ICATS NEWS

AUTUMN 2016

EDITOR'S NOTES

Ali Green

Welcome to the Autumn edition of ICATS News and greetings from a rather grey Plymouth. Yet again it has been a very busy six months for everyone at ICATS.

Dr Tony Curtis ventured to the British Society of Flavourists' Annual Symposium and has produced a fascinating overview of the event, looking in particular at lactose intolerance and the subsequent reaction of the food industry. Tony has also written some excellent reviews and offers his own inimitable take on news stories that will undoubtedly be of interest to our readers. Sharon Heard attended the British Society of Perfumers' New Ingredients Symposium and Awards Ceremony and gives her report on the event. We would also like to thank Pia Long (Perfumer, perfume blogger and ICATS Student) for her fabulous insight into the materials presented at the Symposium.

Rather than looking to the future, I have gone back to the ancient world to give you all an overview of some of the exciting current academic research in the ancient aroma trades and sensory worlds. Not only will we explore some ancient theories of olfaction, but also Roman gardens, Greek funerals and the use of orris and saffron in the Greek and Roman worlds. All things sensory are 'on trend' in the field of history and I will continue to keep you informed of interesting developments in this captivating field of academia in future issues.

I hope that you enjoy reading this issue of ICATS News. Please do get in touch if you would like us to cover any events or have some interesting news from your area of the aroma trades industry.

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ICATS International Centre for Aroma Trades Studies

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BRITISH SOCIETY OF PERFUMERS NEW MATERIALS SYMPOSIUM

SHARON HEARD

Despite the lengthy trip up from Plymouth to Whittlebury Hall near Towcester, I really enjoyed the journey to the BSP New Materials Symposium and after a long day it was good to arrive in such a relaxed and welcoming environment.

After a good night's sleep it was all go organising the ICATS stand before the presentations began. At this point, I would like to offer my thanks to Peter Whipps and Roger Duprey for their assistance in making this happen!

The day started with an introduction and welcome from Kate Williams and, judging by the crowded room, it was clear the Symposium was oversubscribed, showing just how popular it has become in the industry. The Symposium was split into sessions and presentations with two delegate groups moving between the various rooms provided throughout the day.

The presentations were once again varied in their subjects, commencing with a fascinating lecture by Andrew Steel (The Treedom Group) on oud oil. Current issues such as supply and demand, production techniques and cultural uses and choices for oud were part of the overall presentation. The concerns around protection of agarwood trees and discussion about the use of plantations to produce oud oil were equally interesting and well presented.

Symrise presented *Nerolione* and *Jascinthaflor* in a variety of formulas for delegates to experience. This enabled the trial of these materials in a variety of ways to gain an understanding of their key features and effects. Firmenich's offerings included *Lilyflore, Ambrox Super* and *Honey Signature base* which smelt like the real thing. Someone commented that this was the next big note to hit the industry...we will see!

Lunch was a great time to catch up with various people and it was lovely to meet Liz Dowden from Phoenix Fragrances, one of our ICATS students. It's always nice to put a face to a name and meet our students in person. This was also a busy time on the ICATS stand and it was good to catch up with Lisa Hipgrave from IFRA and many other delegates interested in the ICATS Diploma.

During the afternoon sessions, Dr Wolfgang Krause and Christian Seufert from BASF gave a fascinating presentation along with Steve Roth and Federica Galli from Albert Vielle, and Arnaud Bernard with Christophe Delahoye from Emerald Kalama.

After an intense day of smelling the new materials, the grand finales were the Annual Gala Dinner and Excellence Awards. The worthy winners rewarded for their excellent contribution to innovation in the industry were;

- Female Fragrance: *Alaïa* by Alaïa
- Male Fragrance: *Bottega Veneta Pour Homme Extreme*
- David Williams Award Personal Care: *Lynx Black* Deodorant
- Evelyn Speller Award Home Care: *Cardamom and Moroccan Rose candle*, Jo Malone
- Fabric Care: *Comfort Intense Sunburst*
- Pierre the Perfumer Award: for the most daring fragrance in any category (sponsored by PFW): *Original Source Liquorice Scrub*

After a long eventful day it was good to see the BSP New Materials Symposium was once again a great success.

Matthew Williams

Kate Williams and Helen Hill

The David Williams award winner

Kate Williams and John Bailey

Roger Duprey

The Symposium delegates

50 YEARS ON - A REFLECTION ON EVELYN SPELLER

Subsequent to the Symposium, I attended a small celebration lunch with Tony Curtis to mark his 50th anniversary of joining the industry in July 1966. We were discussing the BSP Awards and I mentioned the Evelyn Speller Award. Tony met Evelyn when he first Joined Bush Boake Allen at the BBA Stratford (East London) Research Laboratories. This prompted Tony to reflect on 50 years in the industry: -

Evelyn Speller was part of a research team who pioneered developments during a golden period of perfumery technology advances. The 50s had seen smart developments of traditional Analytical Chemistry such as the Sully method of organic peroxide analysis.

This cleverly circumvented problems of solubility and exclusion of air by performing the analysis in a refluxing mixture of chloroform and acetic acid. Fast forward a decade and this leading edge research was encapsulated in a paper by Sully 'Quantitative gas-liquid chromatographic analysis with detectors having a non-linear response'. The age of advanced instrumental methods was upon the industry.

Evelyn worked on a variety of research areas and was involved with quality issues including odour quality. In a sense she followed her nose to the BBA main research centre which was developing at Walthamstow. She became a Creative Perfumer of distinction. She nicely illustrates that great perfumers arrive at their top position from a variety of career paths. The one great unifying characteristic appears to me to be a passion for essential oils and other aroma materials.

