products, and their users, guaranteed to stand in the spotlight!

Start-up Scent No. M Creates Lab-developed Microbial Fragrance Oils

Researchers from the University of Glasglow have launched a start-up, Scent No. M, to create lab-developed essential oils–free from animal and plant extracts, for perfumes, scented candles and other products. The start-up's mission is to improve the ethics and sustainability of the fragrance industry.



The start-up business followed a conversation about how some friends have particularly appealing natural scents, due to the reactions of commonly occurring human bacteria.

Supported by the Industrial Biotechnology Innovation Centre (IBioIC), the start-up business followed a conversation about how some friends have particularly appealing natural scents, due to the reactions of commonly occurring human bacteria. A prototype microbial fragrance oil is now being developed, which could be widely used by the fragrance industry.

The bacteria used as part of the process are non-genetically modified organisms (non-GMO), which is believed to be a first for the industry. Studies show that consumer purchasing decisions are increasingly informed by ethical and sustainability concerns. Unilever recently reported that its purpose-driven brands are growing at twice the rate of other product lines.

The team behind Scent No. M received £20,000 of funding via the first IBioIC-backed award at the 2022 Converge Challenge, as well as support from the innovation center's scale-up and business development experts to turn the concept into a commercial reality.

Hua Wang, Ph.D., co-founder of Scent No. M and research fellow at the University of Glasgow said, "Many people don't realize that even though the fragrances found in perfumes or cleaning and beauty products come from natural sources, they may in fact be derived from animals–such as whales, deer and bees–and plants farmed specifically for the supply chain. We saw an opportunity for an alternative which doesn't rely on depleting natural resources and can instead be developed in a lab. It is still a natural product; it is just a new approach to harvesting aromas.

"There could also be additional benefits for people who tend to react badly or find traditionally- fragranced products irritating. Our microbial alternative may be much kinder on the skin. The project is still at an early stage, but we are excited to see how the prototype could lead the business to grow, perhaps to include our own fragrance line in the future."

Liz Fletcher, director of business engagement at IBioIC added, "This project is a great example of how lab-based biotechnology could be used to modernize and transform an entire supply chain. We are seeing more and more exciting opportunities where scientific expertise and research is providing new avenues for manufacturing a wide range of products and materials in Scotland. In Scent No. M's case especially, it could lead to the production of more fragrances under controlled, reliable environments, offering greater reliability and resilience compared to current methods."

Solvay Partners with Ginkgo Bioworks Expanding R&I Footprint in the United States



Ginkgo Bioworks is an American biotech company that specializes in using genetic engineering to produce bacteria with industrial applications.

Solvay has announced a multi-year collaboration agreement with Ginkgo Bioworks to utilize synthetic biology to accelerate the development of new sustainable biopolymers. Ginkgo Bioworks is an American biotech company that specializes in using genetic engineering to produce bacteria with industrial applications.

This partnership is designed to strengthen Solvay's position in biotechnology as part of the Renewable Materials and Biotechnology growth platform which aims to meet the growing demand for sustainable solutions by increasing the share of renewable carbon in Solvay's product offering and developing new business opportunities enabled by biotechnology.

Partnership highlights include:

- Solvay will acquire a Ginkgo (formerly Zymergen) laboratory in Cambridge, Massachusetts.
- Expand Solvay's R&I footprint in the U.S. and establish a sustainable growth base in synthetic biology.
- Solvay will integrate deep competencies in bioinformatics/data science, strain engineering, biocatalysis and fermentation processes, strengthening and accelerating the ability to scout, develop and turn into businesses the most valuable biotech-enabled opportunities.

Solvay CEO Ilham Kadri shared, "We're thrilled to make this important investment and to partner with Ginkgo Bioworks on an exciting project to develop sustainable chemicals and materials, allowing us to provide innovative biotechnologies to new markets. Biotech is the future and this step is an important milestone for our growth platform. We expect to leverage our new presence in the Boston area to step up and accelerate our offerings in this field."

Ginkgo Bioworks CEO and cofounder Jason Kelly added, "We're so excited to welcome Solvay to our platform and to the Boston area at such a pivotal growth period for both of our companies. In our case, it's fantastic to be able to integrate platform capabilities from Zymergen and make them accessible to our partners so quickly. Synthetic biology can help companies across a wide breadth of markets reach their environmental and economic goals at the same time, and it's thrilling to work with a partner taking such a big swing at sustainability."

PROFILES:
FANNY JACOT-BLAIS and SERGE OLDENBOURG

Fanny Jacot-Blais, flavorist

***Perfumer & Flavorist+* [*P&F+*]: What led you to the flavor industry?**

Fanny Jacot-Blais [FJB]: I guess I have to thank my mother for that! In school I was always interested in science but wasn't sure what to do after my bachelor's degree. Although no one in my family had ever worked in the food industry, my mother would always know where to find the right information being that she was a journalist. She once got me a special edition of a magazine entirely dedicated to different jobs linked with chemistry studies—which was how I discovered the flavor industry. I was immediately very excited by the idea of bringing together science and food so I applied for a master's degree at ISIPCA and ultimately graduated in 2011.

***P&F+*: What applications do you primarily formulate for? Do you have a favorite?**

FJB: I am a cross-category flavorist but at the moment I primarily formulate for beverages.

My favorite application to work on is functional or better-for-you beverages. This category of product focuses on health and wellness as well as low-to-no sugar which is right up my alley. I have always thought that beverages on the market are way too sweet or sweetened and should do more than *just* hydrate.

The range of possible flavors for this application is very wide and definitely not boring. Food pairing is one of our specialties at Argeville. I enjoy using punchy fruit flavors like citrus and tropical fruits mixed together, or in combination with spices, flowers, herbs and other botanicals.

***P&F+*: How has the job of flavorist changed during your career?**

FJB: The job of a flavorist can have multiple aspects depending on the type of products you formulate for. I started my career studying the different notes of processed cheese and then moved on to developing seasonings for snacks like crisps (chips) and popcorn. I then worked for a flavor house doing both sweet and savory flavorings for a wide range of applications like dairy products, baked goods, confectionery, hot and cold drinks, soups, sauces, prepared meals, etc. I don't formulate for savory flavorings anymore, but I definitely gained a lot of knowledge in this field which I still use when formulating for sweet applications. Five years ago, I discovered the challenging and fun world of next-generation tobacco products. Who knows, maybe in a few years' time I'll be formulating flavorings for oral care products or pet food. Change is constant in our industry.



Name: Fanny Jacot-Blais

Title: Flavorist

Location: Mougins, France

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***P&F*+: What is the best part of your job?**

FJB: It's going to sound a bit cheesy, but I would say that the best part of my job is to be able to trigger emotions in people. It's quite a powerful thing to make someone travel back in time to a childhood memory or travel to another place in the world. It's also very special to be able to change someone's mood whether the person needs to be energized before going to the gym or to relax after a long day at work.

In my opinion, food is an experience in itself, on the same level as listening to music or watching a film. It doesn't have to be grand every time but it can affect you deeply.

***P&F*+: Advice for people coming into the flavor field.**

FJB: My number one piece of advice, which is a bit of a given in this industry, would be to try as much different food from around the world as you can. You don't even need to take a plane to do so as we are lucky enough to live in a world where exotic culinary experiences are right in our grocery stores and local eateries. I am still working my way through the 94 flavors available at my favorite ice cream shop!

Serge Oldenbourg, senior perfumer

***P&F*+: What led you to the fragrance industry?**

Serge Oldenbourg [SO]: I would say pure luck! I had just quit university and was relieved of military duties. My wife was pregnant and I was looking for a job; any kind of job would have been satisfying. At that time I was living in Grasse, in the south of France—you know the capital of perfumery—but since none of my family was involved in the fragrance industry, I knew absolutely nothing about perfumery. It was pure luck that I found a job as a lab assistant at Robertet.

While I was studying, my main interest was math. So you can imagine how I felt when I discovered the work to be done as an assistant of a perfumer had nothing to do with any scientific work. I remember coming back home after my first day of work and telling my wife, "There is no science, I will be out within six months!" That was 48 years ago.

Again I was lucky to work for a senior perfumer with a chemistry background, polyglot and very open to showing and guiding me in the field of perfumery. Of course, located in Grasse I cached a lot of information about natural materials, their production, composition and usage in formulations. Besides, I have always been interested in the chemistry that is applied in the F&F industry.



Name: Serge Oldenbourg

Title: Senior Perfumer

Location: Germany

The senior perfumer I was working under became very busy traveling and during his absences he asked me to sort of take over when projects involving his formulas had to be worked out for the price or regulatory reasons.

Then I left to work for Dragoco, first in Paris, then in Hong Kong and Tokyo and finally in Holzminden, Germany.

I then joined Haarmann & Reimer (also in Holzminden), which then merged to form Symrise. Since I knew both companies very well, I transitioned into a role in fragrance parts.

Now that I am retired, I consult for Aroma Chemical Services International (ACS International). I also engage in the development of the International Society of Perfumers-Creators (ISPC) which is assembled of creative perfumers from around the world.

