ICATS
Education for the aroma and flavour trades

ICATS News

Summer 2021

Editor's Notes Deirdre Makepeace

How has your business pivoted? A question that many of us have been asked as we adapt in simple ways or more dramatic re-engineering to thrive in these changing times. As a distance learning organisation, our core product has not had to change dramatically but the way we run the organisation certainly has. In summer 2020, enquiries took a downward turn but we kept in touch with our customers, reinforced our ethos of flexible learning and consulted with industry. As the year closed we therefore found we were well placed to respond to rising levels of interest.

It is often when the proverbial rug is pulled from under our feet that we are at our most creative. The out-dated mantra of 'how we do things round here' becomes irrelevant as business plans are re-drafted, or perhaps even shredded. How can we do things differently? How are consumer values and consumption habits changing and what new opportunities does this create for my business? The Event Reports in this issue clearly demonstrate the agility with which the aroma and flavour trades are reading the market and building the skills and resources to optimise those opportunities. The skilled professionals of the future therefore need to have an un-blinkered awareness of changing markets, combined with the creativity to re-imagine a future very different to the one that was imagined little more than a year ago.

Welcome to ICATS

ICATS has been providing world class distance learning for nearly 30 years. Its foundations were in the aroma trades but in 2012 the course was developed to incorporate a flavour pathway, recognising the increasing integration between the two sectors. The courses are accredited by the International Federation of Essential oils and Aroma Trades (IFEAT). From its base in Plymouth UK, ICATS runs a virtual network of academics, industry professionals and tutors supporting students around the globe as they develop their technical and managerial skills to succeed in the specialist and complex aroma and flavour industry.

Contents

ICATS Team

The ICATS headquarters is in the University of Plymouth Campus in the UK from where a core team of staff is supported by a wider virtual team that delivers the full portfolio of educational services including the Diploma Programme, workshops, and other educational initiatives.

Dr Ali Green
Director of Studies

Dr Tony Curtis
Founder and Principal Tutor

Sharon Shand (née Heard)
Student Experience, Finance and Administration

Peter Whipps
Tutor and Past President BSP

John Forbes
Tutor, Industry Expert and Fellow of The British Society of Flavourists

Professor Dave Harwood
IFEAT / ICATS External Examiner

Deirdre Makepeace
Chartered Institute of Marketing Examiner, Author and Tutor

John Wright
ICATS Author and Industry Expert

Dr Brian Lawrence
ICATS Author and Industry Expert

John Ayres
ICATS Author and Past President BSP

Penny Williams
ICATS Author and Industry Expert

IFEAT ICATS Diploma and Certificate

Barriers to international travel do not present any specific challenges to studying with ICATS. Our students work in locations across the globe. What ties them together is a desire to develop their technical and management skills, enabling them to contribute positively to business strategies and operation in these unusual times. The programme is delivered through distance learning, supported on a one-to-one basis by professional industry experts and educators.

The core qualification offered by ICATS is the masters-level Diploma but the approach to learning is completely flexible so students may find that the concise Certificate, or even selected units, may suit their needs better. Science graduates might select financial, marketing and project management whereas small business entrepreneurs might choose the science and technical modules to develop skills for wider oversight of the business. Each unit is assessed by a work-related assignment, allowing students' roles to be reflected in the content; adding professional context with scope to tackle live workplace scenarios.

To date, nearly 150 delegates have enrolled on the programme and they come from a wide range of roles within the sector including producers, brokers, processors, compounders, manufacturers and retailers. The units are shown here with the options for specialising in the fragrance or flavour pathways.

Not sure where to start? Contact us and we can work with you to develop and individual learning plan.

Global units:

1 Foundation science and mathematics
2 Odour and flavour language
3 Aroma materials of natural and synthetic origin
6 Safety, regulatory and environmental issues
7 Operations, logistics and QA
8 Marketing and business environment
9 New Product Development
10 Project management
12 Financial and management issues
12 Research methods and dissertation proposal
13 Dissertation

Fragrance pathway:

4 Fragrance creation and evaluation
5 Application of aroma materials

Flavour pathway:

4 Flavour creation and evaluation
5 Application of flavouring materials

IN THE NEWS

Dr Tony Curtis

ICATS Founder and Principal Tutor

It is nice in these sombre times to start this with some good news. Congratulations to Chanel No 5, it is now 100 years young! The industry reports many hundreds of new fragrance launches around the world each year. It is truly remarkable and unique that this fragrance has maintained its pre-eminence for generations spanning both the 20th and 21st centuries. In uncertain times it is reassuring that something has timeless elegance.

In any news review it is impossible to not refer to the ongoing COVID-19 events. Living without smell [& taste] is one of the lectures reported in the *Health & Well Being* section of the IFRA-UK Olfaction anniversary book: *Living without Smell*, Professor Carl Philpott (2016). At that time the work was groundbreaking. In another section of Olfaction, work is reported on odour used in the diagnosis and identification of diseases. With COVID-19 one of the key diagnostic indicators is loss of smell and taste. The New Scientist runs a weekly feature The science of cooking written by Sam Wong. In the May 8th edition, he reports on approaches to help 'If your sense of smell has been affected by illness, you can still make food interesting using the basic tastes'. *Life Kitchen* (a not-for-profit cookery school) has published a cookbook *Taste & Flavour* specifically for people who have been affected by COVID-19. In Carl's IFRA Fragrance Forum presentation he reported 'Exposing our olfactory receptors and brain to smells through [olfactory] training programmes is helping to accelerate recovery'. Such programmes are now being used as part of the efforts to help patients with 'long' COVID-19 smell loss symptoms.

In *Olfaction* the ability of mosquitos to detect and select their victims by odour was discussed. This might be thought to be just interesting. However, malaria is still a major killer. The World Health Organisation reports that 409,000 died from the disease in 2019. The May 1st Edition of the New Scientist reports good news with the development of a new vaccine. As with COVID-19 this is one element of a multi-dimensional approach with weapons such as impregnated mosquito nets having their place. I was drawn to this article by another featured article – the linking element was DDT. The May 2021 edition of *Chemistry World: Pesticide resistance – a growing problem* was discussed. Dr Ali Green in her excellent reports covers the increasing impact of environmental issues discussed at the January 2021 IFEAT Conference. The complexity of the issues is illustrated by the history of DDT. In today's environmental impact concerns; DDT is a classic POP (**P**ersistent **O**rganic **P**ollutant). Clearly this is bad news. In its time it was a life saver of many thousands of people and regarded as a wonder chemical.

The message from this excellent pesticide article by Bárbara Pinho is that a systems multi-disciplinary

approach is needed. It is nicely summarised by 'You've got to use all the tools that you can get your hands on'. Spraying and forgetting [a whole field] is no longer an option for many farmers. However, the UK wheat crop is reduced by 800,000 tons by a single weed; solutions are needed to feed the World. If the last 50 years has taught us anything it is that searching for single 'silver bullet' is not the way to proceed. The decreasing costs and increasing power of Artificial Intelligence (AI) is a new part of the arsenal. It is becoming possible to identify a single weed [as distinct from the crop plant] with AI and then to zap it by highly targeted pesticide application or by mechanical means. One attraction of the use of use of Roundup was the reduction in mechanical disturbance of the soil. Indiscriminate deep ploughing of fields is also an environmental problem. These new approaches may avoid the use of glyphosate where, in any case, increasing plant resistance is developing. This is definitely food for thought.

Another feature article in the May 1st vintage Edition of *New Scientist* was *The Wisdom of the Woods*. When Suzanne Simard discovered the wood wide web people were sceptical. Now she has found that trees are caring, sentient and wise. It is easy to forget that there is as much of a tree below ground as above. The ground is not solely the preserve of the tree roots but is also a rich eco-system interacting and communicating (e.g. fungus). This

is a new take on the old saying 'Can't see the wood from the trees!' A forest or a field is not a collection of individual plants. It is a giant complex eco-system of interconnecting elements. Just as with our evolving knowledge of the complexity of odour receptors, yet again, we are beginning to grasp that the whole is more than just the sum of the parts. Complex and important interactions are the order of the day.

The May 2021 Edition of *Chemistry World* reports on an approach to make supercritical carbon dioxide more affordable for new product development and start-up situations. This is yet another important development. From field to plate, from flower to shower our industry environment has never been so turbulent. MBA and business studies texts observe that there are three types of organisations:

- Those who wonder what happened [lost & gone!]
- Those who wonder what happened [losing, observing but taking no action, going!]
- Those who make things happen [thriving, observing and taking action]

New product ideas and business developments come from monitoring the environment, making sense of the signals and taking appropriate action. This has always been the case. However, where time scale might have been years, now it may be months. AI may be coming to a farm near you faster than you might have expected!

ICATS-SCS-obituary notice
Anthony (Tony) Hunting (1933 – 2021)

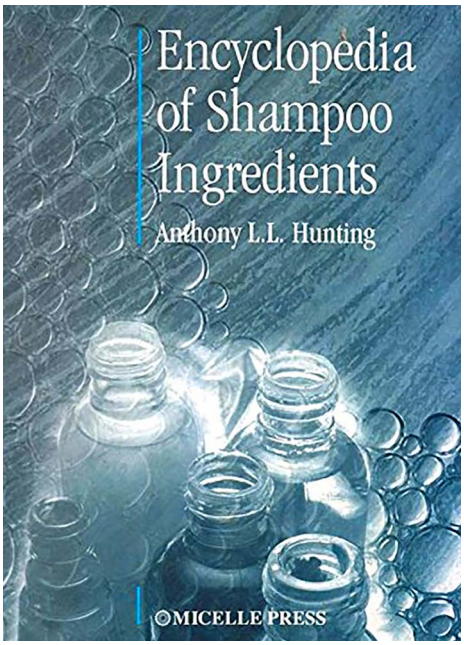
Anthony (Tony) Hunting amassed some sixty years of experience, both in England and the United States, in developing, formulating, manufacturing and marketing raw materials for the cosmetics and toiletries industries and in writing and publishing books on the function of these materials in cosmetics, toiletries and perfumes. He was a long-term member of the Society of Cosmetic Scientists (SCS – formerly the Society of Cosmetic Chemists of Great Britain) and of the New York chapter of the Society of Cosmetic Chemists (SCC), having joined the SCS in 1957 and the SCC in 1979.

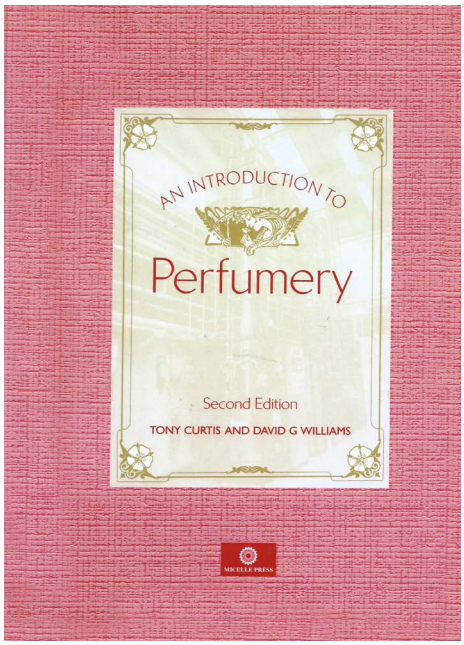
Tony was born in Portsmouth in 1933. His father, as a bandmaster serving with the Royal Marines, spent long periods at sea during the Second World War, and both before and during that conflict was frequently posted to different locations around the UK. As a result, Tony's schooling was often disrupted. He deferred his National Service while he took a University of London external degree course at Portsmouth Municipal College. He obtained a Chemistry BSc degree in two years. After completing his National Service in the RAF, in 1955 he began to work for Cyclo Chemicals, a surfactants manufacturer for the cosmetics and detergent industries in Woolwich, London, where he became General Manager.

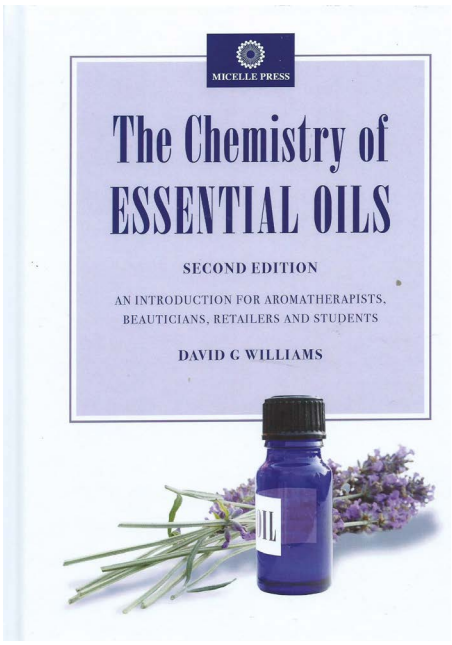
In 1976, the company merged with Witco Chemical Ltd in Belgium, the European subsidiary of the New York group Witco Chemical Company. Tony then joined REWO Chemicals, a soap and detergents manufacturer based in Steinau an der Strasse, Germany, one of the companies comprising the Cosmetic Specialties Group of Emery Industries, and in 1978 he moved with his wife, Janet, to the United States To take up a position as Production Manager at the plant of another member of that Group, Malmstrom Chemicals, in Linden, New Jersey. He left REWO's employ at the end of 1980 to become a consultant on surfactants and a freelance technical writer.