PIA LONG ON THE NEW INGREDIENTS PRESENTED AT

THE BRITISH SOCIETY OF PERFUMERS' SYMPOSIUM

The British Society of Perfumers Annual One Day Symposium was held at Whittlebury Hall in Towcester again this May with an accidental theme of fragrant roots. Two of the presentations, unbeknownst to one another, focused on a different kind of scented root accord.

BASF demonstrated DL-menthol and dihydrorosan. Nobody talks about chemicals like Dr. Wolfgang Krause and he had the room guffawing away as he took us through some serious chemistry. DL-menthol is a very well-known material, but Wolfgang felt it was unfairly neglected in perfume creations and called it *"the under-estimated baby of the industry."* We smelled it in a shower gel and reed diffuser fragrance demo formulas and, of course, DL-menthol was the star of the mint tea giveaways BASF had prepared. We also smelled Dihydrorosan presented in fine fragrance and shampoo formulas. Rosy on its own, the demo formulas for Dihydrorosan showcased how this material can highlight fruity and floral notes in unexpected ways.

Symrise treated us to an interactive presentation where tables were laden with demo formulas showing off Jacinthaflor – an interesting white floral-type material which can bring indolic aspects to fragrances without the discolouration issues, Nerolione – as the name suggests, a high-impact ingredient for orange blossom creations and Irisnitrile – a diffusive iris note booster. Jacinthaflor was strongly indolic and Irisnitrile had an added cucumber-watery aspect which amplified the bloom of the demo formulas. It seems that clever use of Irisnitrile can really add extra dimension and lift to iris accords. Presenters Annabel Chemelnyk and Antonia Weber guided visitors through every aspect of these versatile molecules.

Firmenich offered us one of the most surprising olfactory experiences of the day by showing off a cedarwood oil, Alaska, which is exclusively sourced from their partners in British Columbia and comes from sustainable forests. It showed smoky and aromatic nuances usually absent from typical cedarwood essential oils, as well as a sparkling grapefruit top note, whilst lacking the typical 'pencil shavings' part of cedarwood aroma. We were also shown Pepper Sichuan supercritical fluid extraction, which was highly aromatic, and Lilyflore, Ambrox Super and a Honey Signature base which is a blend of natural materials and synthetic captives. The honey note was so realistic that some visitors were overheard asking for a slice of toast to go with it. It could do wonders to a tobacco accord and many more besides. We were sent away with a pre-prepared box of miniature samples, which was a really good way of ensuring all delegates could explore these materials at their own pace later on.

Emerald Kalama Chemical, who introduced themselves to the BSP audience as the world's largest producer of benzoic acid and benzaldehyde with production facilities in US and Europe, told us about the town of Kalama in Washington, U.S.A, which has been the obvious inspiration for the company name. Steve Roth from EKC had travelled from Portland, Oregon to be at the Symposium and this was his first visit to the ODS. According to Steve, the town is not necessarily welcoming to chemical producers, yet the company thrives there. We were shown Azuril, Osyrol and Vetimoss with demo formulas including interesting fantasy citrus, vetiver and blackwood accords. Azuril in a Citrus Fantasy accord added floral facets and softness while reducing bitterness. Osyrol was a fantastic booster of woody notes, and Vetimoss brought out many hidden nuances from a vetiver accord.

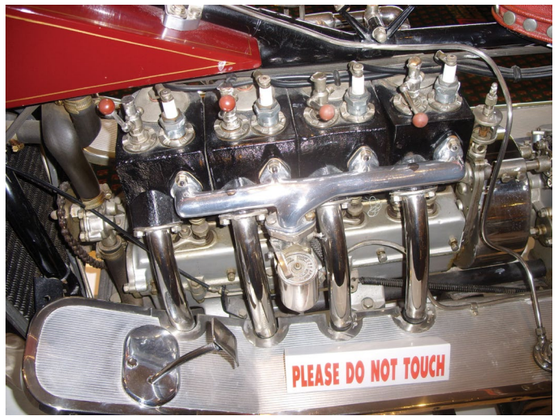
Albert Vieille emphasised their natural product offering to us in a creative way – by serving delicately pastel-coloured macaroons flavoured with some of their essential oils – neroli and rose were particular favourites and disappeared off the tables rather rapidly. They were perfectly accompanied by the rich, roast aroma of the Arabica Coffee Salvador alcoholic extraction we smelled alongside them. The Arabica extraction lacked the rubbery, burnt notes sometimes found in coffee materials. We also smelled our way through various resins and naturals from their selection, including variations on the labdanum theme; raw materials resulting from different production methods from the same plant stock.

BRITISH SOCIETY OF FLAVOURISTS' SYMPOSIUM

15TH JUNE 2016
THE FUTURE OF BEVERAGES & DAIRY FOODS FLAVOURINGS

DR TONY CURTIS

This Symposium was as interesting as it was eventful. For the first time the British Society of Flavoursists staged the event at the National Motorcycle Museum, Birmingham.

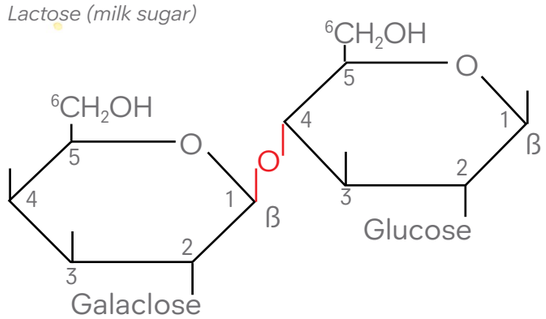


Your ICATS Newsletter correspondents are fearless and tenacious to get you the key stories: a sandstorm in Morocco, a strike-bound conference hotel in Canada, a snowed-in British Society of Perfumers workshop at Whittlebury Hall and the New Delhi monsoon have not deterred us in the past. This was just as well! Possibly as a result of climate change, Birmingham greeted us with its own monsoon conditions and a flooded M6. The 20-minute taxi journey from the renovated Birmingham New Street Station to our hotel took well over an hour. However, a good dinner and an early night revived us for this most important event in the UK Flavourists' calendar.