***P&F*+: Describe yourself in three ingredients.**

SO: I would say I love working with musks, especially those that are completely renewable. But I prefer to talk about accords rather than about single materials. In a formula, one single component may give a "twist." The basic accord is

essential—it is the real personality of the fragrance and must fit with the wearer's mood. For me, the most interesting accords are chypre (for both masculine and feminine fragrances), spicy (when coupled with cold green or woody cologne) and balsamic as ever-support for exotic dreams. To be more precise, I love L'Heure bleue (Guerlain), Diorissimo (Dior) and Antaeus (Chanel).

***P&F+*: Advice for people coming into the perfume field.**

SO: Be patient! Working hard and long may not show immediate effects. You will face a lot of difficulties (one of the most painful being the sentiment of loneliness), but with patience, open-mindedness toward people's feelings and a lot of empathy for fragrances, you will discover, learn and practice a wonderful artistic craft. Wishing you all a good journey!

***P&F+*: How has the job of a perfumer changed during your career?**

SO: As I look back, of course, it looks like the job has changed dramatically—but tell me which job has not in the last almost 50 years?

Many perfumers are complaining about prices, but that is not new! The improvement in technical requirements, olfactive stability or strength exigencies, have also become stronger but it is part of the technical knowledge of the perfumers.

New materials have appeared which opened new olfactive areas and the "overdose" turned out to be more accepted by the consumers.

For the perfumer, the main changes were to adapt to the regulatory aspects of their fragrances—which is a good thing as fragrances have to be as safe as possible for the consumers and looking for good/renewable fragrance materials.

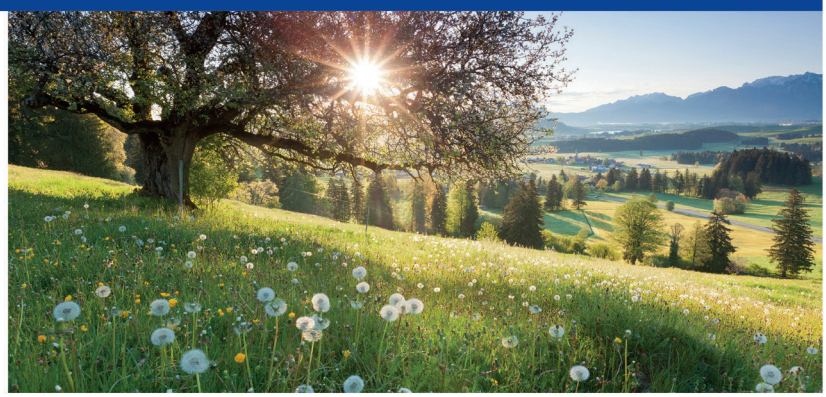
***P&F+*: What is the best part of your job?**

SO: Discover and then integrate! New materials and different cultures force you to think and formulate differently. This opens new views on creation.

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Ethyl hexanoate has a pineapple odor, but it cannot stand alone in pineapple flavors.



BY JOHN WRIGHT
johnwrightflavorist@gmail.com

Flavor Bites: Ethyl Hexanoate

Ethyl hexanoate in tropical, berry, orchard, fermented and other flavors.

Ethyl hexanoate (FEMA#: 2439, CAS#: 123-66-0) strikes me as an attractive raw material, but one inevitably associated with a modicum of disappointment. That mixed sentiment dates back to my early days as a flavorist, trying to make nature-identical pineapple flavors before allyl hexanoate was recognized as nature identical. Not really a fair judgment. Ethyl hexanoate has a pineapple odor, but it cannot stand alone in pineapple flavors. It is, however, invaluable in many different combinations with other esters. This conclusion holds for an extremely wide range of other flavors.

Note that the dose rates given throughout this article are the levels suggested for use in flavors intended to be dosed at 0.05% in ready-to-drink beverages or in a simple bouillon.

Tropical Fruit Flavors

Acai: Ethyl hexanoate only plays a modest role in acai flavors, but 50 ppm is helpful.

Cherimoya: The effect of this raw material in cherimoya flavors is much more obvious. Levels can vary, but 600 ppm is a good place to start.

Durian: Similar comments apply to durian flavors. Ethyl hexanoate works well in combination with ethyl 2-methyl butyrate at levels of addition around 1,000 ppm.

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Guava: One thousand ppm also works well in guava flavors, cutting through the heavier cinnamate esters.

Jackfruit: Jackfruit flavors have some similarities to durian flavors and ethyl hexanoate works equally well. The level can be raised a little, to around 2,000 ppm.

Kiwi: If durian and jackfruit flavors are at one end of the aggression scale, kiwi is at the other. Two hundred ppm of ethyl hexanoate works well in this subtle profile.

Lychee: Lychee flavors are also fairly subtle, and run into the additional hazard of easily being seen as dominated by rose. Ten ppm of this ingredient has a modest, but noticeable, effect.

Passionfruit: The fruity note in passionfruit flavors is very important. Ethyl hexanoate can add depth and bite to ethyl butyrate at around 1,500 ppm.

Pineapple: Here we come to the cause of my mixed reaction to ethyl hexanoate. It should clearly be the dominant ester but, alone, it is not sharp enough. Overdoing the level does not help. Five thousand ppm works perfectly well.

Soursop: One thousand ppm of ethyl hexanoate provides a good fruity middle note for soursop flavors.

Starfruit: One thousand ppm of this raw material is also a good initial level of addition in starfruit flavors.

Berry Fruit Flavors

Blackberry: Fruity esters generally play a less important part in berry flavors than in tropical flavors, but they can still be helpful. Ethyl hexanoate, at around 100 ppm, adds brightness to blackberry flavors and also helps to build out the center of the profile.

Blackcurrant: Three hundred ppm is a better level in blackcurrant flavors, working equally well in realistic as in more fantasy-oriented flavors.

Fresh cranberry: Only 50 ppm of ethyl hexanoate adds a little brightness to all types of cranberry flavors, working especially well in fresh profiles.

Gooseberry: Lighter esters, especially methyl butyrate, tend to lead in gooseberry flavors. Thirty ppm of ethyl hexanoate adds depth.

Raspberry: The ideal level of this raw material in raspberry flavors depends on the profile. Twenty ppm works well in very violet-oriented flavors and levels up to 100 ppm are better in more berry-oriented creations.

Redcurrant: One hundred ppm is a good choice of level in redcurrant flavors, enhancing the berry's character.

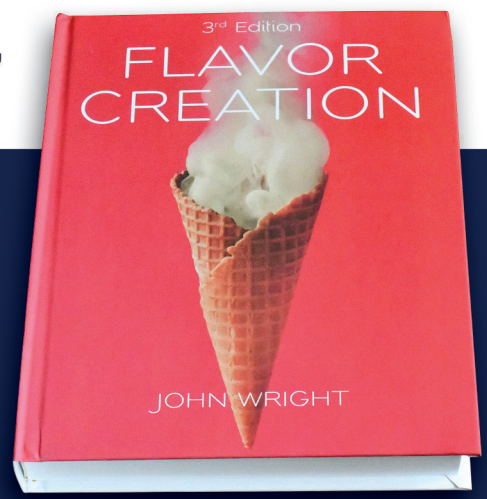
Strawberry: Ethyl butyrate is frequently the dominant ethyl ester in strawberry flavors. Alone, the

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effect can be rather thin and ethereal. Three thousand ppm of ethyl hexanoate provides a perfect balance.

Orchard Fruit Flavors

Apple: Ethyl hexanoate also does not play the dominant role in orchard fruit flavors, but it can provide a useful backup. Ethyl 2-methyl butyrate is naturally dominant in apple flavors. Nevertheless, around 300 ppm of ethyl hexanoate adds depth and broadens the profile without sacrificing impact.

Apricot, nectarine and peach: Despite their close relationship, ethyl hexanoate works best at slightly different levels in these three flavors. One hundred ppm works best in apricot, down to 50 ppm in peach and further down to 20 ppm in nectarine.

Cherry: One hundred ppm of ethyl hexanoate is an effective level of addition in all of the many different types of cherry flavors.

Pear: At first sight ethyl hexanoate is far away from the typical profile of pear esters. Despite this fact, 100 ppm rounds out the profile nicely.

Plum: Ethyl hexanoate is much more prominent in plum and prune flavors. One thousand ppm is very effective in plum flavors but 500 ppm works better for prune.

Fermented Flavors

Beer: The yeast aspect of all flavor profiles that derive from fermentation owes most to ethyl octanoate, followed by ethyl decanoate. Ethyl hexanoate plays an important role in brightening this mixture and giving it more impact. One hundred ppm is effective in all types of beer flavors.



Thirty ppm of ethyl hexanoate adds to the profile of orange juice flavors.



Ethyl hexanoate is much more prominent in plum and prune flavors. One thousand ppm is very effective in plum flavors.

Brandy: Brandy is the distilled fermented spirit with the most evident yeasty note and ethyl hexanoate is ideal at 200 ppm.

Bread: Bread flavors vary dramatically in the level of yeast character. Twenty ppm is a modest starting point for this ingredient, but the sky's the limit.

Rum: Although it is less obvious than in brandy flavors, the yeasty note is quite important in rum flavors too. One hundred to 150 ppm is a good level in light and dark rum flavors.