He also set up a publishing business, Micelle Press, in partnership with his wife. Tony wrote and published four books on cosmetic and toiletry ingredients: his first book, *An Encyclopedia of Shampoo Ingredients,* published in 1983, achieved great success; a companion volume, *An Encyclopedia of Conditioning Rinse Ingredients,* was published in 1987. There followed a two-volume work, *A Formulary of Cosmetic Preparations*. The first volume, Decorative Cosmetics, appeared in 1991, and the second, *Creams, Lotions and Milks,* in 1993. Tony went on to publish three books on perfumery, two of which – *The Chemistry of Essential Oils* (1996) by the late David Williams and *An Introduction to Perfumery,* 2nd edition (2001) by Tony Curtis and David Williams – have for many years provided a valuable source of information for students enrolled in ICATS' courses.

Tony was a kind, generous and unassuming man. He showed extreme dedication to his profession, his career and his family. He also found time to pursue his interests in Philosophy, Astronomy, Mathematics, Jazz and the Cinema. He invented several board







Tony Curtis remembers...

games, one of which, Molecules, was based on chemical structures. For many years he enjoyed playing squash and badminton.

Tony died on 10th March 2021, aged 87, after a long illness. Tony is survived by his wife Janet and their two sons.

When I was researching some background for this article on Google, I came across a BBC archive page from early 1990s on the Plymouth BA Business of Perfumery degree. One of the problems in getting this degree accepted was that there was not a suitable core textbook. David Williams and I foolishly thought this would be easy. It was not, but we got *Introduction to Perfumery* published. By the time the first edition of the book was published the original publisher had been taken over and the new larger organisation was only interested in mass appeal books. Tony Hunting came to the rescue and in 2001 the second edition was published. David Williams, myself, generations of students and the Aroma Trades Industry are deeply indebted to Tony, not only for rescuing our book but for the loving specialist service he freely provided to the industry.

As one of his authors, I found Tony a truly exceptional Commissioning Editor. His editorial advice was invaluable. At the IFEAT Conference in Singapore I visited the Cosmetic Facilities at Singapore Polytechnic. The first part of the proceedings was the Dean asking me to autograph his copy of *Introduction to Perfumery!* Tony Hunting's contribution to the industry was truly global. Specialist textbooks are not a pathway to fame and fortune; they are a work of love for a subject. We are all greatly indebted for his passion for the subject and the industry.

The ICATS team extend their condolences to Janet and gratefully acknowledge the supply of the detailed biographical information included in this obituary.

EVENT REPORT

Like so many events last year, the IFEAT Conference scheduled to be in Berlin in 2020 was sadly but understandably postponed. It was so wonderful to hear about the online event in early 2021 that sought to bridge the gap until the next in-person event, sharing the latest science and business knowledge with the IFEAT family and aroma trades community.

Dr Ali Green and Deirdre Makepeace

IFEAT Virtual Conference 2021 'Keeping the Industry Together'

Given the global nature of the industry operating across numerous time-zones, languages and cultures was a formidable task and praise must go to the organising team for such a professional virtual interface that was not only easy-to-use but worked pretty much seamlessly across all the days of the conference. With all of us now proficient in virtual meetings through necessity it allowed the industry to feel closer as a community despite the miles separating us.

There is not the space here to cover all the sessions in detail, my selection should be of benefit and interest to our readers across the value chain. However, I would encourage all readers to engage with the IFEAT website for further details of all the excellent speakers, research and insight in the spotlight at this unique global event.

Crop reports

IFEAT commissioned three comprehensive crop reports on major industry raw ingredients mint, citrus and spices. As the year has obviously been extraordinary in numerous ways, it was fascinating to compare the three crop-types, traditionally grown in a number of global locations, each with their own opportunities, advantages and challenges.

Mint

Antush Agarwal (Managing Director of Firmenich Essex Mint JV) got the ball rolling with the mint report, beginning with *peppermint (Mentha × piperita)* and contrasting the two major growing regions of the US and India. I experienced the US mint industry several years ago on the IFEAT Study Tour; it is a high-tech business from farm to manufacturing with massive monocultured fields and innovation in hybrids, mechanisation, distillation and QC. The Indian industry relies on manual labour and is relatively low tech in most parts of India (although the Punjab has larger organised facilities). However, the price of Indian oil is low, driving the overall price down from $50 per kilo to $40 and driving US production down despite healthy Yakima and Idaho single and double cut crops. Forest fires have also had some effect on output in the US. With *spearmint (Mentha spicata),* however, both pricing and production have remained stable. Washington State in the US is the largest global producer whilst Indian production is much smaller scale (less than half the production of the US) and is interestingly grown as an annual. Over the last year production of peppermint in India has reduced whereas Spearmint has increased. Finally, *cornmint (Mentha arvensis)* is much more prevalent in India and is being grown in five regions in fours states. The yield has recently increased with the product primarily used for isolates and fractions. Antush saw big challenges across the industry from climate change, supply chain issues and contamination (particularly in India with low-tech facilities) and the increasing requirements for labelling and certifications. However, the COVID crisis did not at that time appear to

have had a major impact (although at the time of writing, there is an awful situation in India which will undoubtedly have implications for industry), Antush looks to a future where agricultural advancements will have a beneficial impact on the mint industry with a focus on natural, sustainable, biodegradable and traceable oils. He also believes that new applications for mint oils will be developed that will increase demand for this versatile oil used across a number of market sectors: oral care, confectionary, personal care and home products, and in the wider chemical industry as an insect repellent including pet care applications.

Citrus

Sergio Davalos (COTA Ltda) spoke about the lemon industry over the last year with the most important information being that there had been a increase in demand due to COVID and the market has remained stable, however there has been a decrease in processing which has led to a recovery in price since the drop in 2019. The main producers in the southern hemisphere is Argentina and South Africa, who process oil between April and September; whereas Spain heads the Northern hemisphere ahead of the US, Mexico and Italy and process oil between November and March. 70% of all oil is produced by Argentina and Spain so the focus is on them where there has been a reduction in production over the last two years. As with a number of agricultural crops, climate change has been of concern, but oil supply has also been affected by an increase in the demand for fresh fruit. HLB or greening is a constant concern for citrus producers and is also on the rise and new EU regulations for the detection of unwanted residues from aflatoxins or pesticides have also proved a challenge the lemon oil industry. Sergio predicts that 2021 will see a further reduction in production but he can't say how big this will be because of the current uncertain global situation with COVID. However, prices are likely to increase due to a stable demand.

Colin Ringlieb (Ultra International) covered the rest of the citrus oil report and highlighted the dramatic difference between 2020 and the previous year's report in Bali again highlighting COVID uncertainties and weather variation possibly due to climate change as particular issues for the industry since citrus is grown in a narrow belt around the world, making it difficult to move crops or diversify. Whilst there has been an increase in the demand for organic oils, greening has had a significant effect on the quality of oils.

Orange: the demand for fresh oranges has been consistent while those wanted for processing has been variable. However, despite relative stability in demand, production is down with the US down by 5%, Brazil by 20% and Mexico by 45% with overall orange juice production there down by 60% alongside a drop in aldehyde level of 1.1% in Mexico possibly due to greening. Spain has also seen a significant production reduction of 15% due to heavy rains and high temperatures at the wrong times. Pricing, however, has increased as it is in demand for a number of COVID-related applications

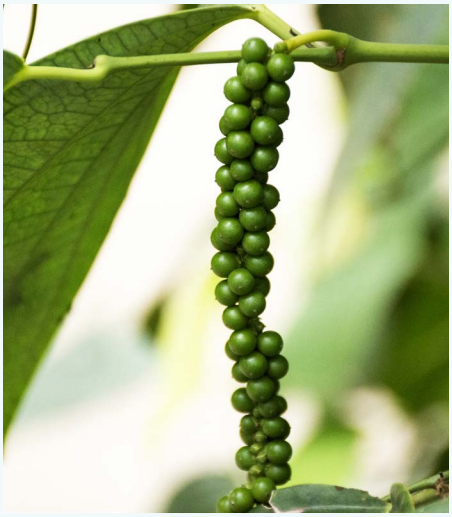
Lime: there are two types of lime: key lime from which we get distilled oil (mostly produced in Mexico and Peru) and Persian/Tahitan lime from which we get the expressed oil (mostly produced in Brazil and Mexico). Central and South American production has been affected by prolonged drought so this has affected production with Mexico again suffering quality issues from greening. Despite this, however, globally 2020 has seen a more stable lime market than all the other citrus products.

Grapefruit: in general, although production is pretty stable in Mexico, it is dropping in the US particularly since the juice has been contraindicated with numerous drugs and health conditions. It has been hard for producers to hit the key Nooktatone level with again restricts which crops can be used for oil production. Consumers have moved towards the pink and red varieties in preference which has kept prices higher for white grapefruit oil. New EU agricultural residue limits are restricting lots of fruit from the market whilst demand for organic grapefruit oil is very high. As a result of this unpredictable marketplace, prices have been far from stable.

Tangerine/mandarin: there has been a big increase over the last 20 years, particularly in the fresh fruit market whilst the demand for oil has actually decreased (20% in the Italian market). As with other oils, there has been an increase in demand for organic tangerine oil.

Bergamot: a small but important market for flavour and fragrance markets while aromatherapy usage has increased over the last ten years. Unfortunately high temperatures had a big impact on the 2019 crop, impacting the bloom, fortunately 2020 was a bit better. There is only a limited supply of the high-quality oil required by the fragrance industry which obviously has a significant impact on pricing.

Finally, Colin spoke about the



disastrous vector-transmitted pathogen HLB, known as greening, as it is having a devastating impact on citrus crops across the world. The host for the *Candidatus liberibacter spp*. bacterium is the Asian citrus psyllid – a type of jumping plant louse that can be transmitted by grafting onto root crops. Since there is no cure for the disease farmers can only manage it through antibacterial management, removing infected plants and frequent scouting and declaration of crisis. Clearly this is of great concern to citrus farmers and those who depend upon their produce so will definitely be under the spotlight for potential scientific investigation in the future.

Spices

Adityan KB (Plant Lipids) began his report with a brief history of spices, which I sadly don't have space here to cover. He then went on to outline some of the key issues overall for the world of spices with the primary concern being that COVID lockdowns in the spice growing heartlands coincided with the main harvesting period of January to May. In addition, like other sectors, the tighter EU regulations concerning pesticides and the weather had also played their part in making 2020 a challenging year for spice oils.

Black pepper oil: known as 'the king of spices, this has traditionally held high economic value but in recent years, prices have dropped significantly. COVID-19 has had a major impact on demand for this common food ingredient (which has left suppliers with large stocks) but has not had a big effect on supply chain.

Lemongrass oil: this perennial crop is harvested every three to four months. In 2017-18 there was a price increase but since then prices reduced and are now showing an upward turn again. There is more interest in farming lemongrass since it is a low-investment crop and there has been an increase in demand due to the need for citral disinfectants due to COVID-19. Unfortunately the pandemic has had quite a high impact on the supply chain but farmers are able to postpone harvesting in order to get the best price.

Davana oil: an annual crop harvested between February and March that needs to be handled in the right way since it is very weather-sensitive. Due to bad weather, production was greatly impacted in 2020 leading to a 50% shortage going into 2021 as well as a reduced *Davanone* content.

Cardamom oil: known as the queen of spices, this spice has different seasons in the key production zones of India and Guatemala. Due to flooding in the growing areas reducing yield, there has been a price increase between 2018-2020. It is likely that production will increase in the next few years as the crop is more attractive due to the good prices.

Ginger oil: as there is a shortage in China, India is currently the largest producer with Nigeria and China also key players. Due to its anti-viral qualities and use as a 'warming/nurturing' flavour, ginger has been in great demand across the globe during the COVID-19 era. This is likely to increase prices over the next two years.

Nutmeg oil: COVID-19 lockdown had a huge impact on Indian production as it coincided with the harvest, therefore, prices went up. A larger crop was expected in India (although how the current situation has impacted this prediction is unclear).

Clove bud/clove leaf oil: mostly produced in Indonesia, this crop was massively affected by the excess rainfall caused by El Nino leading to lower production, which was only exacerbated by COVID-19. However, prices were decreasing prior to this so it isn't clear to what extent they will be impacted by this.

Cinnamon bark/cinnamon leaf oil: the production in Sri Lanka was massively impacted by the COVID-19 lockdown as it also coincided with the harvest, driving prices up. Since Sri Lankan cinnamon has a unique odour profile, it couldn't be easily replaced by spices produced in Vietnam or China.