This year's theme was *The Future of Beverages & Dairy Foods Flavourings*. As always the BSF organisers are to be complimented in providing the usual mixture of provocative, informative and engaging presentations from key note speakers of international reputation. In our necessarily brief report, I pick out highlights that I found particularly engaging; a more complete report can be found in the BSF Newsletter.

Lindsey Bagley (Eureka / Flavour Horizons) opened the proceedings with *Little Miss Muffett – Milking the Opportunities*. This was a scholarly overview of milk and milk beverages. As a Lecturer in International Marketing I found the discussion of lactose-free dairy drinks particularly interesting. I used to give the genetic basis of lactose intolerance as an example of *think global – act local* with international food and beverage marketing. As a result of a significant duration of dietary differences, more people are lactose intolerant in Asian countries than in Northern European countries. With ever-increasing multiculturalism in Northern Europe the market for lactose free is increasing hence the increase in the shelf space devoted to soya-based and other substitute milk products.

Lactose (milk sugar)



An alternative is the elimination (I prefer this to removal) of the lactose (a disaccharide) by enzymic conversion to its two monosaccharide components (glucose & galactose). Interestingly, this tends to make these products a little sweeter. Glucose is used as the sweetness standard (100) and the indices for the three sugars concerned are: lactose 16, glucose 74 and galactose 33. This shows the reason for this effect.

This development in lactose-free products in some ways led us nicely to the next lecture by Jamie Rice (RTS Foodtrending) *Future trends in Beverage & Dairy Flavours*. As I write this report, I am drafting tutorial notes on *Critical Thinking*. This informative and provocative overview of trends had me reflecting on two pitfalls we discuss in this ICATS tutorial.

The first is the problem of aggregation of data. Here, if you combine two sets of data and plot a trend you may not only lose some data but even get a false trend. Jamie discussed how there was little change in the major food segments (e.g. dairy products) over the last five years and little was expected over the next five years. A naive interpretation might be that the markets were static and that little was happening. However, nothing could be further from the truth. The food and beverage market is highly fragmented and highly competitive. Although the overall envelope of spending in the major sectors may not be moving massively, there is a good deal of turbulence as companies fight to maintain market share and track trends within specific product groups (e.g. sugar free in beverages). There is still a lot of new product development (NPD) being undertaken.

This moved me nicely on to reflect on another statistical trap: this is sometimes called the survival effect. In the

Second World War USA & UK air forces used statistical techniques to develop aircraft. One aspect was to analyse the pattern of damage to aircraft with a view to determining how to better site armour on the aircraft. It was noted that most damage was recorded on the fuselage of the aircraft. A naive interpretation of this data would lead you to think this is where more armour should be situated. However, the complete reverse was the case. Damage to the fuselage was often survivable and aircraft limped home whereas damage to the engines and / or fuel tanks was much more critical and aircraft were thus much less likely to return. The data had only been collected from the survivors, a dangerously biased sample. Armour was needed elsewhere, not on the fuselage. What may you ask has this to do with trends in beverages?

Jamie invited us to reflect on two facts. Around 90% of new products fail. Many companies as part of their market intelligence track patents associated with new

Sugar Cubes

Plymouth Gin

products. This can be misleading. Published patents refer to the past and in NPD we need to look to the future (i.e. new trends, not past trends). In addition 90% of these products are likely to have failed i.e. tracking patents and new product launches does not necessary give you good insight in the successful introductions and trends (the data is confounded by many NPD failures). Alternative approaches are needed to get under the woodwork and pick up genuine new trends. It is good from time to time to get to a meeting such as this. Not only to listen to the specific issues but also to reflect on insights they can give us to broader questions.

The idea of being perversely wrong was reinforced by Professor Julian Cooper's (324 Consulting Ltd) lecture *Sugar & Sugars: The Potential Impact of Reformulation on Food Products*. Here I can only pick on one small aspect of this wide-ranging and authoritative contribution to the proceedings. One major trend is to remove the 'evil' sugar from products. However, sugar is a very special ingredient and has various functionalities in a product (e.g. mouth feel). In an elegant illustration Julian gave the example of how, perversely, lowering the sugar content of a cake formulation can increase the calorific content (as calories per 100 gm) of the final product. The law of unintended consequences is alive and well. Perfumery and flavouring have one aspect in common. The removal of one ingredient may precipitate a complete rethink of the product and is rarely as simple as many people might expect.

The afternoon continued with another outstanding contribution: Dr Dave Baines *Taste Modifiers – Driving future trends for Dairy & Beverages*. We are all familiar with the standard tastes: sweetness, sourness, saltiness and bitterness. More recently, much interest has centred on the *umami* effect and flavour enhancers. Monosodium glutamate has become a key ingredient; if added to food it enhances (let us use a term borrowed from our Hi-Fi – amplifies) the flavour. If added to food it also has a dreaded 'E' number (for MSG E 621). Of course it can be formed naturally in some foods and cooking in which case it does not need to be declared. Leading edge research is postulating a new flavour effect the *kokumi* effect. The word derives from Japanese: rich [koku] taste [mi]. The effect is to modify (enhance) part of the flavour profile (rather like the old bass and treble control on an early Hi-Fi) - which is different to lifting the whole profile. There is active patent activity on these products which do not need 'E' numbers as they are not flavour enhancers, they are modifiers. These materials are interesting as they are peptides (a few linked amino acids). They appear to function on calcium receptors on the tongue. They are effective at fairly low concentrations of the order of 2 -20 ppm. This is in contrast to salt and monosodium glutamate, which are effective at around 1000 ppm.