Whisky: Ethyl hexanoate, and companion yeasty notes, are also good elements of whisky flavors. The ideal level is a little lower around 100 ppm.

Wine: Most wine flavors, Beaujolais being the sole exception, do not need a strong yeasty note. One hundred ppm is a reasonable level of addition of ethyl hexanoate in most instances.

Other Flavors

Cheese: Cheese flavors need widely different levels of ethyl hexanoate. At the extremely high end, blue cheese flavors need around 200 ppm to harmonize with the ketones. Very much lower levels, nearer 10 ppm, are better in cheddar cheeses flavors.

Concord grape: Of all the range of fruit flavors, concord grape is prominent as an obvious home for ethyl hexanoate, 1,500 ppm works well.

Orange juice: This raw material is seen as, perhaps, in the more subtle category in respect of citrus flavors. This is true, but 30 ppm does add to the profile of orange juice flavors.

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T. Hasegawa Designs Technology to Mimic Flavors Found in Nature

T. Hasegawa discusses HASEAROMA tech designed to remedy common challenges in flavor formulation.

T. HASEGAWA

Capturing the essence of a natural flavor can be both challenging and exciting for flavorists. Beyond their creativity and skillset, flavorists rely on their tool belt of flavor technologies to achieve a winning application.

T. Hasegawa has debuted HASEAROMA™ technology, designed to build multi-layered flavor sensations to create depth and balance within formulations. *Perfumer & Flavorist+* (*P&F+*) connected with T. Hasegawa vice president of R&D Jim Yang to discuss how the newly debuted HASEAROMA technology can remedy common challenges faced by flavorists when attempting to mimic natural flavors and beyond.



HASEAROMA was developed with the intention of recreating that intimate feeling of biting into your favorite fruit, dish, or sauce for the first time, reproducing that "first bite" sensation.

***P&F+*: What are some of the common challenges faced by flavorists when trying to mimic natural flavors? How does HASEAROMA remedy that challenge?**

Jim Yang [JY]: One of the most common challenges faced by flavorists when trying to mimic natural flavors is narrowing down to specific varieties. For example, consumers may have a generic idea of a mango flavor, but in nature, there are many different varieties of this fruit. Food and beverage brands may want to elevate their product development with an Alphonso mango or Ataulfo mango, presenting a challenge to flavorists for pinpointing the specific components that separate these distinctly different flavor varieties. Oftentimes, when flavor matching or in sensory analysis, the dominant flavor profiles are more pronounced, which makes it more difficult to determine smaller, more refined differences. This usually results in a non-specific mango profile; sometimes this is enough for a customer and it ends there, but the rising demand for authenticity and specificity of botanical cultivars or culinary recipes from consumers is where HASEAROMA really shines. The HASEAROMA technology works by isolating each natural molecule of a flavor and refining these molecules through a delicate process that can last for nearly 12 months, in which specific flavoring components are rebalanced to create the same flavor profile and depth creating impactful mouthwatering taste and aroma replicating that of the original fruit or food. Building a multi-layered flavor sensation.



Jim Yang

***P&F+*: Can you touch on the versatility of HASEAROMA? Can this technology be used beyond true-to-fruit flavors?**

JY: HASEAROMA is incredibly versatile within each application. Depending on what a customer might be looking for, we can distinguish specific flavor varietals or add depth of flavor. This could mean the subtle differences between a white peach and a yellow peach, or in savory applications, the subtle difference between chicken thigh versus chicken skin. HASEAROMA can also help us replicate the distinct depth of flavor that you get through cooking applications, for example refining an onion jam to taste caramelized instead of sauteed.

This versatility exists across all categories; we have both sweet and savory options, from fruits and vegetables to a plethora of protein flavors, which are

completely vegan and quickly gaining momentum in the product development of plant-based alternative proteins. While our fruit line is amazing, we know that our savory technology will make a positive impact in the coming years with meat, seafood and poultry. HASEAROMA allows us to refine and replicate the authentic flavors of proteins—including specific variations such as chicken thigh, chicken fat, chicken breast, or more—without relying on animal products. Our chicken and beef flavor offerings will directly serve the growing demand for authentic-tasting alternative proteins as vegan and vegetarian diets become more mainstream.

***P&F+*: What are some of the applications HASEAROMA can be utilized for? How can product developers take advantage of it?**

JY: Our applications team is hard at work discovering new applications for HASEAROMA every day, both savory and sweet. Currently, our most popular applications are in snacks (i.e. pineapple jalapeno flavored almonds); plant-based meat alternatives, and beverage (i.e. grapefruit sparkling water), but the possibilities are endless and we will be working with customers to discover more opportunities from sports nutrition, energy bars, soups and prepared meals. When developing new products, HASEAROMA is a must, as consumers are looking for authenticity in the products they buy.

There are a handful of ways product developers can implement HASEAROMA into their new products. But outside of creating new true-to-food snacks or beverages, product lines could feature distinct variants of the same food/flavor, both using HASEAROMA to offer engaging experimentation in a variety pack of snacks or an assortment of seltzers.



HASEAROMA allows us to refine and replicate the authentic flavors of proteins—including specific variations such as chicken thigh, chicken fat, chicken breast, or more—without relying on animal products.



HASEAROMA is the 4K HD of flavor solutions—offering a higher specificity and authentic taste experience.

***P&F+*: How does HASEAROMA align with growing consumer demands for natural flavors?**

JY: HASEAROMA is the essence of nature itself, and with each bite, the depth of each flavor molecule is as pronounced as the last, with sharp defining characteristics. Through our refining process, which takes nearly 12 months for each flavor, HASEAROMA offers sharp defining characteristics with higher specificity, comparable to the original natural food or fruit. Pure authenticity is the driving force of HASEAROMA, in a world focused on natural flavors.

HASEAROMA was developed with the intention of recreating that intimate feeling of biting into your favorite fruit, dish, or sauce for the first time, reproducing that "first bite" sensation. Packed with intricacy, we've crafted this flavor technology solution for your end products and make it possible for every bite to deliver that overwhelming satisfaction and experience that you have the first time enjoying that food item.

There will always be customers who simply want a basic flavor and don't need the specificity that HASEAROMA delivers. Sometimes, just a universal "peach" flavor is all a customer needs and not a "Golden Jubilee yellow freestone peach" but HASEAROMA allows for this level of variation. At T. Hasegawa, our favorite analogy for what HASEAROMA offers is the progress of television resolution. Each year, the image quality and resolution of television sets get better, with 4K High Definition now the baseline standard. You may not require that level of resolution every time, but it's helpful to have this available as consumers continually demand a higher standard. HASEAROMA is the 4K HD of flavor solutions—offering a higher specificity and authentic taste experience. Whether it's for a new product or improving an existing line, it's definitely worth a try to see how HASEAROMA can elevate your product development and deliver a more authentic "true-to-nature" taste experience.

Neuroscience vs. Perfumer: How the Nose Processes Smell

Understanding the best techniques perfumers can utilize while constructing a fragrance, the latest innovations in scent and more.



As functional fragrance continues to boom, neuroscience is making its way back to the main stage.

About seven years ago neuroscience, the study of the nervous system's structure and function, was becoming quite a hot topic in the fragrance industry. In 2016, *Perfumer & Flavorist+* (*P&F+*) published "Applying Neuroscience to Understand Consumer Preferences[a]," in which authors Michelle M. Niedziela, Ph.D., Erin Carbone and Bill Thau described the benefits of integrating neuroscience into fragrance formulation and marketing stating, "Neuroscience can help market researchers and product developers better understand their consumers as well as how their product is performing. Through measuring the non-conscious consumer response to products, concepts and before/after results, it is possible to make decisions for product development and marketing, as well as develop product claims."

As functional fragrance continues to boom, neuroscience is making its way back to the main stage. With fragrance houses and brands creating ingredients and formulas designed to be mood-boosting for users or offer claims of heightening the wearer's focus, neuroscience is providing the answers. Or at least, trying to.

[a]*https://img.perfumerflavorist.com/files/base/allured/all/document/2016/01/pf.PF_41_01_044_04.pdf*

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During the International Fragrance Association United Kingdom's (IFRA UK) Fragrance Forum 2022, the event hosted a discussion between professor Stuart Firestein, Ph.D., of the Department of Biological Sciences at Colombia University and IFRA UK director Lisa Hipgrave on how the nose processes smell from a neuroscience and perfumer's perspective.

P&F+ reached out to the duo to continue the conversation. Below are the responses provided by Hipgrave who weighed in from a perfumer's perspective. Readers can tune into Firestein's insights on neuroscience as it relates to scent through the digital edition or by visiting *www.perfumerflavorist.com/multimedia*.

***P&F+*: How does this differ from a perfumer's perspective versus neuroscience?**

Lisa Hipgrave [LH]: A perfumer processes a smell through learned knowledge. The odor profile of a substance is learned during training and so to the effect of materials when used in combination. Perfumers learn to dissect the odor of something and break it down into its parts. Of course, this is not always precise as groups of ingredients have similarities and it has been found that you can often reproduce an odor using different materials.