Celery seed oil: most is exported from India where the price has been steadily rising since 2016 a trend that continued last year due to a 20% smaller crop. In Punjab, one of the key growing states for celery seed, it has to compete with food production under the minimum support price scheme so despite the increase in prices, it isn't always prudent for farmers to grow it. This is likely to lead to even higher prices in 2021.Adityan had some good insight into what he envisaged the emerging trends in the spice oil industry to be: -

- Investments in automation and mechanisation in the field to reduce manpower, improve irrigation and overall efficiency.
- Control of the entire supply chain from the farm to the finished product to ensure minimum contaminants and best safety practice.
- Higher inventory to ensure there is no disruption to supply
- Science and technology that works on improving yields for farmers

IFEAT prides itself on keeping its members fully appraised of any regulatory issues in the aroma trades as well as keeping an eye on trends and the latest scientific findings in flavour and fragrance and this specialist panel discussion certainly didn't disappoint.

Regulatory and scientific presentations

Jens-Achim Protzen (Joh. Vögele KG): CMR constituents in naturals: an industry challenge for REACH, CLP and perception

This excellent presentation highlighted the complexity and dilemmas surrounding classification of 'hazards', actual risks and the ethics surrounding requirements of in vivo testing. Jens-Achim selected the complex situation surrounding two aroma chemicals that are natural constituents of numerous essential oils: *p*-Cymene (a naturally occurring plant metabolite, volatile oil component and present as a metabolite in human urine) and *γ*-terpinene (a monoterpene hydrocarbon) recently reclassified as reprotoxic by REACH (category 2 (H 361)). Under the IFRA/IOFI labelling manual 2020, this would impact 58 natural complex substances (NCS) including some commonly used oils (most citrus, tea tree, thyme, eucalyptus, mace/nutmeg and ylang ylang). Since labelling is based on 'worse case scenarios' despite a lack of data in this respect, this could lead to a substantially reduced market. The required in vivo tests then run into numerous ethical issues, particularly for those selling to the cruelty-free marketplace. Jens-Achim suggests that chemical 'clustering' could help producing what he calls 'corner stones' that could then be intrapolated -an approach could potentially be useful with the citrus subset, for example. New ECHA regulations are also complicating matters with legislation intended for single chemicals being applied to NCSs and MOCS (more than one constituent substance) in what could be considered a highly illogical since they were originally devised for the PETCOS then applied to UVCBS (substances of unknown or variable composition, complex reaction products or biological materials) and then to MOCS, which include NCS. Another complexity is that the current position of the EU Commission is not supported by the case law of the European courts so the big question is how should the industry proceed? Jens-Achim had some suggestions along the lines of industry-wide impact assessment, research into alternatives (options or arguments) and creating a position impact statement underpinned by technical support that could be presented. Along with COVID, these tightened regulations have really shaken the industry over the last year (as can be seen in the write-up from the IFRA 2021 Conference later in the Newsletter) and some kind of coordinated approach from the industry would appear necessary.

Eric Angeli (President, SNIAA Vice President Regulatory Affairs and Product Safety, V. MANE FILS): 'Mission Impossible' – Naturalness from Farm to Fork

Eric firstly looked back at the relationship between nature and chemistry where chemistry has swung in and out of favour for religious beliefs to the idea that science could solve every problem to today's complex picture with a polluted world, chemophobic public and increased regulation. Unsurprisingly, the consumer is confused by the current situation with most perceiving 'natural' ingredients to be better for their health and the environment, less likely to trigger allergies and more ethically produced. With flavourings, it is very marked with 88% of consumers reading food labels and perceiving there are two kinds of flavouring: natural and artificial, with natural being the preference for most. There are very strict rules concerning food labelling to avoid misleading the consumer as well as defining formulation rules and labelling protocols about what can be called 'natural': -

- The raw source material must derive from either plants or animals
- The process for extraction must be physical, microbiological or enzymatic
- The obtained natural product must be a pre-existing chemical structure

This is not an easy concept when you move towards a finished product in the food industry, but even more so in the world of fragrances where naturalness is defined by the ISO16128 standard. There are now even more requirements concerning labelling for different global markets not only concerning the concept of natural but also to certify eco credentials and ethical sourcing and the consumer could very easily become bewildered by the multitude of claims.

In order to address this confusing situation, Eric firstly outlined the positive list of claims (organic, 100% natural etc.) and the negative ones (no artificial ingredients, hypoallergenic, no synthetics etc.). He then provided a timeline illustrating various industry initiatives: -

- Green MotionTM (by Mane 2011)
  - 2856 ingredients
  - All formula assessed
- Sustainability Scorecard (Symrise 2017)
  - Patented
  - 80% portfolio assessed
- EcoScent Compass (Firmenich 2018)
- Sustainability rating (Givaudin 2020)
  - Patented
  - 2578 ingredients

He went through the Mane initiative in detail, which is in the public domain on their website:https://www.mane.com/innovation/green-motion Obviously, all of these strategies are useful to those working in new product development, formulation and marketing within the industry and with an increasingly aware public concerned about green issues and their own wellbeing are likely to prove ever more invaluable. Perhaps it is also time for the industry to be less secretive in order to demystify ingredients for the public specifically concerning the idea that 'natural is always better'. I'm sure that the musk deer and civet are very appreciative of synthetic alternatives, not to mention the high toxicity of numerous 'natural' ingredients and ingredients from endangered plants!

Geeman Korah (Kancor Ingredients Ltd., IFEAT Scientific Committee): Pesticides – To be or not to be?

Pesticides have had a very bad press of late all over the world, particularly neonicotinoids, that are thought to threaten vast numbers of pollinators and the public perception in the wealthy west is incredibly hostile as a result. However, this needs to be weighed against the key issue of the loss of arable lands and an increasing population who cannot afford the loss of valuable crops.

Geeman first outlined what a pesticide was: -

"something that prevents, destroys or controls a harmful organism (pest) or disease and can be used from seed to storage"

The virtues are that they protect crops from climate change, water stress and invasive species, avoid food loss in the field and in storage and they lead to more efficient land usage. There are advantages for the farmers since they prevent 'bad crops' and therefore poverty while the consumers have access to high quality food all year round. However, links between harm to consumers and animals have come to light alongside the organic movement and desire for natural 'health and wellness'.

It is a complex situation with different regulations around the world that must be considered as well as being very high profile. For example, of the 1429 pesticides, only 473 are approved in the EU but are used elsewhere. Due to ever more sensitive analytical techniques, more pesticide residues are found in NCSs than ever before, which puts the aroma trades industry into a regulatory storm as it were. So where are the main issues and what can be done?

Beginning on the farm, it is a complex situation where there is minimal education in some areas about the cocktail of chemicals (often restricted to what is available locally) used on various crops as well as how they can contaminate other species due to intercropping in certain agricultural areas (e.g. from Indian cotton to spices grown nearby). With a complex supply chain often containing middle-men, the farmers frequently have no idea where their crops will end up let alone what the regulations are in that region. When the process and concentration factors are examined the situation is even more complex since there is a variance due to processing and the big issue that the neat product is rarely used, but diluted for the end product and never reaches the consumer in concentrated form. If this wasn't confusing enough, there is also variance between the results, depending on which lab tests the sample so there is a probability for error in every case despite the impact this could be having on some key flavour and fragrance ingredients.

Due to this serious and complex situation, IFEAT has selected six NCSs for study, each grown in different parts of the world: cumin oil, capsicum oleoresin, blue chamomile oil *(Matricaria chamomilla.syn)*, jasmine absolute, basil oil and geranium oil. As well as being important to the industry, each of these is exposed to PPP regulation or potential bans. Once the research is complete, IFEAT will collaborate with other associations (EFEO, FEMA, IOFI etc.) to develop strategies for discussion with non-expert regulatory bodies. At the heart of any lobbying must be the socio-economic impact of regulation, with the farmers' livelihood at the heart of the discussion and educational exchange key to this collaborative approach. Further research must also be undertaken to develop more effective processing to remove or reduce pesticide residues in NCSs as well as considering alternatives to conventional pesticides such as bio-pesticides or companion planting. At present 50-60% of many crops are still lost if chemical pesticides are not used so this is obviously a key target area for ongoing research.

As we can see this is an incredibly complex situation with stakeholders across the value chain farmers, manufacturers, regulators and the public holding different viewpoints and priorities. The ongoing IFEAT research can only be a good thing and we look forward to seeing the fruits of this in the near future.

Matthias Vey (IFRA): Nagoya Protocol and CITES – challenges or opportunities for the industry?

The final piece of the regulatory jigsaw concern environmental issues. Firstly biodiversity, its conservation and sustainable use with the Nagoya Protocol also considering fair and equitable sharing of benefits from genetic resources and traditional knowledge. CITES focuses on trade, controlling the traffic of plants and animal species, their parts and derivatives including the trade of mixtures – a huge administrative burden! CITES contains three appendices listing species under three categories: -

- Appendix 1: species threatened with extinction – highly restricted (understandably)
- Appendix 2: species not necessarily threatened with extinction but in which trade must be controlled in order to avoid utilisation incompatible with their survival
- Appendix 3: species that are protected in at least one country that has asked CITES parties for assistance in controlling the trade.

Appendix 2 is the most important for the aroma trades industry but since amendment decisions are only taken every three years by majority vote, it can be a frustrating and laborious process. IFRA hold 'Official Observer' status at CITES and is actively engaged with recommending changes to definitions and entries in the appendices. It has successfully campaigned to exempt mixtures as well as effecting changes in definitions for key terms but because of the three-year decision-making process, it is a situation that can be frustratingly protracted, particularly since it can have such a profound effect on the raw materials trade.

The Nagoya Protocol defines guidelines that participating national and regional governments are sign up to and enact local laws to uphold them, binding citizens to comply. This leads to numerous questions for anyone in the aroma trades if their government has signed up: -

- Am I under the scope of the Nagoya protocol? What must I do to comply with the Nagoya Protocol?
  - Is my ingredient a genetic resource? And a derivative?
  - When and where was this genetic resource sourced? Who is the provider?
  - Which company departments are responsible for compliance?
  - Am I just buying the ingredient or performing R&D? Is our R&D considered utilisation? Is this R&D under the scope of the protocol?

Matthias helpfully put together some advice for companies who are getting to grips with both the Nagoya Protocol and CITES (see images).

IFRA and IOFI are engaging with these bodies on behalf of the industry and are also creating guidance documentation pertaining to a number of key countries that are affected by the regulations. In an ever-changing global marketplace that is also subject to a shifting climate impacting on habitat and ecosystems, these procedures are likely to stay with us and perhaps be subject to increased rigour becoming yet more complex. Global industry-specific bodies like IFRA are invaluable against this background: not only putting forward the industry's point of view to regulators to change or modify policy, but also helping the industry to understand and implement the protocols in order to safeguard natural resources for future generations.

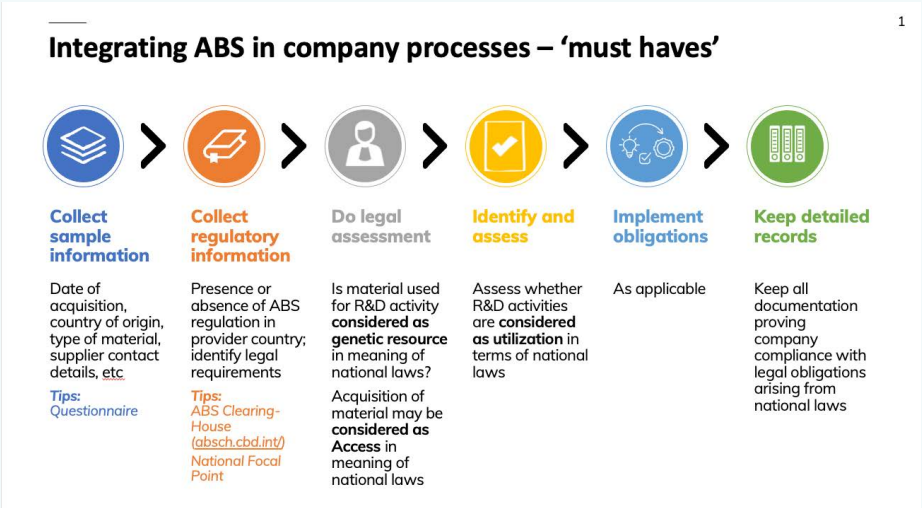
The last session I would like to highlight is this one from one of the most famous names in the world of essential oils.

Everyone is Wrong Except me – the many voices of essential oil safety

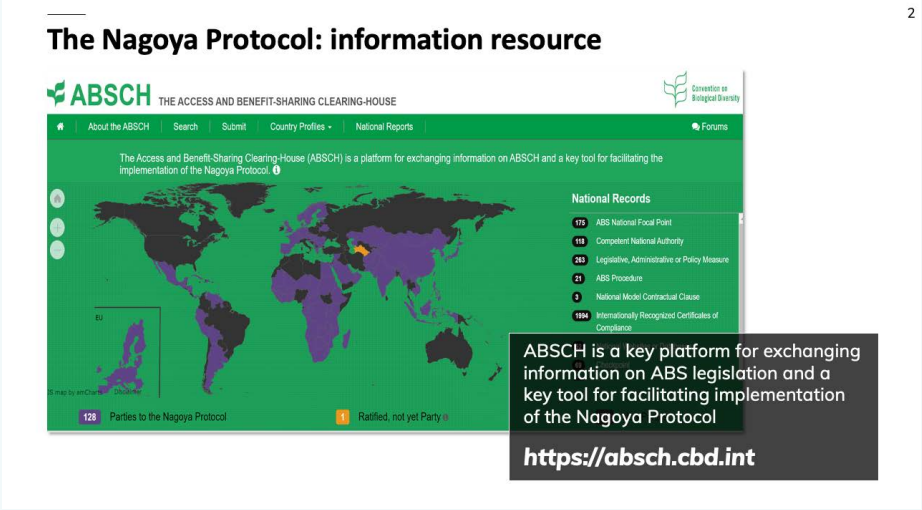
Robert Tisserand (founder of the world-renowned Tisserand Institute, acclaimed author, researcher and essential oil expert)

Robert needs no introduction in the world of essential oils; he is highly regarded amongst both a scientific audience and practising aromatherapists, so it was wonderful to hear his thoughts on the topic of essential oil safety amidst a world of increasing regulation.