Gas chromatography and GC/mass spectrometry greatly advanced our knowledge of volatile flavours and aromas. I speculate that as it has taken longer to develop HPLC and LC/MS, we may have been given less insight into the aspects of flavour derived from non-volatile molecules. The early 21st century has seen us greatly deepen our knowledge of the perception of odours / aromas (e.g. genetic basis of olfaction etc.). I suspect we may now be experiencing a deepening of our understanding of the non-volatiles contribution to total flavour experience.

Our final session involved tasting a 'pick-me-up' beverage based on botanicals. Steve Pearce (Omega Ingredients Ltd.) *Botanicals for Beverages: illustrated novel flavour effects*. However, coming from Plymouth I was reminded of Plymouth Gin and the explosion of designer niche gins. Locally we recently had a festival of gin featuring over 100 gins.

For over 200 years Plymouth Gin has been made by distillation from a special blend of botanicals including juniper berries, coriander seed, orange peel from Spain, lemon peels, green cardamom, angelica root and orris root (see later in ICATS News for a discussion of the use of orris in ancient aroma trades). The use of botanicals in beverages is trending but also has a long history. Plymouth gin has a long tradition with the Navy, first going to sea in 1793. You can still buy 'Navy strength' gin (57% abv [alcohol by volume] as opposed to 51% abv for 'standard Plymouth gin). Navy strength gin is 100% proof. In the soon-to-be-published ICATS Tutor Note on *Critical Thinking* we review the origins of some international reference standards (e.g. the reference one kilogram in Paris). The definition of 100% proof was the strength of spirit that would just let gun powder explode; this sounds much more fun than modern GC methods! Steve sent the delegates away with their taste buds tingling and our imaginations stimulated.

The value of these society meetings is not only that you get to learn about key current issues but you also have time to reflect and discuss broader factors with colleagues across various product sectors. Time away from the bench or computer is not time wasted. Do try to get to these meetings as you will greatly benefit.

MEET A STUDENT:
JOANNE CROSS
FROM TREATT

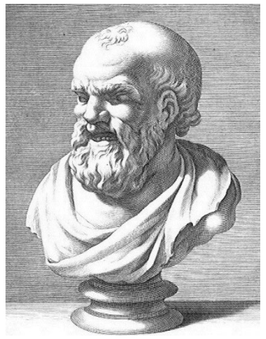
I am Process Control Manager at RC Treatt. My role consists of managing my team who are analysing fractions from our distillation department and putting them back together to make finished bulks. We use the classical wet techniques for analysis of our products (density, OR, RI) and Gas Chromatography to look at the component profile, and we also smell and taste our products.

By completing the ICATS course I am hoping to get an insight into what the customer would potentially use our products for, a better understanding of the legislation surrounding our business, and also to broaden my knowledge on other ingredients that I may not have come across in my role.

ANCIENT TREASURE FOR THE SENSES

CURRENT RESEARCH INTO THE ANCIENT SENSORY WORLD

ALISON GREEN



Democritus

Archaeology often makes the news. Highlights this year include a fabulous bronze age settlement in the UK which has been preserved in a waterlogged environment at Peterborough's Must Farm site, described as Britain's Pompeii. Meanwhile a Roman gladiator school has been uncovered in the Roman town of Carnuntum in Austria which will shed light on one of the more gruesome aspects of antiquity. Attention-grabbing new discoveries and research feature frequently on major news channels, but there is an increasingly large group of academics who are fascinated by the sensory world of the past, in particular its scents and flavours, who do not make the headlines. Nevertheless their work is equally cutting edge and astonishing, enabling us to reconstruct the ancient sensory world in startling detail.

The idea of how the olfactory system works still hits the headlines today with scientific debate still ongoing between the vibrational and shape theories. We have the benefits of extremely accurate electron microscopy and also have an appreciation of cellular and molecular structure within the olfactory system. If we transport ourselves back to the fourth century BCE, however, what kind of theories might be posited without the insight afforded by the instrumentation available today? The philosopher Aristotle observes quite rightly that *"Our sense of smell is inferior to that of other animals"* but then goes on to say that it *"is the poorest of the human senses"*[1] and so subsequently did not extensively pursue the underlying science.

However, there was a school of philosopher contemporary with Aristotle that was far more concerned with the mechanisation by which we smell and taste and put forward its own theory of olfaction and gustation. It must seem bizarre to many that the Greeks had conceived of the atom theoretically without the use of optical magnification two thousand years ago. Nevertheless, through observation of the world around them, the idea that the world was composed of atoms of different sizes and shapes that were constantly in flux was conceived, albeit in a primitive fashion. The basics of the theory are outlined in the fragmentary texts of Democritus, an ancient atomist philosopher a generation older than Aristotle. In his over-arching theory of perception, he believes that everything sheds atoms which then flow towards the eyes, the nose or the tongue and interact with these differently depending on the shape of the atoms. This sounds incredibly scientific at this stage, showing several similarities to the shape theory of olfaction, however, when Democritus explains the theory further it seems rather strange to us. When discussing taste, for example, he believes that a bitter taste is created by atoms with jagged edges that tear the surface of the tongue, whereas honey had round atoms that caressed the tongue giving a sweet sensation. He struggles to explain why some smells and tastes are perceived differently by different people but modifies the theory to suggest that the effect of the atoms can be modified by illness, madness or drunkenness! This idea could give us a somewhat different perspective on some of the great innovations in the olfactory and gustatory world over the years.