Lisa Hipgrave

***P&F+*: From your perspective, what are some of the best techniques perfumers can utilize while constructing a fragrance for the consumer?**

LH: I think when creating a fragrance it is really important to understand what is being requested. Scent is not easily described and often a client may find it difficult to describe what it is they want from a fragrance. So at the briefing stage, it is really important to understand what the client requires and it may not be what they are asking for! What they like or dislike will help and talking through options or better still smelling raw materials with a client to really understand how they describe smells is really valuable.

There are different techniques used when constructing a fragrance for a consumer. Some perfumers will work on the top notes separately from the heart of the fragrance and then combine them further down the line. Some will start with a central odor and then add complimentary notes and scents around that central point. Taking a close-up view and then standing back and looking at the complete picture.

There are also techniques for creating a fragrance for a specific product. For instance, stability is important some products may not be compatible with certain materials. There may be preconceived ideas as to what the odor of a certain product should be like. For example, a market leader in baby products may give rise to the consumer preferring that odor direction in which case the perfumer may enjoy more success by creating a variation on that theme. Other times the perfumer may be asked to create a realistic pineapple fragrance for example and may decide that by adding coconut notes it becomes more pleasant and acceptable as the pineapple and coconut combination is a well-known and well-liked combination.

Perfumers often have a certain style and find some odor areas easier than others and may consistently use a preferred ingredient that enhances their fragrance.

***P&F+*: What are some of the latest innovations, technologies, or tests introduced that allow perfumers to better tap into enhancing the relationship between consumers and scent?**

LH: There are so many new techniques now available although perhaps not yet employed universally. Some companies may have new artifical intelligence technologies whilst others may use algorithms around personality tests. It's an exciting time for fragrance as some areas become more transparent and others even more mystical. Technology has opened up many possibilities.

***P&F+*: From your perspective, what does the future of scent look like, and how we interact with it?**

LH: I think it's exciting that scent and the sense of smell are now becoming recognized as an important sense and have so many benefits. There is so much research now into the many benefits and consumers are beginning to recognize how fragrance can enhance their lives.

p&f+

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DIGITAL TRANSFORMATION AND AI IN FRAGRANCE

Exploring the growth and potential of artificial intelligence in fragrance formulation.

BY ADAM SHAHAF, vice president, Business Development, Moodify Scent Technologies



Adam Shahaf

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Similarly to other industries, AI started from applications that are not unique to fragrance, such as analyzing consumer behavior as recorded in e-commerce transactions and social media for the purpose of creating fragrance products that sell better.

> From a perfumer's perspective, AI formulation is not going to replace the perfumer but rather empowers and enables through decision support.

Software is eating the world and now it has recently begun smelling it as well. The fragrance industry is starting to go through deep digital transformation processes that address its core competencies, and naturally so, is thus very affected by artificial intelligence (AI). In contrast to information-based industries such as finance and insurance, fragrance took longer to undergo digital transformation because entry barriers for startups and innovation, in general, are higher. CapEx (capital expenditures) involving chemical compounds and labs, together with higher OpEx (operational expenditure) for interdisciplinary talent, make it less susceptible to disruption.

Fragrance is more difficult to digitize because there is less academic applied olfaction research work offering technologies ripe for commercialization; and because olfactory nomenclature is limited and less articulated than other senses. The latter not only creates difficulties in generating data sets for AI but also makes it challenging to have AI talent reach the profound subject matter understanding that is so necessary to develop adequate solutions. In addition, the widely common (and justified) perception of perfumery as an art and craft creates a basic distrust for AI solutions in fragrance.

AI in Fragrance

Nonetheless, AI is beginning to penetrate fragrance. Similarly to other industries, it started from applications that are not unique to fragrance, such as analyzing consumer behavior as recorded in e-commerce transactions and social media for the purpose of creating fragrance products that sell better. But also recent years innovations in machine learning, bioinformatics, and drug discovery have posed an opportunity to develop AI models that touch the core of fragrance design and formulation and can actually make computers sense and articulate olfactory perception. Publicity of such innovation made stakeholders in fragrance more open to risk resources for progress.

The integration of AI in core fragrance capabilities manifests in several types of applications: formula-to-brief recommendation, formulation, sensing and new molecule design. The formula-to-brief recommendation is the ability to match existing fragrance formulas to new briefs. It enables fragrance houses to match formulas out of their 50,000+ formula portfolios to new customer briefs that could benefit existing non-exclusive formulas and enable fragrance houses to continue monetizing them.



The widely common (and justified) perception of perfumery as an art and craft creates a basic distrust for AI solutions in fragrance.

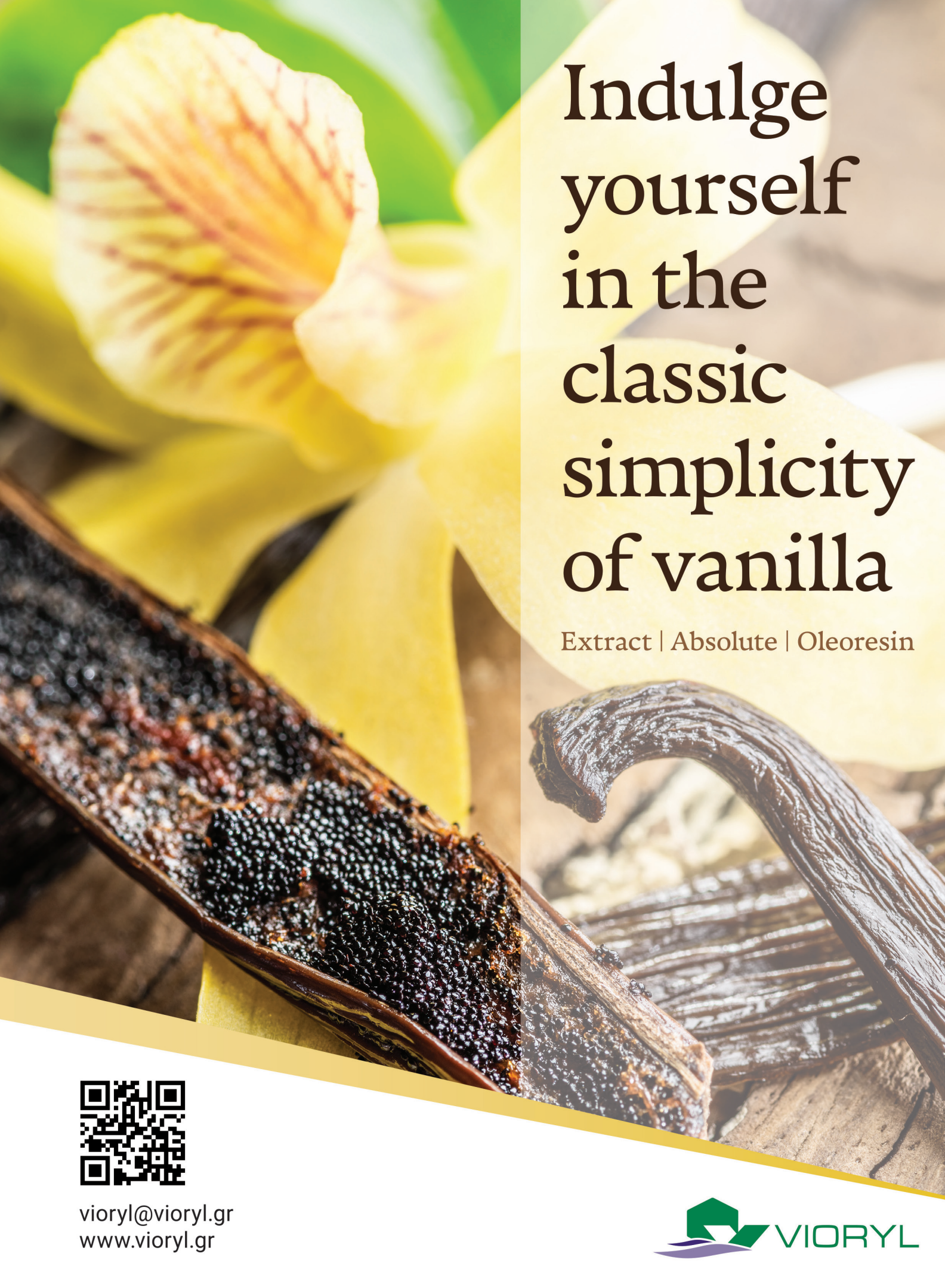
AI formulation is the ability to generate fragrance formulations and reformulations using software that predicts their perceptual impact. This is highly challenging as perfumery arithmetic is nonlinear in a nonlinear way: 1+1 equals sometimes 3 and sometimes 0. It is also difficult because creating standardized perceptual data sets is costly and requires a very particular set of interdisciplinary expertise. However, once operational, the impact of AI formulation is strikingly disruptive: effective malodor control formulas generated in seconds; close-to-identical odor profile reformulation enabling cost, supply chain, sustainability, and regulation formula optimization; fragrance house palette optimization; and personalized perfumery are direct outcomes which can collectively result in hundreds of millions of dollars in the business outcome: cost savings and new revenue. From a perfumer's perspective, AI formulation is not going to replace the perfumer but rather empowers and enables through decision support.