Firstly, Robert talked about the users of essential oils. Interestingly, the vast majority of essential oils are not used by professional aromatherapists but are bought be the general public who may or may not read safety information. With most users using the oils topically, allergies are the most widely publicised but Robert was keen to point out the difference between Type 1 allergic response mediated in the IgE cells that can cause contact urticaria and anaphylactic shock almost immediately (incredibly rare for essential oils) and Type 4 allergic response, where we see



Matthias helpfully put together some advice for companies who are getting to grips with both the Nagoya Protocol and CITES
Credit: Matthias Vey, IFRA



delayed hypersensitivity that can cause contact dermatitis and is mediated by the T cells and although far more common than the Type I reaction they are still relatively rare. Thus, skin sensitivity while classed as an allergy, actually differs from the common perception of allergic response where anaphylaxis could lead to death.

Reporting of and testing for contact dermatitis can also be a haphazard process. Firstly, there is a common myth among a sector of non-professional essential oil users that redness on the skin is part of the 'detox process' and a number of high-profile cases have focused on such uses who continue to apply essential oils despite a skin reaction. As anyone properly educated in essential oil safety knows, any redness is not a good thing and is never caused by the detoxification process in the body, mostly undertaken by the organs of elimination (liver and kidneys) and the lymphatic system. When essential oils and fragrance mixtures are patch tested on skin professionally, Robert was keen to point out the differences between the types of tests and the variability of tests undertaken by different companies: when a fragrance mixture was tested on the same 5006 dermatitis patients, one test identified 220 (4.4%) as reactive, with another brand identifying 465 (9.3%). Although both figures are reassuringly low, there is considerable variation and if such figures are used to establish absolute values for chemical risk, this could lead to safe products being labelled as potential allergens and vice versa.

So where does this leave the essential oil producers and users in reality? Firstly, Robert focused on an essential oil that has one of the highest sensitivity records: cinnamon, in particular the chemical cinnamaldehyde which triggered the most reactions amongst test subjects – unsurprisingly the 2% solution triggered more reactions than the 1%. A survey was undertaken of US websites that sold cinnamon bark oil to examine recommendations for dilutions when using the essential oil. There was no general consensus, with one offering no advice at all, the most common being 0.07%-0.1%, several simply suggesting 'dilute' and three companies saying it should not be used topically. The Tisserand Institute undertook its own research on cinnamon using 345 participants: 55 were actually discounted from the study leaving 290 in the report, 213 of whom had no reaction and 77 reported an adverse reaction. When the results were scrutinised further to compare diluted and undiluted oil, 24% reacted to the diluted oil while 34% reacted to the undiluted sample. The Institute also examined the frequency of application, deducing that the more frequent the application, the more likely a reaction was. However, it is important to recognise the part that responder bias plays in these kinds of studies. Those who have a reaction are far more likely to respond, whereas those without a reaction may well just fall off the radar and lose interest; this again can also indicate a substance has a higher incidence of sensitivity than it actually has.

When we move on to actual scientific research, there are other issues that come into play. Firstly, the issue of botanical identity: where the use of common names rather than correct Latin full species names in studies and anecdotal reports can cause real confusion about what has actually caused the sensitivity. Robert gave the excellent example where five completely different species with completely different phytochemistry are all commonly called cedarwood: Atlas Cedarwood *(Cedrus atlantica)* and Himalayan cedarwood (*Cedrus deodora)* both contain Himachalene isomers, Chinese cedarwood *(Cypressa funebris)* contains Thujopsadiene, Cedrol and α-Cedrene, while Texan cedarwood *(Juniperus mexicana)* and Virginian Cedarwood *(Juniperus virginiana)* both contain Cedrol, α-Cedrene and Thujopsene. In some studies, often undertaken by dermatologists rather than essential oil experts, there is no publication of the chemical constituents under investigation, which then hampers further specific research as there is no certainty about which compound is causing the sensitivity. Similarly, the term 'oil' can cause confusion: whether it's the fatty oil or essential oil being reported as a sensitiser. Robert cited *Nigella sativa,* commonly called black seed oil for which there are numerous reports of sensitivity but most of them seem to relate to ingestion/application of the fatty oil rather than the essential oil but only one study from eleven explicitly states this.

A key paper by Posadzki et al (2012) on the Adverse effects of Aromatherapy, published in the International Journal of Risk and Safety in Medicine has been cited 104 times in further studies. When scrutinised, however, Robert found that of the cases examined in the paper 25 of the 42 cited should not have been included since they were a consequence of highly abnormal usage including lots of non-aromatherapy uses, whereas typical 'normal' use of essential oils in the correct dilution and with appropriate carrier oils have not been investigated.

In order to delve deeper into some of the complexities behind this issue, Robert examined the hot topic of essential oil components as endocrine disrupters, with a focus on lavender, which has been linked in studies to gynecomastia (the development of female characteristics such as breasts in males under 9). A paper by Henley et al (2007) has been cited 399 times and details three cases of prepubertal

gynecomastia linked to lavender-scented soap, hair products and healing balm. Robert's team scrutinised the Henley research and two further investigations, two of which showed lavender as estrogenic. However, there is a concern about the results given that all used MCF-7 cells for the research. These trays contain Phthalates and Bisphenol A, that can be leached from the plastic by the essential oils both of which are known endocrine disrupters thereby calling these results into question as it would be impossible to tell whether it is the leached chemicals or the essential oils that are to blame. Two more recent studies (Heger-Mahn et al 2014 and Shinohara et al 2016) showed no estrogenic action for lavender oil. Robert's team have written to Elsevier's Editor to challenge the paper as it has had such consequences for industry regulation. Another study that supposedly 'proves' lavender is estrogenic is Diaz et al 2015, which also investigates three cases of prepubertal gynecomastia. These cases are associated with *Agua de Violetas,* incredibly popular among the Hispanic population, and cover a year's exposure. However, the precise components of these products were not tested using the techniques that would be utilised within the industry and there was no investigation to isolate any other compounds that could actually be the culprits. There was compelling evidence, however, that the Agua de Violetas caused the symptoms, so the question was, did they actually contain lavender? In tests of the first brand, there was only 0.48% volatile substances and of these 42.13% were ionone isomers, whereas the was no linalool or linalyl acetate present (which would be expected if lavender was an ingredient). In the one case where lavender could have possibly been present, there were only 1.6% volatile substances in the product and of these, 0.95% was linalool and 0.06 linalyl acetate – a tiny percentage of the actual product. As Robert pointed out *'If 1g of cologne was sprayed on the skin, this could contain 0.04mg of lavender oil. If 3.6% of this is absorbed (Lapcynski et al 2008 for linalool), this would equate to 1.4µg of lavender oil. To put this into perspective 1.4µg x 35,000 = 1 drop.'* His conclusions were that other chemicals, notably ionone isomers and benzyl acetate were found in significant amounts, whereas there was no conclusive proof that lavender was found in any, and even if it were present, its potency would be so low, it would not have a clinical impact.

In conclusion, Robert's excellent presentation showed that more than ever, regulations and risk assessments are not necessarily being driven by 'good science' yet are having a significant effect on the industry as well as causing unnecessary fear amongst consumers. Statistics are key to this, with regulators needing to be informed on the interpretation and real-world impact of the numbers involved when talking about tiny molecular components of essential oils. There is an urgent need for well-designed research programmes by essential oil specialists to counter misinformation and as a lobbying tool to educate the regulators such as the recent change in EU Regulations.

Naturals & Business

2020 & 2021 Trends and Challenges Panel Discussion

Dominique Roques, VP at Firmenich and IFEAT Executive Committee member introduced a panel discussion with experts from around the world and representing producers, distributors and end users:

- Sofia Lluch co-owner of Lluch Essence, Barcelona based distributor with bases around the world
- Robby Gunawan of Indesso Aroma in Indonesia, very well-known for their clove and patchouli oils
- Rick Boucard of Texarome, in Texas USA, dealing mainly with cedar oils, instrumental in creating Distillers United a forum to share knowledge of distillation and extraction
- Laurent Bert, Capua, Calabria, an Italian citrus company, 'King of Bergamot'
- Tim Valentiner Vice President of US aromatherapy company doTerra, representing the end users.

The discussion focused on three key themes affecting the sector.

Naturals – the market view today

In the light of the incredible changes the market has faced during the COVID-19 pandemic. The producers, distributor and consumer brand represented in the discussion were invited to share their experiences. All reported that the markets had been volatile. One negative trend was a fall in demand for oils such as Rose and Jasmine that are predominantly used in the fine fragrance sector. Demand may still exist but the opportunity to buy has been affected, particularly with the loss of air-travel retail opportunities. However, aromatic applications for cleaning products had compensated for this with much stronger demand. Rick Boucard compared the current crisis to the economic crisis of 2008/9 when demand dropped dramatically as panic struck: 'It's important to understand if it's an inventory activity or a true slowing of demand'. What happened then, and repeated in 2020 was an explosion of orders after a dramatic dip. Behind this lies steady growth. Laurent Bert described the 'Black Swan effect', an unpredictable event with a catastrophic effect but agreed that the growing demand for citrus in home care and detergent products showed that consumers are valuing natural and ethical products. Sofia Lluch considered the fortunate position of Lluch as a larger company operating in a wide range of markets with overall demand remaining strong. Lluch works with over 3,000 ingredients and operates in many markets. Demand is continuing with stronger recovery predicted for the second half of 2021. Tim Valentiner stated that the health and wellness category has been growing and that this could be considered as a paradigm shift: 'I don't think there is a normal we are going back to.' As an online business doTerra has been able to continue strongly. At all levels of the industry it was agreed that the crisis had presented many logistical and production challenges from staff isolating or falling ill to the movement of goods and skilled

BLACK SWAN is an unpredictable event characterised by its extreme rarity, severe impact, and the widespread insistence that it could have been predicted, although standard forecasting tools usually fail in this regard. A historic description of rarity, the phrase was recently popularised by author Nassim Nicholas Taled in 2001.

personnel being restricted, presenting businesses with plenty of challenges getting products to wherever they need to be.

Availability of products and ongoing climate-change challenges

How is the industry's position changing and does this remain a priority. Sofia Lluch considers COVID-19 to be one challenge among many natural disasters affecting the trade in 2020 including Australian bush fires and flash floods in Honduras, Salvador and Guatemala. These are all sharp reminders of the climate challenges being faced and they have combined to make 2020 an extremely difficult year. With some growth in demand for many essential oils, the key issues discussed included water shortages, climate volatility and risk in geographically distinct growing regions. Efficient solutions considered by the panel were varied including gaining clear insight into the bottlenecks which may be more to do with investment in skills and technology than growing conditions. Some species may fare better than others, for example Texarome focuses on cedar, which is a very robust tree, seen as a weed tree in Texas. For doTerra the risk is spread by working with production partners in 45 countries and supporting diversification, for example managing supply by working with producers in both the northern and southern hemispheres to achieve alternate harvest seasons. DoTerra's mantra is 'source the best and help the most' for example taking the more challenging route of diversification in Eastern Africa, working over many years to convince small farming communities to grow essential oil crops with a guaranteed market. Robby Gunawan described similar producer relationships in which farmers are encouraged to move from commodity crops to a mix, including essential oils, enabling new growing partnerships to emerge.

Meeting the needs of regulators and certification authorities

Is regulation going too far or is it an essential tool in giving consumers the provenance and quality they increasingly expect? Rick Boucard described the friction that sustainable and ethical certification can create when working with families that may have been creating and distilling for many generations in communities around the world: '... and then somebody comes in asks are you are abusing your people, do you have slaves, are you destroying your land – we need you to certify'. A different approach could be to exalt and highlight the sustainable traditions and cultures and the amazing stories behind them. Tim Valentiner agreed that certification it is not a one-size-fits-all; essential oil production is niche and complex. Indesso works with thousands of growers and sets targets for certification but Robby Gunawan explained that certification requires traceability and this needs cooperation through the whole of the supply chain, presenting a chain of certification challenges. The panel's views on solutions were varied but all agreed that customers and end users want to know where their product is coming from, as Tim Valentirer summarised, 'providing insight for consumers in an authentic way'.

The discussion ended with a Q&A session which concluded on a cautiously optimistic note with health and wellness as part of the 'new normal' and a future likely to see continued growth of naturals.