Recreating or interpreting the sensory world of the ancients is an incredibly popular area in contemporary research and has formed the basis of numerous conferences and symposia over the last few years. The challenge is not only to imagine what happened at ancient sites, but also to isolate what those visiting in ancient times would have seen, smelled, heard, touched or tasted. This idea was explored in two fascinating papers that I had the pleasure of hearing, one in 2015 in Bristol and one this year in Edinburgh, both presented at the annual Classical Association Conference.

Greek Lekythos Vase

Alexia Petsalis-Diomidis from Kings College, London explored the experience of death in the Greek world through the detailed examination of one particular child grave from Classical Greece. What is immediately obvious is that the child's body was buried with a plethora of beautifully-decorated vases and jars. From the number and types of jar, it was obvious that perfumed oil had formed a large aspect of the burial regime with four *lekythoi* (see image) and seven other vessels present in the grave. Dr Petsalis-Diomidis explained that the preparation of the body would have taken several days and was undertaken by the women of the household. She suggests that although the expensive oil would have had a religious function (that is to ensure that the gods would be pleased and let the child travel to the underworld peacefully) there was probably a highly practical reason, in that the smell of decomposition would be hidden. Leaves and twigs (often from

Miriam Bay and The garden at Winterbourne House

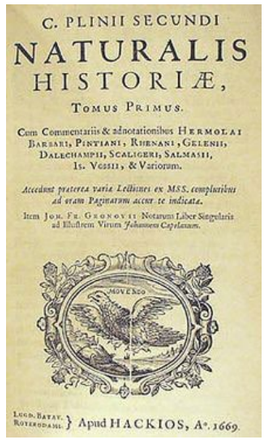
1 Aristotle, de sensu 441a

the bay tree) were also put into the coffin to provide a more pleasing smell along with tiny statues of maternal goddesses to accompany the child to Hades. Thus it is clear that the role of perfumed oil in the ancient world was far from a simple cosmetic, there were also obvious religious functions to its use.

A different sensory context was explored by Eleanor Betts of the Open University, focusing on water in religious sanctuaries in Italy, in particular how ancient people would have interacted with a healing sanctuary in Umbria, Italy. A key element was the river flowing through the site, containing a large number of iodine and bromine compounds that would have had a very noticeable aroma, not necessarily that pleasant! However, these halogen compounds are well-known now as fungicides, bactericides and virucides and despite any mystical connotations may well have had a therapeutic effect on any people or animals immersed in the water. The smell of the water may well, even at this early stage in history, be one that was associated with health and wellness, as indeed are the smells of several halogens today.

This moves us on to the tricky area of compounding and raw materials in the ancient world. It is all very well to consider that perfumed oils were used in certain contexts and that smells were a key element of the ancient environment, as they are in any context, but how can we identify how they were manufactured? Dr Laurence Totelin, a Senior Lecturer in Ancient History at Cardiff University has a passion for ancient botany and pharmacology and has undertaken a number of experimental formulations drawing on ancient texts and archaeological techniques. There is a general feeling that all such concoctions must have been really unpleasant, but Laurence feels that many ancient cosmetics were actually extremely pleasant. She is always on the hunt for authentic ingredients for her recipes and is currently looking for the ancient perfumery ingredients of *saussurea costus* and nard and is aiming to recreate the famous unguent of Cleopatra. If any of our readers could source these and lend a hand to some fascinating research please contact her (all contact details are at the end of this article).

Another approach to understanding the sensory world of the ancients has been taken by doctoral researcher Miriam Bay from the University of Birmingham, UK. She has reconstructed a Roman garden at Winterbourne House and Gardens on the outskirts of Birmingham (UK). To get an authentic selection of plants, she has used the poetry of Ovid, a passionate poet who is perhaps best known for upsetting the Emperor Augustus, who was trying to promote solid Roman values, by writing poems advocating adultery. The information for the botany, however, has not predominantly lain in the more erotic offerings, but in the fabulous mythological work the Metamporphoses. Here Ovid discussed the world of the senses in glorious detail with the aromatic world featuring strongly in his poetry. With this garden, Miriam has created a dialogue between ancient and modern and between the literary


C. PLINII SECUNDI
NATURALIS
HISTORIÆ,
TOMUS PRIMUS.
Cum Commentariis & adnotationibus HERMOLAI BARBARI, PINTIANI, RHENANI, GELENII, DALECHAMPII, SCALIGERI, SALMASII, IS. VOSSII, & Variorum.
Accedunt praeterea varia Lectiones ex MSS. complurimis ad oram Paginarum accurate indicata.
Item JOH. FR. GRONOVII Notarum Liber Singularis ad Illustrem Virum Johannem Capelmann.
MOVEBO
LUGD. BATAV. ROTERODAMI. } Apud HACKIOS, A°. 1669.

and the sensory. She has a fabulous blog site that outlines the plants she has chosen for the garden, many of which will be well-known to perfumers: these include damask and centifolia roses, bay, violets, hyacinth and saffron crocus. Plans are afoot to use the garden as a base to explore ancient perfumery, cookery, ritual and medicine at an introductory level. Details of the fabulous opening ceremony can be found on Miriam's blog site alongside with her contact details if anyone has projects that they feel would be ideal for this beautiful garden setting.