Development & Projections

In the future, AI formulation may be complemented by the nascent attempts to use AI to engineer new fragrance molecules, though that kind of capability is still highly experimental.

Recent development in small sample VOC sensors, aka e-noses, in combination with AI processing, has led to early abilities to predict how actual fragrance samples will be felt by a human nose. The impact of perceptual e-nose sensing will affect quality control and new fragrance product development as they could potentially take away a significant operational cost for human evaluators who are limited in their capacity to sensorily assess scent on a large scale.

And lastly, a further horizon development that would impact the fragrance industry is scent teleportation. In Moodify's vision, scent teleportation is the ability to communicate scent digitally and deliver it in a device no larger than a standard Bluetooth desktop speaker, thus creating a new dimension of scent to multimedia. Scent teleportation would be enabled by sets of primary scents, varying combinations of which will create multitudes of scent experiences. It is still difficult to fathom how scent teleportation would impact the fragrance industry, but at the point of mass market adoption, a surge in demand for primary scents will encompass a significant opportunity for fragrance houses.



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VIORYL

2 Beverage Innovation Sessions on the *Flavorcon* 2023 Menu

See two of the sessions on the roster dedicated to low-to-no alcohol and boozy sips.

BY JENNA RIMENSNYDER, managing editor, *Perfumer & Flavorist+*



Attendees can expect an assortment of samples of full as well as low-to-no alcohol pours.

We are five months away from the return of *Flavorcon* to Cincinnati, OH. Scheduled for November 8-9, 2023, within the Duke Energy Convention Center, *Flavorcon* 2023 is set to host a new lineup of sessions dedicated to the latest innovations, trends and insights in flavor.

With growth in consumer demand for low-to-no alcohol options as well as an interest in innovative flavors in ready-to-drink beverages, *Perfumer & Flavorist+* tapped two boozy experts to take the stage.

Buzz on Brewing

Certified cicerone and all-around beer enthusiast, Stephen Rich will return to the *Flavorcon* stage for his session, "**How to Brew: Empowering Flavorists**." This session will provide flavorists and flavor scientists with the basic formulation and process steps in brewing, and the general impact on flavor and aroma to better approach flavor innovation from a brewing-specific application. Attendees will get to sip on a variety of non-flavored beers, each providing a different example of five primary

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Flavor enthusiasts will walk away with insights on how to better tap into various aspects of the alcohol market and ways to innovate.

flavor components in beer: malt, hops, yeast, carbonation and intensity.

About Stephen Rich

Stephen Rich is a brewer and trusted industry advisor in Ontario, Canada, helping breweries to identify and drive continuous improvement and brand development. Rich started homebrewing in 2004 and began brewing professionally in 2009 in Toronto. Since then, he has worked in production, quality assurance, innovation, and managerial roles for breweries large and small, managed the build of North America's first closed-loop and carbon-neutral destination brewery, and has brewed over 200 different brands and hosted more than 150 beer dinners and tasting events. Rich is a certified cicerone, prud'homme beer sommelier, and BJCP Certified Beer Judge.

Time for Wine

According to a recent report[a], the global non-alcoholic wine market stands at $2 billion and is estimated to reach a mart size of $5.2 billion by 2033.

In the article[b] by Mintel associate director of Food & Drink, Caleb Bryant, "Alcohol Alternatives Aren't Just for Dry January," the author discusses the rising trend in low-to-no-alcohol products and consumer preferences while reevaluating their relationship with alcohol. The reasoning? Bryant's research attributes the rise in healthier lifestyle choices.

According to the report, nearly four in ten U.S. consumers report closely or occasionally following the sober curious lifestyle, with adherence concentrated among young, urban, high-income consumers. "These consumers are willing to pay a premium for unique, innovative beverages that allow them to achieve their personal health and wellness goals[..]



Brewmaster Stephen Rich is returning to the stage for his session, "How to Brew: Empowering Flavorists."

ahttps://www.factmr.com/report/4532/non-alcoholic-wine-market

bhttps://www.mintel.com/food-and-drink-market-news/alcohol-alternatives-arent-just-for-dry-january/

While consumers are looking to switch up their drinking habits, they refuse to compromise taste," Bryant writes.

Flavor chemist Michael Colangelo is set to take the stage for the timely session, "**The Trick to Dealcoholizing Wine Without Compromising Flavor**." Colangelo will dig into the challenges and how to rebuild the flavor profiles in low-to-no wines and non-alcoholic sips. And yes, there will be plenty of samples ranging from full to no-alcohol so that attendees can get a taste of the process.



Surely Wines flavor chemist Michael Colangelo will make the trip from California to Cincinnati for his session, "The Trick to Dealcoholizing Wine Without Compromising Flavor."

as early-stage startups like Flavor Insights, Cana Technology and Surely Wines, bringing a unique perspective to the field of beverage development.

As the director of Beverage Development at Surely Wines, Colangelo is responsiblefor product development and innovation of wine, cocktails and functional beverages. The flavor chemist also has expertise in creating flavors for various categories, including sports nutrition, alcoholic and non-alcoholic beverages, coffee, tea and beer.

About Michael Colangelo

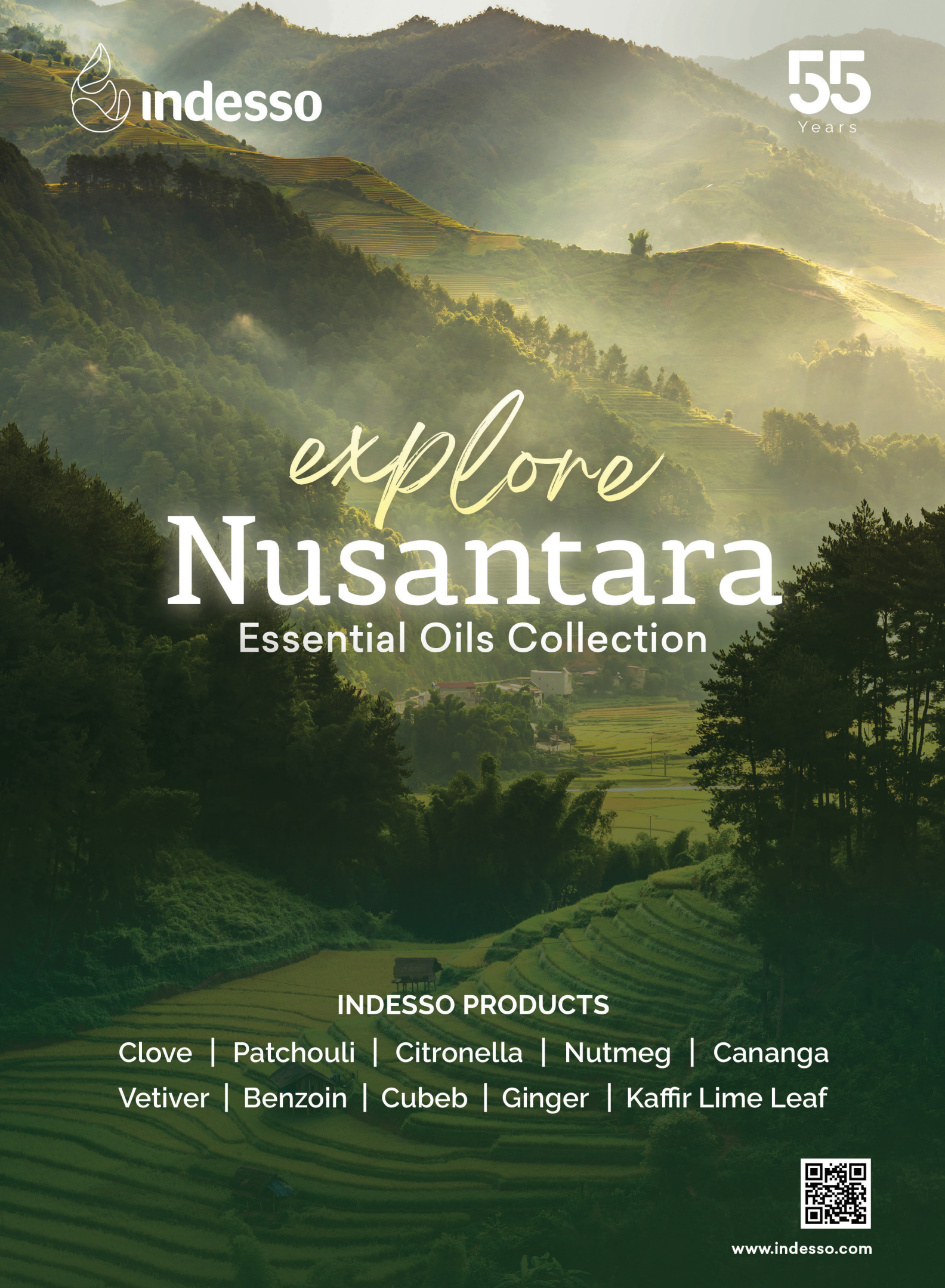
Michael Colangelo is a flavor chemist and beverage expert based in the San Francisco Bay Area. He is known for his extensive experience in creating healthy and delicious beverages that contribute to overall well-being. Colangelo has worked for several big businesses such as Pfizer, and Givaudan, as well

How to Register

Be sure to visit *www.flavorcon.com* to receive the best rates for the two-day event. The website also hosts hotel and transportation details for planning a successful trip to Cincinnati for the flavor event of the year. Have a question about exhibiting? Email Paige Crist at pcrist@allured.com.