Michael Carlos Givaudin F&F Industry in a Covid World

From the 2020 Chinese New Year to the Western Christmas celebrations, COVID-19 has taken every opportunity to spread through populations around the globe. China imposed tough restrictions. Singapore employed 'distance ambassadors' to ensure regulations were being followed. More relaxed guidance in Spain and Britain resulted in large drops in GDP. Consumers cut back on luxuries and started stock-piling necessities, building their 'pantries of panic'.

Michael Carlos went on to develop a wider industry picture with longer terms stresses on our communities and our economic systems. Consumption is straining the planet with the plant vs animal food argument gaining significance as resources become increasingly stretched. The top five meat and dairy companies combined emit more greenhouse gasses than Exxon Mobil, Shell or BP. Obesity is another significant challenge with rates exceeding 25% in USA and Europe, a health factor that proved to be critical as the pandemic spread.

These factors have of course had a major impact on consumer behaviour and relationships with products and brands:

- Fewer opportunities for customer contact as travel continues to be restricted
- A resurgence of local brands as consumer 'go local'
- Companies responding accordingly; Givaudan's focus has moved from global fragrances to products tailored for local markets
- Remote working impacting on the workplace, raising the significance of tools such as 'Carto' which enables creation and evaluation without a perfumer in the lab
- Manufacturers developing plant-based proteins and cultured meat products

Carlos is based in Singapore which he described as a microcosm of Asia and the food security challenges and opportunities it faces, including rapid food demand growth, relatively low yields, climate related issues and land availability. The Future Ready Food Safety Hub (FRESH) has been established with the '30 by 30' goal of producing 30% of Singapore's nutritional needs by 2030, a significant challenge for this small country. The initiative aims to foster collaboration and better relationships between the food industry, researchers and regulators.

These complex issues are set against the tanker-trend backdrop of climate change and global warming. Carlos presented a world map showing the regions of the planet predicted to become less suitable for human habitation, providing a stark warning of the major challenges that lie ahead. Carlos closed with the words of Mark Carney, past Governor of the Bank of England:

'The economy must yield to human values'

'What is more valuable, Amazon the company or Amazon the region'

'When true climate change comes there is nowhere to self-isolate'.

The session's Q&A brought more food for thought as Carlos agreed that we need to change the lifestyles of 'innate carnivores' by getting people to change at a younger age: 'Eating meat could become like smoking cigarettes.'

Ferran Serrat 'When Prices leap'

Ferran Serrat is the Senior Purchasing Manager Aroma Chemicals of Ernesto Ventos SA. Price fluctuations may be considered as particularly relating to natural ingredients but Serrat's presentation explored the varied and complex drivers affecting prices of raw materials from both natural and chemical sources. These can include sudden shutdowns resulting from accidents, technical problems or cyber-attacks at productions plants or they can be as a result of the 'rage of nature' such as the tsunami triggering the Fukoshima disaster, floods, drought and of course disease as we have seen with COVID-19. Other factors might be new applications for a raw material, consumer fashions and trends, legal disputes, new regulations or shipping space issues that affect the supply chain.

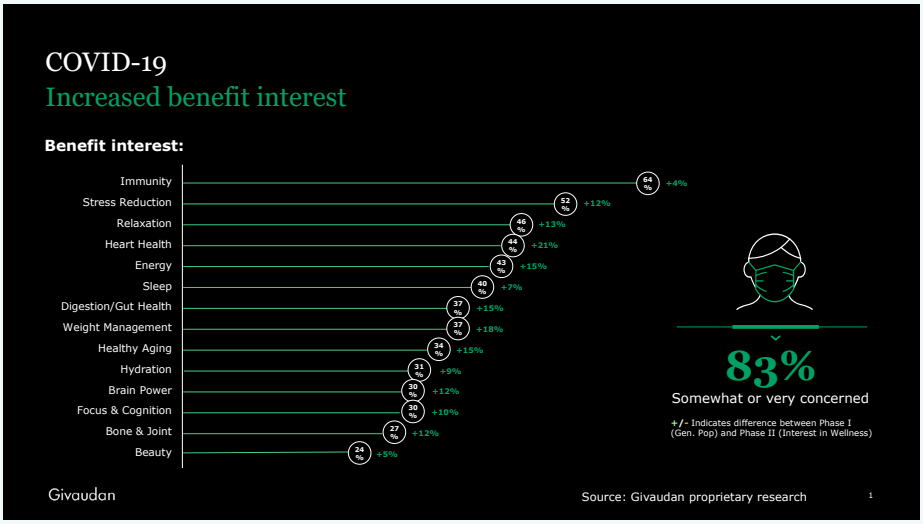
Serrat reflected on a number of case studies that helped to put this into context:

- BASF accident in citral plant (Oct 2017) resulted in a product shortage and the prices of Linalool more than doubled
- Maltol/ Etil Maltol is mainly produced in China and an accident in the main factory stopped production, resulting in a price climb which took two years to resolve
- Gamma Undecalactone-Aldehyde C14 – capacity restrictions in some factories resulted in a shortage in 2014-15, with a corresponding hike in prices...three new sites and now prices are at a new low
- Dihydromyrcenol – two accidents in Indian factories in 2018-19 stalled production and DHM prices skyrocketed
- Leaf Alcohol/CIS-3-Hexenol – Japan used to dominate the market but new Chinese producers emerged and an initial price drop ensued. Increasing demand has since seen shortages and corresponding increases in prices.

The world is full of surprises but fundamentally supply and demand rule in such situations and 'panic is the best-seller!' Now in 2021, freight prices are going up week-by-week as a result of COVID-19, an additional cost that will inevitably work its way through the supply chain.

Givaudan Flavour Ingredients – 'Talking Functionality with GFI'

A transatlantic Givaudan team presented the latest views on the consumer trend for distinct functional benefits from food products, supported by the findings of a comprehensive research survey. Tom Charmont, Head of GFI introduced the team and Mark Sewell, launched the discussion, describing the trend for functional products as a long-term, sustainable trend that is top-of-mind for consumers.



Talking functionality with GFI
Credit: Givaudan

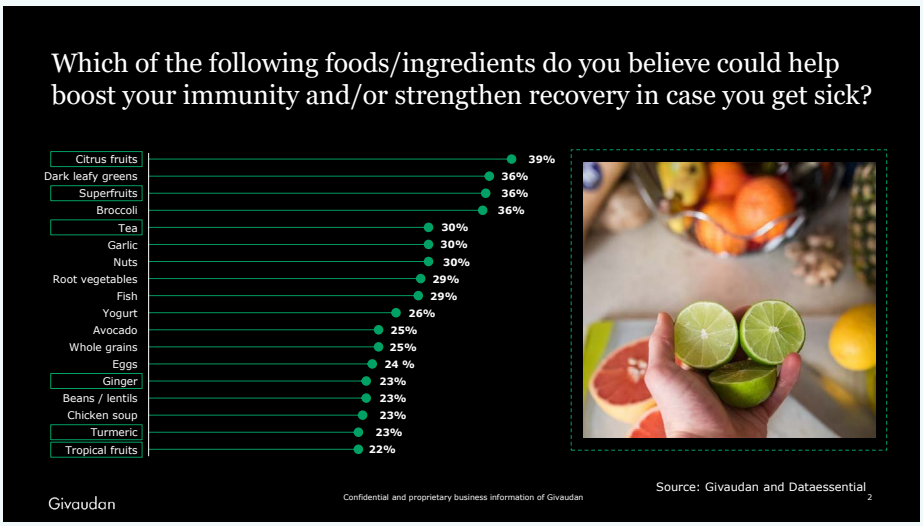
Jay Klosterman, Director of Commercial Innovation at Givaudan set the scene for the current market where there is new hope in the form of vaccines and 'more change for consumers than any period in history'. Shopping habits have changed with ecommerce driven by growth in the late generation segments and irregular purchase patterns driven by a tendency to stock-up. COVID-19 has also driven consumers to expect functional benefits in everyday food products – more than just enjoyment.

The Givaudan survey interviewed a total of 1,224 consumers across different periods during the pandemic, assessing 30 ingredients across 30 different need states, measuring benefits sought such as heart health, sleep, stress-reduction and immunity. Some of the findings:

- 83% were somewhat or very concerned about COVID-19.
- 63% stated the benefit interest of immunity, making it the top benefit sought, followed by stress reduction (52%) and relaxation (46%).
- When asked 'Which of the following foods/ingredients do you believe could boost your immunity and/or strengthen recovery in case you get sick?', the results highlighted for example: citrus fruits (39%), superfruits (36%), tea (30%), ginger (23%) and turmeric (23%).

These results highlight 'what is emerging and how we can support those consumer trends today'. Considerations for functional ingredients include GRAS certification ie recognised as safe, clean labelling and authenticity of talking about nutrition, 'functional claims' e.g. digestive health, 'soft claims' e.g. the calming properties of camomile and approved health claims e.g. 'may reduce the risk of heart disease'.

When asking which foods/ ingredients are thought to boost immunity, citrus is at the top of the list and it is no surprise to find that this is translating to an increase in sales of fresh citrus and a resulting downturn in availability of oil. Consumers have to a degree entered 'survival mode', reverting early in the pandemic to tried and true products that they were comfortable with. Further into the pandemic people were seeking experiences – flavours, enjoyment, exotics – taking them to places that they can't go to physically. This presentation was a fascinating synopsis of top quality research that gave the virtual audience evidence for the way consumers will prioritise in different ways as their environment and their concerns change.



Talking functionality with GFI
Credit: Givaudan

EVENT REPORT

Two Online Events with the BSP and SCS.

Dr Ali Green

Dr Jane Parker, Reading University
(https://research.reading.ac.uk/flavourcentre/)

Chrissi Kelly, AbScent
(https://abscent.org/)

BSP & BSF AbScent Webinar: Parosmia Unwrapped

This timely webinar featured academic research about the debilitating condition known as parosmia, where there is a distortion of smell and things taste and smell 'abnormal'. This is a symptom at the forefront of public awareness since anosmia (complete loss of smell) and parosmia can be symptoms of COVID-19. A large number of parosmic cases appear as a post-viral symptom and parosmia is classed as a quantitative olfactory disorder (that can both improve and worsen), along with anosmia (complete loss of smell/ taste), phantosmia (smelling things that are not present) and hyposmia (decrease in the general ability to smell/taste).

The study initially sought to isolate which foods were potential triggers for parosmics in that they were specifically unpleasant or altered from what is generally accepted as normal. The foods identified all contain potent flavour chemicals: meat (MFT), coffee (FFT), cucumber and watermelon (2, 6-nonadienal), green peppers and peanuts (2-isobutyl-3-methoxypyrazine) and fried foods (2, 4-decadienal). The initial hypothesis was that the parosmics could only identify these potent chemicals but couldn't sense the other more subtle aromas that would normally 'balance' things out. In order to assess this, the study narrowed down the substances to a single one that had a reported effect on many parosmics and also one for which there was a very secure chemical analysis: coffee. They recruited some test subjects: 15 pre-COVID parosmics, 15 post-COVID parosmics, 15 non-parosmics. Using 'Sniffin' Sticks' featuring the aroma compounds, olfactory loss was measured and specific chemical triggers were isolated.

Thiols such as Furfural mercaptan were particularly triggering but interestingly, when those parosmics responsive by this chemical attempted to discuss the smell, they lacked the vocabulary to describe it (unlike the control group) using more hedonic terms such as 'disgusting', 'repulsive' and 'sweaty' as opposed to the normosmic descriptors like 'leather' and 'popcorn'. Thiols are also present in roast, grilled and barbecued foods, all of which are often particularly repellant to parosmics.

Once the trigger chemicals and the response of the test subjects had been assessed, the Reading team sought to investigate the biological cause of parosmia within the olfactory system. The first observation was that there was no correlation between the type of compound and the olfactory receptors. This led to further research on what substances are perceived as disgusting by parosmics. Interestingly this also uncovered a puzzling peculiarity whereby parosmics often found smells perceived by normosmics as unpleasant to be pleasing, such as faecal aromas for example, and were unable to detect certain 'unpleasant' chemicals at all: indole, p-cresol and skatole could not be perceived (foul is fair/ fair is foul).