As I highlighted in last summer's newsletter, the perfumed oil trade in the Mediterranean is incredibly ancient. Dr Joanna Day, an archaeologist from Trinity College Dublin, has been looking at specific ingredients that were used in ancient perfumery and I attended two great papers that she gave, one on saffron and one on orris. Saffron, she notes is best-known as a cooking ingredient and was very popular in the Roman world in a number of contexts, but is listed in the *Natural History* of Pliny the Elder as an ingredient in ancient unguents, being popular on the island of Rhodes[2]. Saffron is also used in a funerary context as a perfume and has been documented as being sprinkled on audiences at spectacles. This activity was not only undertaken to signal wealth, as it was an expensive commodity just as it is today, but it was also designed to be a multi-sensory experience for the audience. The colourful golden threads would waft a delicate perfume into the air as well as leaving golden marks on the clothes of those in the best seats marking them out as the highest status in the audience. This golden treasure is still used in perfumes today and is particularly popular in the Middle East (frequently mixed with oud) as well as being the star in Jo Malone's *Saffron*; it is so interesting to know that our ingredients have such an ancient heritage.

In this year's paper, Joanna turned to a far more widely used and familiar perfume and flavour ingredient: that of orris derived from the bearded iris. When using ancient texts, it is difficult to establish exactly which hybrids were used in the ancient aroma trades or in what form they were incorporated into the oil. Nevertheless Joanna has been able to establish through close reading of texts (including Pliny's Natural History 21.19 devoted to the iris) that Illyria (the northern Balkan peninsular) was the centre for iris production and it was from here that the rhizomes were transported to the centres for perfume production, such as Corinth (famed for its beautiful aryballoi and *alabastra* perfume bottles).

Today, the processing of orris is a complex process to get from the rhizomes to expensive the orris concrète with 15 hectares of cultivated irises leading to only 1kg of the absolute. Today, steam distillation or solvent extraction are the usual methods of extraction leading to the orris butter, yet there is no evidence that these were used in antiquity. We have a few tantalising clues to ancient processing from obscure references in ancient texts and archaeological finds. The philosopher Theophrastus tells

us in his comprehensive work On Odours (a fascinating exploration of the use of fragrant materials and how they are perceived[3]) that iris rhizomes are at their best three years after drying (section 34). He also describes various techniques for extracting the aromatic material from their plants sources detailing expression, enfleurage and maceration in section 22, but gives no clue as to which, if any was employed for orris. The Roman physician Dioscorides in his Materia Medica 1.66[4] discusses the extraction of oil using the maceration process, which is a two-day process; he goes on to suggest repeating the process two or three further times to make it more concentrated. Using chemical analysis, residue of iris oil has been found in Chamalevri (near Rethymno on the Greek Island of Crete) dating back to 2000 BCE, so it clearly has a long heritage in the world of perfumery[5]. As well as the familiar perfumery applications in oil and cosmetics, Joanna told us of a number of surprising medical applications for orris root: Dioscorides tells us of its usage in the treatment of coughs, headaches, sleep disorders and as an anti-venom whereas Arataeus of Cappadocia recommends it to induce vomiting in ill children.

As you can see research into the world of ancient flavours and fragrances is truly thriving. There is an active academic community which would really welcome input from those working in industry. Please find below contact details and/or web-links for many of those mentioned in this article if you would like to contact them about their work.

- Eleanor Betts is a founder member of the Sensory Studies in Antiquity initiative: https://sensorystudiesinantiquity.com/
- Laurence Totelin can be reached on TotelinLM@cardiff.ac.uk and documents some fascinating insights into ancient recipes of all kinds on http://recipes.hypotheses.org/author/laurencetotelin
- Miriam Bay's Ovid's garden blog and her contact details can be found on: https://nasossong.wordpress.com/category/winterbourne-project-ovids-garden/
- Joanna Day can be contacted on: joanna.day@ucd.ie

2 Incidentally the extensive list of unguents and their ingredients to which Joanna refers makes a fascinating read to any involved in the aroma trades today and can be found online at the following website: www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.02.0137%3Abook%3D13%3Achapter%3D2

3 A complete translation of On Odours can be found here: penelope.uchicago.edu/Thayer/E/Roman/Texts/Theophrastus/De_odoribus*.html

4 A German translation of Materia Medica can be found here: en.wikisource.org/wiki/De_Materia_Medica/Book_1#66

5 A detailed discussion of the Iris in prehistoric Crete can be found in a great article by Maria Vlazaki, "Iris cretica" and the Prepalatial workshop of Chamalevri" published in Cretan Offerings, 2010 and online on JSTOR.

BOOK REVIEWS

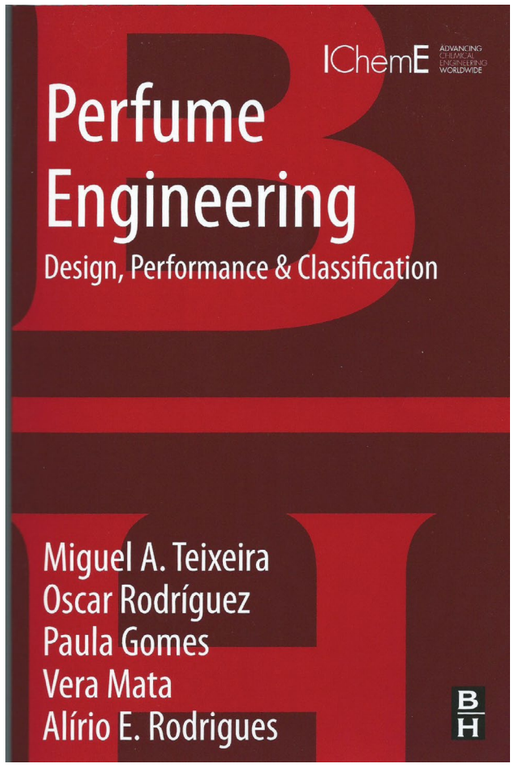
DR TONY CURTIS

Perfume Engineering: Design, Performance & Classification

Miguel A. Teixeira, Oscar Rodríguez, Paula Gomes, Vera Mata & Alírio E. Rodrígues

Published by Butterworth-Heinemann (in association with IChemE) (2013)

£36.99 (ISBN 978 0 08 099399 7)



Contents

This book is not an easy read. In fact, there were whole sections that I had to skip. However, do make the effort to look at a copy of the book. This is a timely and valuable contribution to the development of perfumery. Wells and Billot in their landmark book *Perfumery Technology - Art : Science : Industry* gave balance to the three threads. Renaissance painters concocted their own paints with little reference to modern paint technology. Has our state of knowledge and technology developed far enough for perfumery to become more scientific and technical and less of an art form? Modern architecture, with scarcely a straight line in sight (e.g. the London Gherkin), would not be possible without the use of computers. Could CAD / CAM come to perfumery? I will return to this later.