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THE IMPACT OF CLIMATE CHANGE ON FRAGRANCE

How climate change is impacting the supply chain, regulations and company protocols.

BY MARTINA BIANCHINI, president, International Fragrance Association



In response to global climate trends and regulatory and societal drivers, the fragrance industry is innovating in the fragrance value chain.

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Climate change is one of the most pressing issues of our time. It affects all areas of our global economy and society–including the fragrance industry.

The impact of climate change is probably the most visible through extreme weather events such as floods, storms, or droughts which are becoming evermore frequent and have disrupted natural ecosystems and agricultural production.

As an industry that is deeply rooted in nature and agriculture, the fragrance industry is not immune to the impacts of climate change, particularly as natural raw materials–grown all over the world–depend on resilient ecosystems in a healthy and stable environment or they cannot flourish.

These climate change effects impact the security of the supply of natural raw materials and undermine the resilience of supply chains, particularly for natural ingredients.

Governmental Action

Governments and businesses around the world must take action to mitigate climate change's causes and effects. The Intergovernmental Panel on Climate Change (IPCC) has issued a number of reports outlining these. The United Nations' Sustainable Development Goals (SDGs) seek to provide a global policy framework for world economies to become more circular and shift to more bio-based resources in this effort.

In Europe, the Green Deal is the overarching policy framework translating the UN SDGs into policies that aim to help Europe to become a climate-neutral continent by 2050. In other countries, the government's efforts to combat climate change are underway using either voluntary measures or regulatory instruments.

Chemicals are the building blocks of the fragrance business–as well as many other economic activities. This is why there is so much attention given to the revision of chemicals legislations around the world. Fragrance ingredients, whether natural or synthetic, fall under chemical legislation. The EU's Classification, Labeling and Packaging legislation (CLP) lays the foundation for how fragrance ingredients will be categorized in the future, and it does not differentiate between the origin of the molecules.

> "There is also a need for greater collaboration and communication between the fragrance industry, policymakers, and stakeholders to find common solutions to these complex and shared challenges."

Current Successes

In some ways, the fragrance industry already has positive attributes. It is not a highly energy-intensive industry and therefore its overall carbon footprint is relatively small when compared to other sectors.

Yet, carbon footprint management and commitments to CO_2 reduction targets are key. International Fragrance Association (IFRA) and its



Paying attention to deforestation is important, particularly in supply chains of relevance to the industry, such as timber, palm, vanilla or cocoa.



IFRA recently signed a Memorandum of Understanding with the Indonesian fragrance sector to document a best practice case study on the sustainable sourcing of patchouli.

member companies are taking steps to minimize the sector's carbon footprint by pursuing Green Chemistry principles and by committing to sustainable practices. The sustainability maturity level in the fragrance industry is high, as outlined in the first IFRA-IOFI Sustainability report (*ifra-iofi.org*). The fragrance and flavor industry's sustainability charter outlines five focus areas in which attention is needed to become more sustainable and address climate change.

Looking Forward & Areas of Focus

Our continued success as a sector depends on robust, and sustainable supply chains and on access to specific raw materials. The future supply of natural raw materials hinges upon the resilience of the ecosystems in which they are grown today. Investments in knowledge, education and partnerships on responsible sourcing are good investments in the future of the industry.

Climate change can lead to soil erosion which can lead to biodiversity loss. Coupled with human deforestation of timber, the long-term impact could be adverse if not managed with care. Therefore, paying attention to deforestation is important, particularly in supply chains of relevance to the industry, such as timber, palm, vanilla or cocoa.

The protection of biodiversity–a key component of the IFRA-IOFI Sustainability Charter–is a vital way to our sector's climate response. The fragrance industry must do–and must be seen to do–everything it can to protect the sources of its ingredients and the people who grow them.

Many fragrance ingredients are sourced from countries that are particularly vulnerable to the impacts of climate change, such as droughts and extreme weather events. This can disrupt supply chains and lead to shortages of key ingredients, which can in turn affect the availability and cost of fragrances.

In response to global climate trends and regulatory and societal drivers, the fragrance industry is innovating in the fragrance value chain, including developing new formulations that use alternative ingredients, such as natural, renewable and bio-based and plant-based extracts. This response to a growing trend towards sustainable and eco-friendly fragrances appeals to consumers who are becoming ever more environmentally conscious. Besides this, the fragrance industry continuously invests in research and development to find new, innovative ways to create fragrances that are safe and sustainable by design. With 8% of revenues spent on R&D, the innovation capacity of the industry is high.

To address the broad range of challenges, the fragrance industry has started to invest in sustainable sourcing practices and supply chain management. Large fragrance companies already have established partnerships with local farmers and communities to ensure the sustainable production of key ingredients. IFRA is involved with sustainable sourcing research, having recently signed a Memorandum of Understanding with the Indonesian fragrance sector to document a best practice case study on the sustainable sourcing of patchouli.

Other fragrance companies have implemented systems to monitor and reduce the environmental impact of their supply chains, such as by reducing emissions from transportation and energy use. Some companies are also using renewable energy sources, such as solar and wind power[a], to power their production facilities. Other companies are exploring new technologies and processes to reduce their carbon footprint, for example with new production methods, such as using enzymes[b] and microorganisms to create fragrance ingredients, which may be more sustainable and environmentally friendly than traditional chemical synthesis.

Final Thoughts

Despite these positive efforts, there are still challenges that need to be addressed in the interplay between climate policy and the fragrance industry. The EU will apply the Corporate Sustainability Due Diligence Directive in 2025, which requires more transparent information along the supply chain. It will apply to actors inside and outside the European Union. This is where the IFRA-IOFI Sustainability Charter can help members, suppliers and customers to meet future requirements.

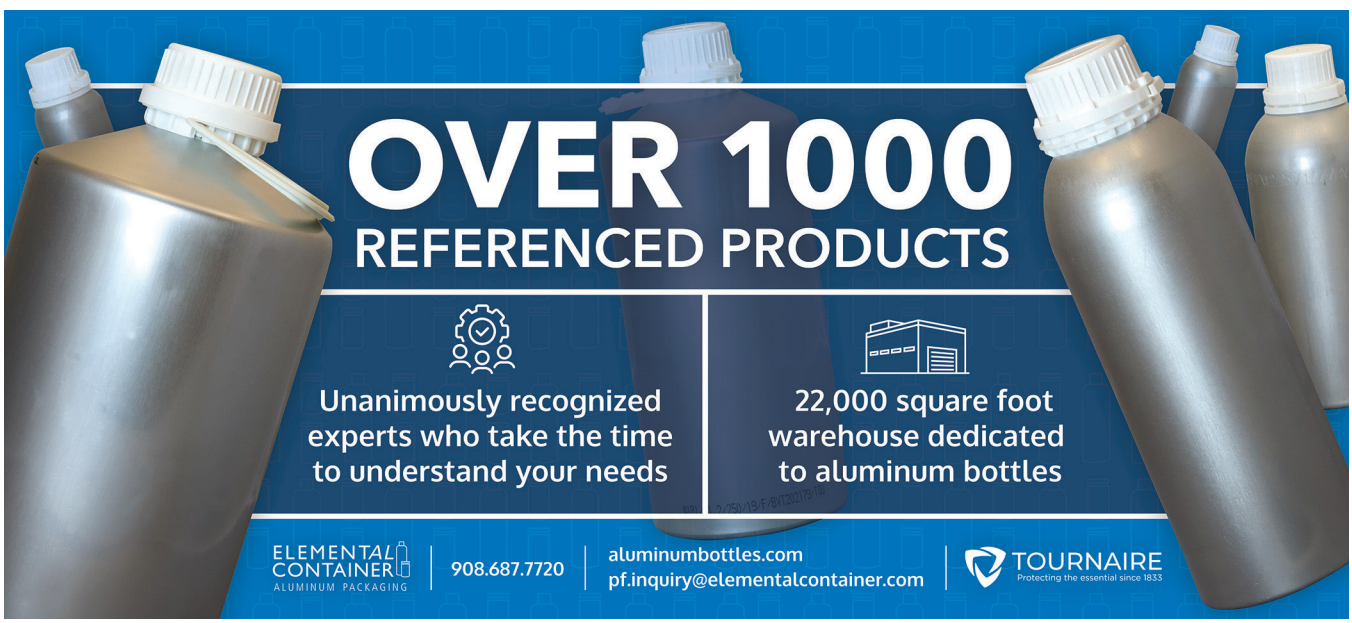
Consumers of fragrance products are becoming ever more nuanced in their choices, favoring natural and sustainable products. There is a growing movement towards greater transparency and accountability in all value chains including the fragrance industry. Some companies have started to disclose more information about their ingredients and production methods, and there are calls for more standardized labeling and certification systems to help consumers make informed choices. There is also a need for greater collaboration and communication between the fragrance industry, policymakers, and stakeholders to find common solutions to these complex and shared challenges.