The situation was obviously far more complex than simply certain receptors being inactive: -

- Parosmia is more than just a random imbalance of aromas
- It is not just about thresholds
- There is a common set of molecules that trigger distortions
  - These molecules tend to be potent and have very low thresholds

    - They separate into distinct groups
- There are no known receptors which are specific for the described trigger molecules
- Parosmia is independent of quantitative olfactory loss
- Parosmic odour quality is not related to odour concentration

The current hypothesis the team are working on seeks to explore the following biological scenario subsequent to viral infection: -

- Neurons had been lost and new ones needed to form
- The body's own defence mechanism impeded this process through scar tissue, accumulation of mucus and inflammatory response perhaps leading to 'cross-wiring'
- It isn't a purely random mis-wiring of receptors but very specific receptors are involved
- It could be down to a preferential rate of growth for these receptors

The current COVID crisis has massively increased the potential number of test subjects, in particular younger individuals, who are experiencing olfactory disorders. The Reading team have joined forces with Dr Puya Dehgani-Mobaraki, an ENT consultant at the forefront of research into this field, and are part of the Global Consortium for Chemosensory Research (https://gcchemosensr.org/) a worldwide study. Initial findings found that a diminishment of sensory perception was very common in COVID: 80% experienced decrease in olfactory function, 69% in gustation and 25% in chemesthesis (perception of hot and cold). There appears to be no relationship between these phenomena and nasal obstruction since, if it is present, it is unrelated to the reduction in sensory perception. However, certain protein receptors have been identified as more open to attack, namely ACE2 and TMPRSS2. Although the olfactory neurons are not directly affected, the conical sustentacular olfactory cells were, due to the prevalence of ACE2 and TMPRSS2 on their surface. These cells would need to regrow from the basal cells and their absence can explain the loss in olfactory perception. The ongoing research aims to further investigate this hypothesis and whether the 'mis-wiring' aspect is actually the case. No doubt updates to this research will be published in due course and we will be keeping our eyes peeled for these.

As you can see in some ways this webinar raised more questions than it actually answered as the research is ongoing. In the meantime as we wait for further data on the causes of parosmia, anyone who is dealing with parosmia or other olfactory disorders themselves might want to check out AbScent's website for support and potential treatment options or contribute to the Chemosensory study on COVID-related olfactory disorders mentioned above.

EVENT REPORT

Dr Christian Margot (Distinguished research chemist and Director of the Corporate R & D Division), Dr Christale Porcherot (Principal scientist in the Corporate R & D Division), Dr Jerôme Jallet (Vice President of Consumer and Market Innovation)

Dr Ali Green

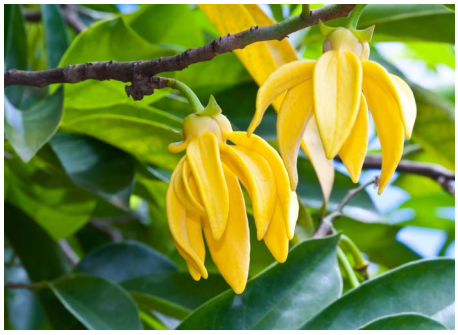
BSP/SCS Joint Webinar: The Science Between Scents and Emotion - a Firmenich presentation

'Everyone feels comforted by vanilla', 'lavender encourages relaxation', 'ylang ylang is the fragrance for seduction' etc. etc.: we are all familiar with these kinds of assertions in the popular press, on labelling for fragranced products and when we visit aromatherapists. Are these claims founded in any kind of science and can they possibly apply universally across cultural, gender and age boundaries? This fascinating lecture investigated a completely different aspect of the science of fragrance: the interface between scent and its effect on the mood of the individual. It was no less scientifically rigorous than the parosmia study (in the previous article) but delved into the complexity of psychological differences and how these are affected by our genetics and environment. This investigation combines techniques from both experimental psychology and cognitive science and was undertaken by Firmenich in conjunction with the University of Geneva.

In 2009, scientists began to look at how scent connected with all the senses in the cutting edge Brain Behaviour Laboratory at Geneva University including neuroscience, the VR lab and also developed new MRI techniques that combined with a novel odour delivery system. This eventually led to the creation of an inhouse Cognition and Behaviour laboratory at Firmenich in 2018. The research has been so ground-breaking that it has led to over 40 peer-reviewed publications, 6 book chapters and over 750 citations!

The initial findings demonstrate that the statements I gave at the beginning of the article are far from universal. Firstly and very importantly, there is no simple link between a scent or ingredient and the triggered emotional state. Secondly that individual experiences and the context of the fragrance matter. Thirdly, verbalisation of the individual's perception of scent is key. Lastly any solutions and formulations should be country and category-specific. So where does that leave perfumers in a global marketplace?

The Firmenich team unpacked their research and conclusions in stages beginning with attempting to define emotion; since in order to measure something it is important to understand what is being measured! This was the first difficulty since there is no universally agreed definition, however, most scientists agree that memory triggers emotions having been conditioned by life experience. This learning experience begins in utero through the exchange of scents and flavours with the mother; thus familiar fragrances are highly individualised by culture and location depending on what the mother eats and where she goes as can



be seen in the image outlining the different response to strawberry in the UK and US. Add to this a lifetime of experiences and the connection between scent and experience remembered in the brain's limbic system as well as an individual's personality and you get a huge variety of responses to the same smell.

Important research at Oxford University using an MRI scanner showed that it was not only the individual that affected the perception of scent but also the context given for that particular smell. In the Oxford study the scientists used a cheese-like smell and one group of individuals were told it was body odour while another that it was cheese. Unsurprisingly there was a marked difference in the brain areas activated with the cheese group (more pleasure) than the body odour group!

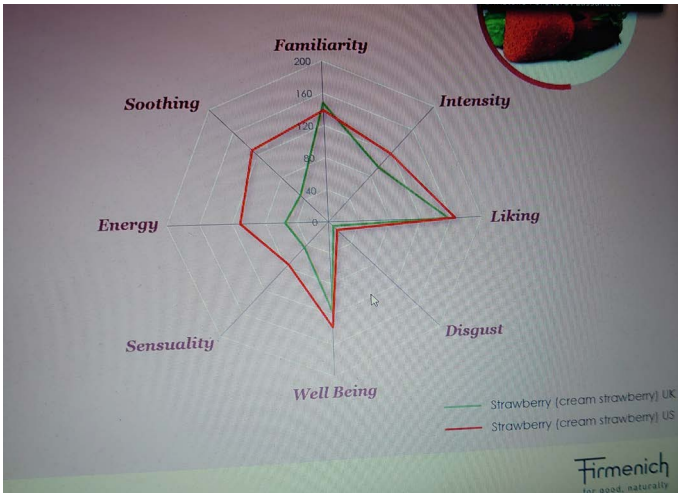
Further exploration in how to measure emotion was undertaken with both implicit (unconscious physiological) and explicit (conscious verbal) responses to fragrance examined. Researchers soon found that although they had a raft of techniques to measure implicit responses such as FEMG (facial expression mapping), EEG (measuring brain activity), ECG (heart-rate), GSR (sweat detection = arousal) and most precisely FMRI (which can focus on specific brain areas down to 10,000 neurons), none of these could actually explain any arousal. In other words was stimulation because the subject was experiencing something new, something complex or became more attentive or alert for some reason or because the fragrance was complex and that some kind of decipherment was occurring. The key to unlocking the implicit responses could only come from verbalisation thus making the explicit responses absolutely vital.

In order to establish some kind of universality with their results, the team collaborated with universities in the US, UK, China, Singapore, India, Mexico and Brazil, running the same three combinations of odour tests to try to establish some common ground in the verbal responses across the globe. In all, they identified 480 'affective terms' indicating a good deal of variation. However, they eventually isolated 37-35 adjectival terms that covered 6/7 categories which could be applied universally. They then developed a 'scent wheel *(see illustration)* that could be utilised for any new fragrance development which they then cross-checked against FMRI brain scans to check for correlation in brain activity. Providing the explicit tests had a rapid response time, they were found to be more accurate as a predictor of behaviour.

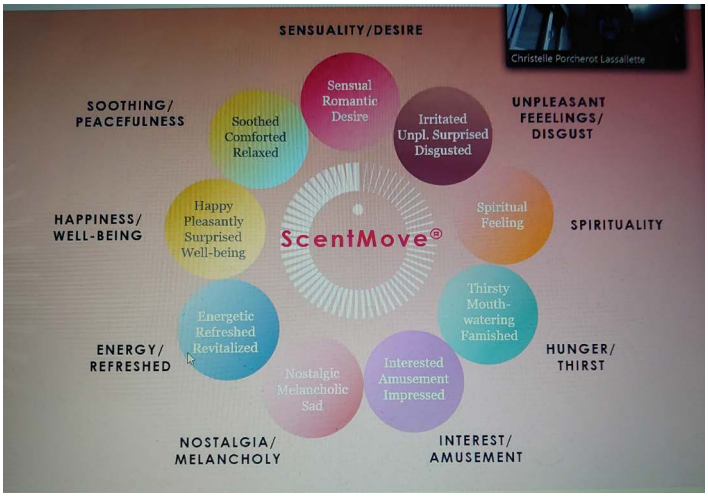
Taking all of this into account, Firmenich have been able to develop tools to provide a novel holistic approach to fragrance creation in response to a customer brief focusing on 14 emotions. Firstly they pick the best emotional positioning (they call this EmotiClaim™) for which they have the data for 10 thousands respondents from internet surveys along with concept and claim tests. Then they connect the chosen emotion to the product design (they call this Emoti360™) for which the data comes from 4400 respondents concerning ingredients, colour and brand association. Next they create the fragrance driven by the emotion (they call this EmotiCode™), informed by over 50 thousand consumers and according to the creation rules established. Finally they boost the emotional claim with accords validated by 8100 consumers (they call this EmotiBoost™) having used the fragrance technology developed in this study. In the presentation, a case study for a product that reflected the idea of wellbeing was explored, with not only the fragrance ingredients considered, but also the packaging and presentation of the product too, with certain colours reflecting specific drivers of emotion. Obviously the data used will be relevant to the target market with particular focus on culture and context but still leaves room for the creativity of the individual perfumers to formulate a bespoke fragrance that is not only popular but also fits the brief. Firmenich's work here shows how the very newest research in neuroscience can be used to create successful products for various global markets using a massive collection of intelligently gathered data.

I would urge all of our readers to look at some of the excellent online lectures that have been organised by learned societies such as the British Society of Perfumers, British Society of Flavourists and the Society of Cosmetic Scientists. Although travelling is tricky for many at the moment, there is a wealth of research presented online giving access to excellent webinars and seminars wherever you are.

Differences in response to strawberry between the UK and US



Scent wheel



EVENT REPORT

Dr Ali Green

IFRA Global Fragrance Summit 2021

Due to the current COVID 19 situation, this was a virtual, online event held 2-4 March 2021 and was designed to be as inclusive as possible being free of charge to everyone interested in the safe use of fragrance.

The Conference was far-reaching in its scope so by necessity I will be selective in this report. Understandably, like the IFEAT Conference, there was a good deal of focus on how COVID has had an impact on the social, economic and political environment and their effects on the fragrance industry.

Each day there was a Knowledge Exchange that focused on regulations in different parts of the world (APAC, Europe and the Americas) and the specific concerns for each area. I have chosen to shine a spotlight on the Asia Pacific Region so as not to duplicate some of the information from the IFEAT report. The panellists for this session were Bronwyn Capanna (Executive Director, ACCORD – Australian hygiene, personal care and speciality products industry association), Gil Perez (Cochair ASEAN Regulatory Co-operation Project; Workgroup Lead Emerging Regulations, Singapore Chemical Industry Council (SCIC), Bhashkar Mukerji (Givaudin, Chair IFRA APAC Technical Committee), Shelly Young (IFF, Chair, China Working Group), Alain Khaiot (President, CTFAS – Cosmetic, Toiletry and Fragrance Association of Singapore), and was chaired by Rohaya Mamat (IFRA Asia-Pacific Regional Director).

The four areas the panel discussed were chemical legislation, biocide legislation, cosmetic regulation and halal. The region has a population of 2.2 billion and an economy worth $26.2 trillion (the largest global economy and sourcing hub) so getting things right can be incredibly valuable whereas getting things wrong, an unmitigated disaster! One issue common to the region is the problem of communication and finding common ground in an area that is so diverse: there are numerous religions, languages, political systems and local customs to accommodate so finding consensus is a challenge.

Firstly, the new Chinese cosmetic regulations (CSAR) published in 2021 with modifications being continually drafted, has shifted things in many respects for the better. The framework is not only more scientific in its basis but also clearer so more easily applied. The general focus is on risk management with far less compulsory animal testing than previously and a more efficient testing regime that is more transparent. However, language barriers are still viewed as challenges with most relying on contacts and industry organisations like IFRA to disseminate information at grass roots levels. However, despite some improvements, there is no compulsion for complete harmonisation across the ASEAN region, with some countries wanting to do their own thing; this leads to an overall lack of clarity. European regulations are often translated to Asia, but there are differences in the region. The IFRA guidelines are largely accepted in Asia and New Zealand, but there are other issues with some confusion over specific ingredients. The general

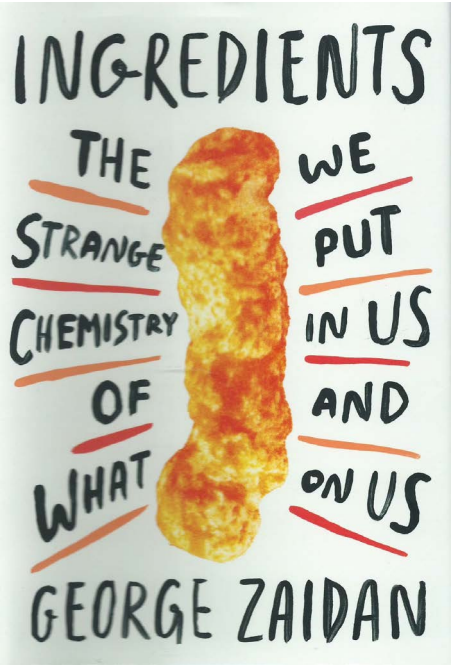
feeling was that regulatory bodies need more input from the industry regarding toxicology, risk and hazard.