This is a small book with just 160 pages but be not deceived - it is packed with numerous thoughts and ideas. I was lulled into a sense of false security. On page 17 we are reintroduced to the classic Carles structure of perfume with top, middle and base notes. Over the page and there is even a reference to my book (written with David Williams) *Introduction to Perfumery*. Things are going well! There is discussion of headspace, odour intensity and odour detection thresholds - all good thoughts. Then a few lines later these ideas get the Chemical Engineering treatment: -

The equation is as follows:

$$\phi i = \left(\frac{C_i^g}{ODT_i} \right)^{n_i}$$

where C_i^g is the concentration of the odorant in the gas phase and ODT_i is its corresponding odour threshold in air (both using units of mass or mol per volume). The parameter n_i is the power-law exponent for each odorant. Well of course!

It is 50 years ago that I learned thermodynamics at university and 40 years since I used them in calculating HETPs (theoretical plates) of high vacuum fractional distillation columns. I am not going through that pain barrier again. However, if you skip some of the heavy-duty engineering mathematics, there are carefully and well-crafted definitions. I liked the model of the perception of a perfumed product as:

- Psychophysics
  - Odour character
  - Odour intensity
- Chemical Engineering [Perfumery style!]
  - Perfume diffusion
  - Perfume evaporation

This book is unique in my experience in linking concepts such as 'Non idealities of multicomponent mixtures and prediction of odour intensities' and traditional perfumery background e.g. The Michael Edwards Fragrance Wheel. If, as with me, the rigorous mathematics is a little out of your league, do skip to the more reflective sections. Chapter 5 is a thoughtful future watch contribution, well worth studying. We have possibly converging technologies:

- Better understanding of olfaction
- Better understanding of the physics of complex systems
- Computers that are capable of handling complexities.

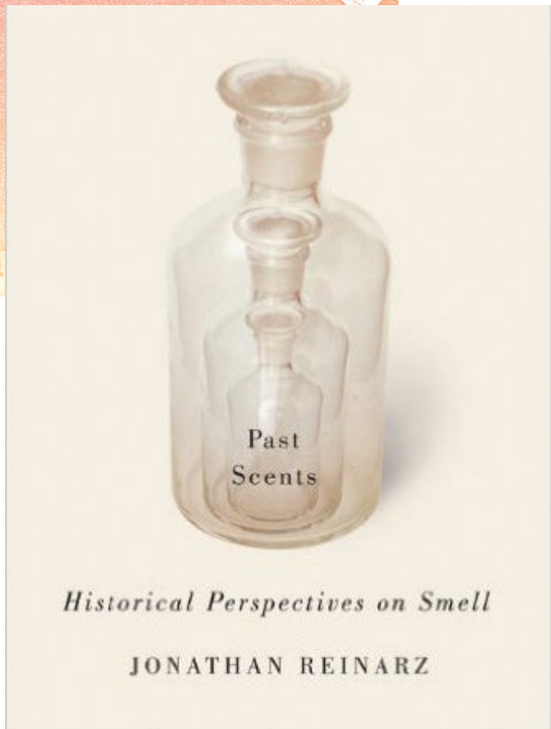
Computers have revolutionised weather prediction. However, remember the butterfly effect. Modern architecture would not be possible without computer design technologies. In this area they have extended the creative reach; could the same be true of perfumery in 20 years? Once every few months read a book that you are uncomfortable with, it helps to get new perspectives on concepts and ideas.

I would suggest buying a couple of copies for the Perfumery Laboratory bookshelf. One copy for the Perfumers to dip into as a reference source, a second copy to lend out to the other members of the new product development team (Engineers, Chemists, Cosmetic Scientists, Marketers etc.) who sometimes think perfumery is just about mixing a few aroma materials at random, rather than a complex process of cost effective aroma engineering.

Past Scents: Historical Perspectives on Smell

Jonathan Reinarz
Published by University of Illinois Press (2014)
£19.99 (ISBN 978 0 252 03494 7)

Contents



The clue to the nature of this book is in the conclusion *Beyond the Foul and Fragrant*. Jonathan Reinarz refers to the 1996 edition of Corbin's *The Foul and the Fragrant* (reviewed earlier in our occasional ICATS Newsletter articles on the classic books of perfumery and flavours). This contains the claim that 'Today's history comes deodorised'. I certainly agree that people have become less aware of odours. Indeed, our cityscape is different. In the second paragraph of *Perfume: The Story of a Murderer* Patrick Suskind paints a vivid picture:

> *In the period of which we speak, there reigned in the cities a stench barely conceivable to us modern men and women. The street stank of manure, the courtyards of urine, the stairwells stank of mouldering wood and rat droppings ....*

Possibly in our modern city life we do not overdose to this extent. However, odour is still an important influence on us. I found the chapter on race and smell particularly interesting. The section on *You are what you eat* is illuminating about attitudes to odour and culture. Reinarz refers to a British diplomat in 19th century Japan reporting:

> *He could comment on the food of his host nation, despite not ingesting any, due to the awful smells he encountered. His revulsion was magnified because the stench invaded or penetrated the body through inhalation.*

Attitudes to international food have changed in the UK in the 21st century with a global palate of cuisine to be enjoyed in the average high-street. I am reminded of problems in assessing malodour counteractancy of aroma materials. Subjects wore pads under their arms for eight hours and these were assessed for sweat malodour by a trained panel. We had to ask test subjects to refrain from eating garlic, spicy or other highly-odoured food before and during the experiments. Durian fruit may not be eaten in public transport in some countries. The link between flavour and perfumery in this context may be 'You smell of what you eat'.