Moving forward, it is important that the fragrance industry continues to prioritize sustainability and environmental responsibility given the impact of climate change. It will mean investing in research and development to find new, innovative ways to create fragrances that are safe and sustainable, whilst also remaining appealing to consumers. The fragrance palette of the future will be influenced by a variety of factors, such as consumer trends, cultural factors, environmental and regulatory developments and technological innovations, and IFRA will continue to support the sector in accounting for these trends.

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[a] *https://nawindpower.com/fragrance-manufacturer-brings-2-4-mw-wind-turbine-on-site*

[b] *https://acib.at/how-flavors-and-fragrances-are-produced-by-enzymes/*



DECODING THE SYNESTHESIA FRAGRANCE BOOM

How perfumers and brands are telling multi-dimensional stories of emerging scents.

BY ARIELLA HALPERIN, founder and creative director, Storied Senses



Synesthesia is a neuropsychological trait in which the stimulation of one sense causes the automatic experience of another.

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Scent is complex. It's invisible, dynamic and multi-faceted–and there are far fewer words in our vernacular to describe it in comparison to the other senses. In essence, this complicated sense is elusive, making its appeal ever more intriguing to consumers in our highly saturated fragrance market. Scent has always been this way; however, the difference between our mothers' and grandmothers' fragrance collections (and quite frankly, even the products from five to ten years ago) and our current market, is that the new options grabbing our attention on shelves and online are telling the most multi-dimensional stories.

Today's up-and-coming fragrance brands, most notably within the direct-to-consumer space, elevate the sense of smell, injecting their concepts with multi-sensorial cues that provoke emotional and meaningful resonance within the consumer. These stories can conjure vivid imagery or evoke powerful and specific memories associated with familiar aromas. Now, this type of storytelling tool has become the necessary approach to fragrance marketing.

Synesthesia, a neuropsychological trait in which the stimulation of one sense causes the automatic experience of another[a], or in other words, the blending of senses, only affects about two to five percent of the population, but the phenomenon is being leveraged as a storytelling device for fragrance products to help make the ambiguous tangible. Someone with synesthesia might interpret certain sounds or voices as distinctive colors and shapes, or associate them with specific flavors and textures. So one can only imagine the number of ways this can be utilized as inspiration for fragrance development.

As a synesthete myself, I associate specific letters and numbers with varying colors–this is the most common form of the neurological phenomenon, what's known as grapheme-color synesthesia. But for other synesthetes, it can manifest differently, for example, perceiving certain types of music as sounding salty or eating a meal that tastes overwhelmingly pink. These types of sensorial crossovers are allowing creatives to craft full fragrance experiences for their products so consumers can tap into all their senses as a performance or meditation[b].

Mood-centric Fragrance

Emerging e-commerce fragrance brand, Colornoise, was conceived on the very notion that blending colors, music, memories and moods generates original fragrance ideas. The brand's founder Krista Nashwinter uses her own synesthesia experiences to inspire her creations, like Rainbow Ice, Iridescent and Love/Hate, each described as Memory, Color or Mood Perfume, respectively. Similarly, Billie Eilish's recent direct-to-consumer flanker fragrance, Eilish No. 2, was influenced by the singer's synesthesia, in which she utilized all of her senses to envision the colors and textures of the scent. The brand explains how both the chronology and the actual shape of the number two gave inspiration to the fragrance's name, as well as providing a connection between how the number '2' is written and the sensual curves the perfume bottle and corresponding imagery evoke.

> "Consumers are flocking to brands that provide an experiential escape after many months of living behind screens and closed doors."

Multi-sensorial

Direct-to-consumer brand founder, Nour Ibrahim, also uses her synesthesia as a storytelling mechanism for her Bleu Nour fragrances. She explains how understanding the potency of multi-sensory experiences is at the core of what her brand represents. Bleu Nour's candles illustrate harmony between color and smell, which creates a rich atmosphere, ripe for recreating memories, feelings and moods. Understanding how her own synesthesia sparks different olfactory experiences, Nour combines bold aromas with a strong emphasis on color and texture.

And perhaps the most cerebral example of employing synesthesia lies within the brand Arpa. Perfumer Barnabé Fillion pairs each of his perfumes with a unique sonic frequency, sculpture and photograph to convey its sensorial character. Fillion's collaborations with art, architecture and music commingle with his fragrances so consumers can visualize the perfume's implied texture.

[a] *https://www.britannica.com/science/synesthesia*
[b] *https://www.thefuturelaboratory.com/blog/synaesthesia-scents*



Direct-to-consumer brand founder, Nour Ibrahim, also uses her synesthesia as a storytelling mechanism for her Bleu Nour fragrances by combining bold aromas with a strong emphasis on color and texture.

Beyond the visual and tactile, a popular form of harnessing synesthesia is to create a unique fragrance narrative by leveraging audio. Aesop's recent Othertopias collection complemented the brand's three gender-neutral fragrances with 60-minute Radiomatique Mixtapes (weekly podcasts) designed to transport the wearer to realms both real and imagined, evoking a further sensory dimension for consumers. In addition, self-proclaimed 'intermedia perfumery,' Folie à Plusieurs, created a collection of five incense sticks, each sold with a link to download an album to be played while burning the corresponding scent. The brand's goal was to elevate the cultural value of fragrance, broadening its meaning and relationship to the human experience.

Decoding the Boom

This surge in fragrance launches and campaigns that experiment with melding scent with other sensory experiences provides a look into how consumers want to interact with fragrance and its adjacent categories. Perhaps as a knee-jerk reaction to the isolation of the pandemic, consumers are flocking to brands that provide an experiential escape after many months of living behind screens and closed doors. This antidote can be highly therapeutic, using sensory cues to trigger positive memories, producing a relaxing and meditative space for the consumer. The physiological nostalgia[c] trend could be here to stay, as fragrance's impressive influence on consumers' perceptions and experiences will continue to drive innovative and emotionally relevant ways to not only reach consumers but to maintain their interest.

[c]*https://www.wallpaper.com/beauty-grooming/arpa-synesthesia-inspired-fragrance-project*

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For savory profiles, the panel thought sichuan pepper absolute CO_2 extract would work well in Chinese five-spice, Sriracha and Szechuan flavors.



BY CYNDIE LIPKA
Principal flavorist,
Bell Flavors and Fragrances

Flavor Materials Report

Flavor panelists evaluate syringaldehyde, turmeric root CO_2 essential oil, buchu oil and more.

Organoleptic Evaluation Panelists

- **Bill Aslanides**, Senior Flavorist, Synergy Flavors, Inc.
- **Deborah Barber**, Senior Flavorist, FONA
- **Nicole Hernandez**, R&D Manager and Senior Flavorist, FlavorChem
- **Christina Hook**, Flavorist, Bell Flavors and Fragrances
- **Judith Michalski**, Senior Flavorist, abelei flavors
- **Andrew Petrou**, Flavorist, Savory, Bell Flavors and Fragrances

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cis-3-Hexenal (50% in triacetin)

Source: Bedoukian
FEMA# 2561, CAS# 6789-80-6
Natural occurring in apple, apricot, banana, beer, black currant, broccoli, cauliflower, quince, grapefruit, mandarin, kumquat, orange, cupuaçu, curry, dill, fish, ginger, grape, guava, hop, kiwi, melon, nectarine, oats, olive, passionfruit, plum, pomegranate, raspberry, blackberry, starfruit, strawberry, tea, tomato.
Odor: @ 1%. Green, fried, oily, fresh, vegetative, potato, root-like, cruciferous, musty, slightly fermented.
Taste: @ 0.*1 ppm*. Fresh, bright, green, lifting, apple, vegetal, grass, oily, orange peel.
Taste: @ 0.*2 ppm*. Fresh, bright, green, oily, almost sour, heavy, cucumber, apple, tomato, viney, brown, grassy, melon.
*Possible application*s: The panel universally felt that this aldehyde would work in many fruit and vegetable profiles. Some felt that every fruit profile would benefit from this. Tomato, cauliflower, broccoli, asparagus, Brussels sprouts, green bell pepper, mushroom, celery, and potato/potato chip came up as options. One panelist thought that this would work nicely in fatty green cheeses and another thought of chicken bouillon.
➤**Bedoukian:** *https://bedoukian.com/*

Ethyl 2-methylbutyrate

Source: Vigon
FEMA# 2443, CAS# 7452-79-1
Natural occurring in apple, apricot, beer, durian, elderberry, fig, muskmelon, pear, pineapple, fruit wines, vinegar.
Odor: @ 1%. Fruity, sweet and slightly sour, fresh, juicy, slightly sweaty.
Taste: @ 1 ppm. Generic fruity, sweet, fresh, juicy, lifting, green, berry, upfront, apple skin, boozy, grape.
Taste: @ 2 ppm. Green, fruity, berry-like, slightly earthy, fig, candied, sweet, apple juice, fresh, lifting, apple skin, tangy.
*Possible application*s: I have to admit, I was a bit surprised to see this short list of where this compound occurs. I mean, ethyl 2-methylbutyrate should be almost ubiquitous, right? How long have we loved this beautiful ester? Several of us said all the berries or all the fruits! Nonetheless, the truth being what it is, the panel felt that berries would benefit from this addition as well as apple, pear, plum, fig, grape (wine, brandy and sangria), cherry, pineapple, tropicals, peach and melon.
➤**Vigon:** *https://www.vigon.com/*



Green bell pepper, mushroom, celery, and potato/potato chip among others came up as options for cis-3-hexenal.