There was a general consensus across the panel that more transparency and collaboration was needed in order to get to grips with the complexity of the situation. There was also a need for better connection within regional players in order to lobby regulators and advise on best practice. However, this required more openness and culturally, this was not the natural approach for some players in the industry. It was also noted that the value chain as a whole needed to be more joined up, with a coordinated approach from farm to finished product rather than each stage acting in isolation. Local expertise, particularly for traditionally 'private' companies such as those in Korea and Japan, is invaluable and the industry needs more transparency and collaboration to facilitate regulatory conformance and lobbying. A key challenge is that the regulations are not all from the same governmental departments: packaging and pollution are often regulated by the environment department whereas other safety areas are regulated by the health ministry. These issues make the production of shared toxicology indexes and skin care risk assessments more prudent for companies and knowledge sharing via best practice webinars and summits is seen to be a really vital step as the industry move forward.

Indonesia is among numerous communities that demand all products conform to halal standards (a set of religious rules that inform how food products must be prepared); this is often extended to topical products as well despite the fact they are not ingested. Since these regulations are not based on science but rather a traditional and religious code of practice, they can be difficult to manage and also to certify. The industry perspective is that more needs to be done in terms of outreach to government organisations and the need for a global standard was highlighted. Auditors vary in their approach and there is no standardised requirement that applies globally wherever halal products are demanded thus making it very confusing for suppliers. It was suggested that larger companies appoint a single person within their organisation to deal with this issue across all product types to standardise protocols for manufacturing, storage and packaging. Eventually, the ideal would be that this expertise could be shared industry wide to produce a global code of conduct.

This session was wide-reaching as you can see from this taster and touched on numerous issues. I would thoroughly recommend anybody in the industry attend this excellent event in the future as the expertise and insight on regulation in the industry across the world is unparalleled.

The following link to IFRA will take you to the IFRA conference page and a full recording of the keynote address from Michael Carlos, IFRA Chairman Emeritus: - https://ifrafragrance.org/priorities/dialogue



George Zaidan
2020 DUTTON: Penguin Random House
Hardcover $16.27
ISBN 978 - 1 - 524 – 74427 – 4

Ingredients: The Strange Chemistry of What We Put In Us and On Us

Dr Tony Curtis

One of the most important things in life is good friends. This book was a present and had been on my shelf for some time before I found time to read it. By page two I was hooked! I do keep an eye out for new publications but this is where good friends come in. They spot things you might have missed and get them for you. Do share your reading discoveries with others.

In the last edition of the ICATS Newsletter I reviewed *The Art of Statistics: Learning from Data* by David Spiegelhalter. If you have not read this book, get a copy, but before you read it do first read *Ingredients!* David makes no bones about part of *The Art of Statistics* being a difficult read in places. Reading *Ingredients* will motivate you to persist in working through the more challenging sections of *The Art of Statistics*.

George's book is entertaining, thought-provoking but accessible. This is a book you can read and enjoy rather study and work through. The simple direct language is however well-founded on extensive research: this is no tabloid cut and paste anthology of excerpts by other authors. One of the thought-provoking issues he brings to prominence is the current focus on content and labelling. The regulatory focus (e.g. FDA) is on **what** the product contains and not what is the **reason** for the incorporation of a given material in the product. He also makes the very relevant point as to what is in a name; his example is enriched flour with:

> 7,8 – dimethyl – 10 [(2S,3S,4R) – 2,3,4,5, -tetrahydroxypentyl] benzo [g] pteridine – 2,4 dione as opposed to the more familiar alternative names such as riboflavin and vitamin B2. Long names can be scary!

He then goes on to discuss an alternative approach NOVA, which is based on the 'nature, extent and purpose' of food processing. This brings us nicely back to *The Art of Statistics: Learning from Data*. Different definitions give us different numbers and we have not even started to get to the interpretation of what the figures mean. A friend teaches History and complains bitterly that it is not the static subject some people think. It is not only that additional facts come to light but that we bring our current values and judgements to the topic. A parallel issue is illustrated by the attitude and regulatory compliance to products containing PGIs (potentially genotoxic impurities) debated in a recent Chemistry World article[1].

The limit set for some of the impurities is in the range of parts per billion for pharmaceutical products. However, the exposure to people from these materials in foods, such as cured products (e.g. bacon) and smoked fish, are much higher. Same issue, different industries, different standpoints and different answers. In my university lectures I would illustrate with a few examples and then set up a group discussion. The learning insight is that in the evaluation of evidence (numbers, data etc.) we bring in our own experience and [subjective?] values. We must not only consider the evidence but our approach to it.

David Spiegelhalter in his book gave these rules for considering data:

- Why am I hearing this number? Be sceptical of the motivation of the person giving the number.
- Are they trying to make it big or small?
- Are they trying to persuade me rather than inform me? (Too often it is the former!)

The subsidiary questions are: -

- Can I believe this number?
- Where does it come from?
- Does it actually represent what I think it represents?

George considers these same issues in his idiosyncratic colloquial style. He is ruthless in exploring the problem of diet, lifestyle and health outcomes. He provides a colourful exposition of how correlation does not definitely imply causation. I particularly appreciate his example of 'Coffee drinking may cause lung cancer.' The generic problem is that the supposed causal effect (coffee drinking) may not be associated with the 'real' cause (smoking). As always correlation does not necessarily imply causation.

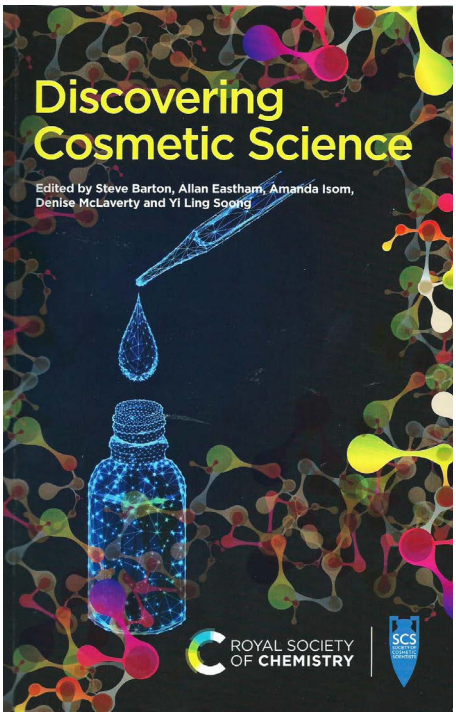
He again has a direct approach in pointing out that the data collection methods may give different results. If you ask people what their height and weight is you not only get a more variation (from the true weight) than if you put the person on the scales in the Doctor's surgery. You may also may get biased results. In surveys on drinking habits how many people confess they over drink? How many people will willingly confess they are obese?

George then discusses the seductive trap of big data. If we use modern data collection methods, we can collect masses of information. This can be considered equivalent to thousands of experiments. If we set up an experimental design, we tend to set the level of 'Significant result' at the 10% level. That is to say there is a one-in-ten chance that the result was obtained by chance rather than a real effect. If our mass observation was equivalent to 1,000 experiments, we would expect 100 spurious 'positive' conclusions by pure chance. Digging out the 'truth' from data is far from easy. We must always remember David Spiegelhalter's rules for data!

Do not be deceived by the open accessible and non-jargoned approach of this book. It is deeply challenging and should make you think more profoundly about how we collect, interpret and extract information from data. Do get and read this book and if you have not already done so, then read *The Art of Statistics: Learning from Data* to get a more rigorous statistical take on the subject. David's book is not always an easy red but George Zaidan's book gives you the motivation to persist. Kotler's monumental book on Marketing explores marketing information for decision making. He discusses it in terms of collection, analysis, interpretation and dissemination of information. Collection of numbers without three last three aspects is valueless. Numbers do not solve problems, we need insight.

[1] *Food for Thought: Why do the pharmaceutical and food industries have different rules on genotoxic impurities,* Page 5, Chemistry World, April 2021

BOOK REVIEWS



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2017: Royal Society of Chemistry
(in association with Society of Cosmetic Scientists)

Paperback £19.99

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Discovering Cosmetic Science

Dr Tony Curtis

Here is yet another wonderful book from the Royal Society of Chemistry. With many texts costing over £100 it is truly remarkable that the publishers have been able to keep the price down to a very affordable student price of £19.99. It is interesting to note the increasing complexity of writing in the aroma trades context (possibly in others!). I have in my library archive a 7th Edition (1974) of *Poucher's Perfumes, Cosmetics and Soaps* (all three volumes). The first edition was published in 1923 and this 7th Edition was revised by a single person, George Howard. To give appropriate coverage to this topic now, no less than five editors have been involved with 20 contributors!

As with *Olive Oil* (reviewed on page 28) the use of colour illustrations and figures greatly improves the book over early publications on this subject. This is most important as, unlike Poucher, this is intended to be a student friendly, readable publication. Poucher was not a 'good read' and was never intended to be: it was a 'bible' reference text. I have Volume 3 open as I write this review. There are no chapters: it is a dictionary of aroma and cosmetic materials from:

> Abies Oils (see under Pine Needle Oils) [page 1] to Zinc Stearate [page 381].

These three volumes were a 'must have' for a Cosmetic Scientist in the 20th century. Now such reference material is only a click away in a Google search. The need for such dictionary works has been replaced with, in some ways a more difficult challenge, accessible but authoritative material for a wider audience.

In my review of *Olive Oil*, I said the book ticked all the boxes for a good text (well-illustrated, free of errors etc.). For Cosmetic Scientists this book also ticks these standard boxes for content and coverage in chapters one to seven. However, the publishers and editors have been much more ambitious and have addressed some controversial issues head-on, where ignorance has triumphed over knowledge and understanding. The book *Ingredients* suggests an important question to ask in addition to 'What a product contains?' is 'Why is this ingredient formulated into this product?' Enter the magnificent Chapter 8 *The Inside Story – The Science Behind Active Ingredients*. I focus here on two fallacies often quoted by sceptics: 'Antioxidants and antimicrobials are bad for you.' As I understand the scientific results, limonene is not a major problem in itself. However, limonene (in common with many unsaturated hydrocarbons) is very susceptible to free radical oxidation when exposed to air. Terpene hydroperoxides are a major issue in skin sensitization. If the conditions of test and / or the storage of test samples are not rigorously controlled, we are measuring the effect of the degraded product(s), not the original

test material (e.g. limonene). Free radical oxidation is a well-understood chemical process and its control and mitigation is to use antioxidants. Yet we find food and other products such as cosmetics that may state free of preservatives and antioxidants as a 'beneficial' claim! The book addresses such issues as:

- What is oxidation and so how do antioxidants work?
- What happens if cosmetics are not preserved? How do companies know if their products remain safe if they become contaminated?

People are entitled to dissenting views and opinions but as Covid-19 myths have demonstrated, fallacious assertions are not helpful. If conventional practice is to be challenged, such debates need to be anchored in an understanding of the mechanisms of product deterioration, the risks that may be involved and the control of risks.

Chapter 9 *Testing and More Testing: The Science Behind Keeping Your Skin Safe and Healthy* continues this addressing a series of important issues such as:

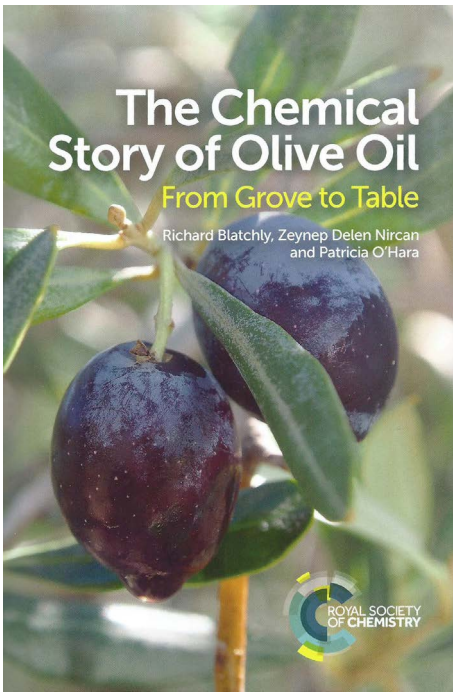
- Cosmetic products – how we keep you and your skin safe and healthy
- Stability testing- making sure product is fit for purpose
- Safety assessment of cosmetic ingredients and finished products

These chapters lay the foundation to the final important chapter: *Myths and Scares – Science in Perspective:* Are cosmetics tested on animals, what is the difference between natural and synthetic ingredients, do cosmetics pollute the oceans? All of these are legitimate issues, but the debate needs to be based on a real understanding of the science and the issues. Preservative-free cosmetics may sound nice, but they can be injurious to wellbeing. If the Covid-19 pandemic has highlighted anything, it is the need for widespread understanding of problems such as risk management. There are many debates to be had but they will be more fruitful if people have proper information and understanding. Terpene hydrocarbons are prone to oxidation (i.e. oils such as lemon oil) and hydroperoxides (formed from oxidation) are powerful skin sensitizers. If we want to enjoy products, how do we control risk? As IFRA aims, we need to bring insight into the safe enjoyment of fragrances [and fragranced products].

One of the questions asked of reviewers is 'Does the book provide fair coverage of the subject?' This book does highlight a gap in academic writing and education provision for the industry. *Discovering Cosmetic Science* does what it says on the tin. It does provide excellent accessible cover of the subject. However, it leaves a yawning gap in the application of perfumes. I live in Plymouth in the South West of the UK. It has a glorious harbour and very expensive apartments lookout across Plymouth Sound to the Breakwater. Some of these apartments have pride of place in their windows for expensive telescopes to better enjoy the movements of ships in and out of the harbour. However, if you look through a telescope the wrong way round you get a very different view! Sometimes Perfumery is seen as a part of Cosmetic Science. The link is obvious with fine fragrances, cosmetics and personal care products. This is generally the view from Cosmetic Science. Go into any major full service Creative Perfumery House and you will find many activities that do not fall into this personal care scope of perfumery. Some will maintain that Cosmetic Science does focus on areas such as surfactants and this translates directly into fabric care. This is only partially true. The problems of cleaning and caring for bleached dyed hair are rather different to removing blood stains from poly-cotton. You do not see enzymic shampoos on the supermarket shelf. Move down an aisle and we may have air-fresheners. These, candles and agarbathies are also important and valuable non-cosmetic markets for fragrances. This is not in any way a criticism or to detract from *Discovering Cosmetic Science*. Rather a plea that another book is needed to cover perfume applications outside of the coverage given within Cosmetic Science to personal care products. There is also an academic need for Universities to provide modules for these areas. There is a major requirement in the global industry for such provision which at the moment appears almost totally lacking.

I would like *Discovering Cosmetic Science* to be on the shelves of any journalist who intends to write about fine fragrances or beauty products. It is of course a 'must have' for all serious students and professionals in the industry. At £19.99 it is a good buy and a fulfilling read.

BOOK REVIEWS



Richard Blatchly, Zeynep Delen Nircan and Patricia O'Hara
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The Chemical Story of Olive Oil: From grove to table

Dr Tony Curtis

I was recently listening to a BBC documentary on the 1950s renaissance of eating out in the UK; one pioneering chef lamented that the only place he could get olive oil was at the local Pharmacist with 'Olive oil BP'! Back then much of the wine was more fit for bio-fuel than drinking; how things have reformed! Now the supermarket has a full aisle of wines from round the world. In Tavistock (a UK Westcountry ancient small market town) there are two small shops. One stocks some 100 cheeses, many of them artisan cheeses locally produced in small quantities. Adjacent to it is a delightful counterpoint - a shop that sells a profusion of different olives and olive oils (nothing else!).

Parallel to this product availability has developed a general deeper interest in food and drink. My copy of the *The Week* has its features on places to eat great food, how to cook good food from outstanding ingredients and expert advice on wines from around the world to accompany them. How things have transformed in half a century!

Before I get into the proper review of this excellent book, I have something of a digression. This is a lament about the comparative poverty of similar interesting writing on essential oils and perfumes. Never mind the oils; which internet influencer has endorsed the latest 'designer fragrance creation'. When I launched the first BA Business of Perfumery people used to ask me what the use was for such a specialist course. In radio interviews I would be asked what was my favourite perfume and essential oil. This is like asking what is your favourite food or wine. There is variety and part of the great joy of good eating and drinking is enjoyment of the diversity and choice we can experience. Take almost any essential oil and there is a global story with differences in quality and production methods. A major IFEAT initiative is to start to plug this gap with the production of authoritative but accessible material for people to start to enjoy the full richness and diversity of our industry. Enough of this digression.

The Royal Society of Chemistry is providing an outstanding service to our industry and society at large with the production of a whole range of accessible (you do not need a PhD in Chemistry to open the cover!) books. Charles Sell's *The Chemistry of Fragrances from Perfumer to Consumer* has been a bedrock text for over a decade. Also reviewed in this edition of the ICATS Newsletter is *Discovering Cosmetic Science* jointly produced by the RSC and the Society of Cosmetic Scientists.

What do I think is so special about this book? When you are asked by a learned society to review a book for the first time, they give you a guideline check list of points to consider: is the book accurate, free from errors and does it cover the topic in sufficient depth etc. *The Chemical Story of Olive*

Oil ticks all the boring but necessary boxes. This book in addition has the X factor of a good TV documentary in that it conveys a genuine passion for the topic. Their enthusiasm brings you into this wonder world. The approach is direct: history of the oil, grow, harvest, process and use the oil. A great improvement is the use of colour illustrations.

As an author of chemical texts, I also appreciate the use of modern software to show chemical structures. 20th Century Chemists grew up with line diagrams in books and with the profusion of hexane structures in terpene chemicals the colloquial term 'chicken wire' (resembling the hexagonal pattern of chicken netting) is sometimes used to describe the result. Modern 3-dimensional colour representation of structure gives the reader a much better appreciation of the 'real' structure of the molecules. Our recent advances in olfaction theory and protein structure have emphasised the importance of the three-dimensional aspects of chemical structure. The traditional line representation does not give a full appreciation of this critical aspect of structure and biological fictionality. This more pictorial representation not only conveys more accurately the chemical information, but also displays it in a more accessible way for lay readers.

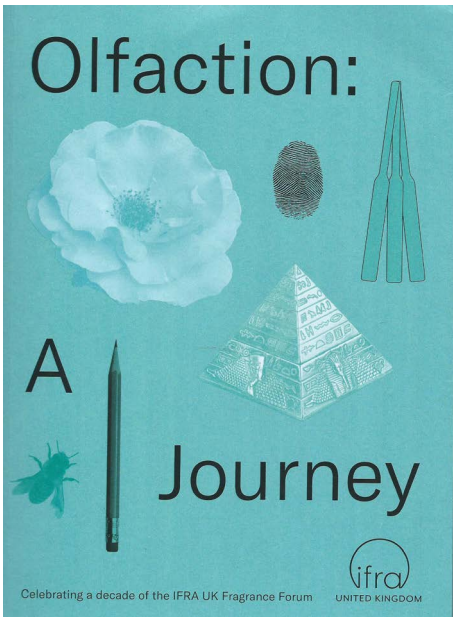
The greater interest in what we eat and drink has generated a welcome profusion of writing. The recent article I have read nicely illustrates this. During the great financial crash investment banks got into problems with exotic activities. The normal day-to-day banking was called 'vanilla' (i.e. boring and dull) banking. Day-to-day banking may not be exciting (very important as I look at this month's bank statement!) but vanilla is not! What a slight on this exciting product. This week's feature article in the New Scientist[1] was *Not so vanilla!* The sub title was 'Vanilla may soon be shaking off its reputation as a run-of-the-mill flavour'. The article then goes onto discuss the ups 'New varieties of vanilla could be more citrusy, smoky, nutty or caramelly.' and downs of modern agriculture 'A lack of genetic diversity limits to flavour of one our most beloved species'. Much the same could be said of olive oil as discussed in this book. Stunning pictures of polar bears and tigers have aroused us to be concerned about endangered species. Hopefully this renascence of interest in apparently humble products (olive oil, vanilla etc.) will generate interest to take like action on these products. Chapter 10 of this book does this well for olive oil.

As befits a publication by the Royal Society of Chemistry the needs of the dedicated Chemist are not forgotten. A major problem with some of the issues associated with food & drink (organic, sustainability etc.) is how to police and assure the public of the authenticity of products. The Royal Society of Chemistry was formed from an amalgam of two learned societies: Chemical Society (academic) and Royal Institute of Chemistry (professional). A key aspect of the RIC activity was analysis of food to detect and measure adulteration in the 19th century. Similar work was undertaken in the assurance of pharmaceutical products and sometimes these fields overlapped: Olive Oil BP and Clove Oil BP are both food and medicinal materials. Attempts at adulteration are still alive and well, just more sophisticated! Chapter 6 Delivering Quality and Assuring Authenticity covers this 'Cat & mouse game' well and address key issues such as 'How do Chemists know it is olive oil?' i.e. not adulterated with some other less expensive oil.

The Royal Society produces these books at an affordable price. Do get and read a copy. There is something in it for everybody. Let us delight in the products that feed our senses and get to understand more about them. The battle has been won with wine, let us now move onto other areas that give us enjoyment.

[1] *Not so Vanilla:* New Scientist, page 46, 3rd April 2021

BOOK REVIEWS



Edited by Lisa Hipgrave, Director, IFRA UK
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Enquiries: anniversarybook@irfrauk

A decade of the Fragrance Forum
[IFRA] A global Fragrance Network
PSYCHOLOGY
DESIGN & CREATION
ARTS & CULTURE
HEATLH & WELL-BEING
BUSINESS INSIGHT
TECHONOLOGY & INNOVATION

Olfaction: A Journey (Celebrating a decade of the IFRA UK Fragrance Forum)

Dr Tony Curtis

Along with the IFEAT conference this is a major industry event in the year! In this edition of the ICATS Newsletter we review *The Story of Olive Oil: from Grove to table*. I well remember returning from an IFEAT Field-trip around the essential oil fields of Tasmania. The next week I was at an evening celebratory dinner for the awards of the Jasmine [perfumery] awards at a 5* London Hotel. I could have described our industry as everything from field to high fashion cat-walk. The second (2012) Fragrance Forum at the Royal Society (London) venue put it nicely *From Flower to Shower*.

The section headings above give the scope and range of the topics covered in these outstanding meetings. The internationally scientifically prestigious venues nicely reflect the eminent presenters and leading-edge content of the lectures: Royal Society of Chemistry (Burlington House, London), The Royal Society (founded in 1660) and the Wellcome Collection. Of necessity it is only possible to sample a few of these eminent lectures.

Some years ago, a symposium at Birkbeck College (London University) also took a broad view of odours and olfaction. The proceedings were converted into a book *SENSE AND SCENT: An Exploration of Olfactory Meaning*. A particularly memorable lecture was: *The Importance of Smell in Medicine*. Historically in the 19th Century the Physician would smell the breath and get the Coachman to taste the patient's urine. In the 20th Century we developed advanced instrumentation (e.g. HPLC) to investigate disease markers in blood and urine. We had somewhat forgotten that the volatiles (odours) in breath are also diagnostic markers for some diseases. Dr Claire Guest's presentation *Sniffing it Out* (2017) is compelling and remarkable. The subheading says it all 'Each disease has its own volatile organic compound 'fingerprint' and dogs can be trained to smell out and detect a specific fingerprint at very low concentrations'.

The IFRA team do pick the hot topics. The May edition of *Chemistry World* feature article *The Air We Exhale* continues the story. The road-side breathalyser has been a cornerstone of drink driving curbs in many countries. This report presents further developments in this area. We are rediscovering 'The pathological world of smell' (Professor Jonathan Reinarz' Forum lecture in 2015). He nicely summed it up 'Medieval doctors were very attentive to the small of patients' breath and sweat. Diseases were also associated with distinctive smells. Plague was said to smell of apples while typhus reputedly smelled of mice'. It is not all good news. *How to make a mosquito invisibility cloak* by Professor James Logan (2017) discussed mosquitos' ability to sniff out a good [infective] meal. Can we find an olfactory way to foil this?

As always with such richness of content it is invidious to cherry-pick articles to highlight. I have selected this next one as it not only draws upon our recent advances in the knowledge of the genetic basis of olfaction but also raises a deep philosophical question *'Do you smell what I smell?'* This is yet another example of the nature – nurture puzzle.

> *No one knows what your nose knows. There may be much greater diversity between humans than previously assumed. And there is no 'true' smell for any given odour at all.*
>
> *Genetic variation contributes to inherent, fixed differences in what we can each smell, and can predict how we respond to odours. We all have very different olfactory sensitivities.*
>
> Dr Darren Logan (2014)

The early experiments with an olfactometer determined the threshold values for odour perception. This work established that different people had different sensitivities to a given olfactory (volatile compound) stimulus. The recent advances our understanding now demonstrate that not only are there differences in ability to perceive odours (threshold values) but also how we interpret this stimulus into odours.

The more we learn, the more we realise how much more we have to learn. Each question answered stimulates new avenues of exploration. This event has deservedly developed a reputation as an annual high sport in the industry's calendar. This anniversary retrospective makes stimulating and provocative reading.

The date of the next Fragrance Forum UK is planned for the 14th October 2021. Do put it in your diary. *The Story of Olive Oil: from Grove to Table* gives a welcome focus to a specific area of the industry. The Forum surveys the whole mountain range of different aspects of our industries' science. It does keep you up to date with the current peaks of interest and cutting-edge research. The IFRA (UK) Team perform an outstanding achievement each year with the assembly of such a diverse range of topics and such renowned presenters. This is truly a highlight of our industry year.

ICATS

Education for the aroma and flavour trades

Contact ICATS

+44 (0)1752 518034

aroma@icatsaromaeducation.com

www.icatsaromaeducation.com

International Centre for Aroma Trades Studies,
Floor 2, Marine Building, University of Plymouth,
James Street, Plymouth, PL4 8AA, UK