Syringaldehyde

Source: MilliporeSigma
FEMA# 3107, CAS# 121-33-5, natural
Natural occurring in apple, apricot, beer, durian, elderberry, fig, muskmelon, pear, pineapple, fruit wines, vinegar.
Odor: @ 1%. Dry, brown, woody, nutty, phenolic, coumarinic, musty, powdery, resinous.
Taste: @ 2 ppm. Low impact, dry, slightly brown, cocoa.
Taste: @ 5 ppm. Dry, brown, herbal, some nutty, slightly powdery
*Possible application*s: These use levels were across the board slightly weak. There was mention of perhaps some sort of mouthfeel or throat tickle associated with this compound. Uses listed by the panel were asparagus, smoke, cooked meat, tea, chocolate, honey, malt.
➤**MilliporeSigma:** *www.sigmaaldrich.com*

Turmeric root CO_2 essential oil

Source: Robertet
FEMA# 3085, CAS# 8024-37-1
Odor: @ 1%. Bright, earthy, musty, woody, spicy, ginger-like, peppery, herbal, saw-dust, dirty, root-like, sharp, warm, cardamom-like notes drying into cedar notes.
Taste: @ 0.*5 ppm*. Low, slight tingle, throat burn, musty, mild woodiness.
Taste: @ 1 ppm. Slight tingle, throat burn, spicy linger, earthy, herbal, sharp, root-like, woody, musty, powdery, pepper bite.

Possible applications: Don't be fooled by this turmeric, as it builds spicy and burns over time! With that being said, the panel thought this would work in white or black pepper, ginger, saffron, curry, cardamom or golden milk flavors. This would certainly find a good home in Indian or Thai spice blends and also root vegetables. There was mention of cask or wood notes and one panelist felt this might work in seafood blends.

➤**Robertet:** *www.robertet.com*

Sichuan pepper absolute CO_2 extract

Source: Robertet

FEMA# 4754, CAS# 102242-62-6

Odor: @ 1%. Bright, fresh, green, terpenic, ginger, slightly citrus, camphoraceous, black pepper, earthy, lifting, warm, herbal, woody.

Taste: @ 5 ppm. Low impact, fresh, green up front, some tingle, vegetative, citrus, juicy, ginger, woody, fruity, salivating, warm, woody.

Taste: @ 10 ppm. Good impact, green, ginger, more heat, fruity, almost berry notes, spicy kick, tingle/salivating sensation, woody, pepper.

Possible applications: The hydroxy-α-sanshools in Sichuan pepper account for the numbing and tingling. This extract was similar to the effect sodium bicarbonate has on me. None of the panel knew what the CO_2 extract would do for that, but we sure found out! The panel felt that this extract would work nicely in ginger, lime and other citrus as well as mango, cola or root beer flavors. For savory profiles, we thought this would work well in Chinese five-spice, Sriracha and Szechuan flavors.

➤**Robertet:** *www.robertet.com*



Situated most firmly in the savory world, 3-(methylthio)propyl mercaptoacetate would find a fine home in mushroom, radish, caramelized, onion and garlic among others.

cis-4-dodecenal

Source: Bedoukian

FEMA# 4036, CAS# 21944-98-9

Natural occurring in coriander leaf.

Odor: @ 0.1%. Green, aldehydic, waxy, tea-like, mango, citrus peel, musty, melon, waxy, chicken skin, fatty, cilantro, airy, vegetative.

Taste: @ 0.05 ppm. Waxy, green, strong, herbal, peely, bitter, fatty, cilantro.

Taste: @ 0.1 ppm. Very pleasant waxy, green, herbal, fresh, citrus peel, fatty, bitter, cilantro.

Possible applications: Bedoukian has nicknamed this one Tangelal. We sort of got the whole citrus peel character (including also orange and grapefruit) but found other interesting things to chat about. On the sweet side, we saw this working in mango, pear, apple and melon profiles. Other notables are parsley, cilantro, cucumber, green bell pepper and chicken skin or fat.

➤**Bedoukian:** *https://bedoukian.com/*

3-(Methylthio)propyl mercaptoacetate

Source: Treatt (Endeavour)

FEMA# 4561, CAS# 852997-30-9

Not naturally occurring.

Odor: @ 0.1%. Earthy, mushroom, cooked garlic, alliaceous, mild roasted, tropical, grilled, char-broiled nuance, meaty, vegetative, slightly skunky, slightly green, radish, seafood.

Taste: @ 0.05 ppm. Earthy, musty, slightly alliaceous, mushroom, tropical sulfur, meatiness, brown, over-ripe fruit, mild.

Taste: @ 0.1 ppm. Mushroom, earthy, fatty, meaty, chicken (boiled or canned), radish, over-ripe, tropical, alliaceous, brown, coffee, burnt, almost resinous.

Possible applications: Situated most firmly in the savory world, this compound would find a fine home in mushroom, radish, caramelized, onion, garlic, fried potato, cooked vegetables, pork fat, chicken fat, roast beef, steak, shrimp, lobster and other seafood profiles. The panel found this could also fit into more stinky cheese profiles, such as melted Brie and Limburger. For the sweet flavorists, this might add interest to mango, passionfruit, durian, other tropicals and maybe even malt, coffee and chocolate.

➤**Treatt:** *www.treatt.com*

Buchu oil, crenulata

Source: Berjé
FEMA# 2169, CAS# 68650-46-4
Odor: @ 0.1%. Sulfurous, minty, tropical, cooly, musty, listing, dried, fruit, green, peach fuzz, vegetative, catty, black currant, camphoraceous.
Taste: @ 0.*1 ppm*. Herbal, vegetative, green, woody, sulfurous, minty, slight peach fuzz, jammy, berry, mild floral, black currant.
Taste: @ 0.2 ppm. Herbal, vegetative, green, woody, fruity, tropical, smooth sulfur, dirty, peach fuzz, tropical, cooly, berry.
*Possible application*s: Notice folks that this variety is different from the standard variety which we are used to Agathosma betulina. There we are talking about primarily iso-menthone, diosphenol and 8-mercapto-p-menthan-3-one. Agathosma crenulata is mostly pulegone and some 8-acetylthio-p-menthan-3-one for the sulfurous note. On the savory side, we found this to be applicable for asparagus, rosemary, winter and summer savory, sage and black currant. On the sweet side, some mentioned blueberry, strawberry, grapefruit, mango, guava, passionfruit, anise, peach, apricot, nectarine. Think of this for use potentially for non-direct add pulegone applications. Isn't this fun?
➤**Berjé:** *https://www.berjeinc.com/*

trans-2-Nonenal, natural

Source: Natural Advantage
FEMA# 3213, CAS# 18829-56-6
Natural occurring in almond, apple, apricot, artichoke, barley, beef, bread, butter, capers, cheddar, cherry, chicken, coffee, crab, hazelnut, kumquat, pecan, pork, tea, wheat bread
Odor: @ 1%. Heavy, chicken fat, green, melon, cucumber, fried chips, waxy, creamy, sweet candy-like vibes, smooth, citrus.
Taste: @ 1 ppm. Herbal, green, metallic, fatty, chicken, melon, cucumber, strong, watermelon.
Taste: @ 2 ppm. Strong, citrus, brown, waxy, cilantro, melon, cucumber, green, fatty, soapy.
*Possible application*s: Most of the panel felt this aldehyde was in the green, waxy, fatty camp mentioning cucumber, watermelon, blueberry, tropicals, cilantro, apple, citrus, tomato, carrot, olive. Yours truly found this to be a bit more in the chicken fat, bread crust and lard/tallow camp. So we could also use it for fried flavors including potato chip and sesame seed. I would evaluate butter profiles for authenticity.
➤**Natural Advantage:** *https://www.natadv.com/*

3-Mercaptohexyl butyrate

Source: Treatt (Endeavour)
FEMA# 3107, CAS# 121-33-5, natural
Natural occurring in passionfruit.
Odor: @ 0.1%. Tropical, alliaceous, roasted, savory, burnt rubber, grapefruit, peach, passionfruit, guava, pungent, woody, green.
Taste: @ 0.05 ppm. Alliaceous, slightly meaty, savory, weak, tropical, rotten vegetables.
Taste: @ 0.1 ppm. Alliaceous, slight throat burn, strong, passionfruit, rubbery, roasted meat, catty, grapefruit, vegetative, green, mild, onion..
*Possible application*s: So, no surprise that the panel mentioned onion, spring onion and garlic. We felt that the generic meat notes would work for background in chicken, pork, lamb, beef and also clam. Passionfruit, guava, durian, papaya, and other tropicals, peach, grapefruit, raspberry and blackberry for the sweets.
➤**Treatt:** *www.treatt.com*



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