The historical smellscape is well reviewed in the chapter *Mapping the Smellscape: Smell and the City*. I would add to the variety of observations about *'Country bumpkins smelling of goats and garlic.'* and that *'The city [London] should be renamed Lorda, or filth, rather that Londra'*. I live in Plymouth, a great sea port and the departing point for the Pilgrim Fathers to the New World (USA). Eighteenth and Nineteenth-Century mariners commented that cities such as Plymouth and London stank of horses because of the amount of horse manure deposited on the streets.

This book is readable and entertaining; however, it is also very scholarly. The reference notes to the chapters stretch to 46 pages. This book is an essential companion to *The Foul and Fragrant* and in my opinion this book will also become a classic addition to the Perfumer's bookshelf. I would also suggest there is enough about food and flavour issues to be of interest to the Flavourist as well. I hope you enjoy it as much as I have, you will certainly become better informed.

IN THE NEWS

DR TONY CURTIS

Natural Food Dyes

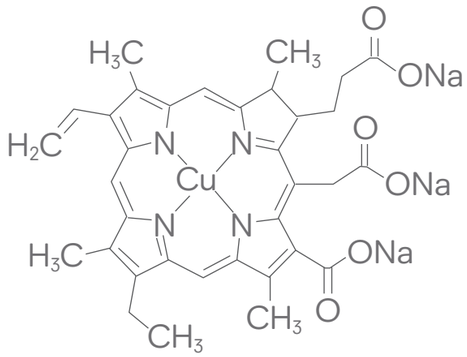
I reviewed the current scientific press and came across this article, which concerns the action of small peptides on taste sensors, just after I had completed my article on the BSF Symposium. In an earlier edition we reported from the IFRA-UK Fragrance Forum on the problems of people with anosmia with the social isolation of people who had lost their enjoyment of food. For them, eating is often not so much a social activity, but a need to refuel. This area has become reflected in the mainstream technical & scientific press. This article in particular attracted my interest *The Flavour Makers: Hacking our smell receptors will allow us to create delicious tailored food flavours* (Jessica Wasper, New Scientist February 2016). We have a new scientific group: The International Society of Neurogastronomy. At their inaugural meeting, chefs, neuroscientists and doctors joined forces to create a dish that would rekindle the pleasure of food for people with taste impairments.

Here we are back to genetic basis of olfaction where McClintock has experimented with S100A5 deleted mice. By this mechanism, he tagged neurons so when they were activated by an odour they had a green fluorescence. The neurons are removed from the noses of the mice and separated. By sequencing the RNAs of these cells, McClintock identified the pattern of receptors activated by an odour.

They use the model of describing the system as analogous to taste barcodes. The report goes on to describe an effect in food and vegetables *'the sweetest tomatoes*

don't necessarily contain the most sugar – rather they contain a volatile compound that stimulates a pattern of receptors that our brains read as sweet'.

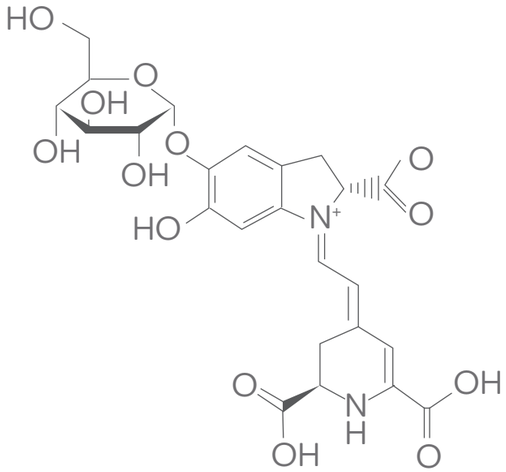
I am certain that the total picture is even more complex. We know, from fragrance work on the genetic basis of olfaction, that individuals can have different perceptions of a given odour stimulus. This might suggest that the barcode might be different for genetically diverse individuals (the *New Scientist* report did not mention if the mice used were genetically identical). Moreover, we know other stimulus such as food colour, colour of plate and material of construction (e.g. spoons of different metals) can all affect perceptions of flavour. One main inference appears to me: the perception of aromas and perfumes is multisensory. Its identity appears to be dependent on pattern recognition; the pattern has vectors from various senses. These vectors' presence and influence have some genetic basis. Just to make life interesting, we have the nature verses nurture aspect. The interpretation of these patterns may also have cultural and experiential aspects.



Coppered chlorophyll

In my book review of *Perfume Engineering*, I speculated about the possibility of CAD / CAM entering perfumery. Clearly, across a spectrum of scientific disciplines, we are gaining more and more knowledge. However, we are still a long way for being able to create perfumes or aromas by painting by numbers. Barcodes there may be, but reading these in a human is a lot more complex than the laser reader in our supermarket checkout. One clear indication is that Flavourists and Perfumers are working in an overlapping area of science. This is recognised by the annual joint meeting of the British Society of Perfumers and the British Society of Flavourists.

Food was the feature subject of this February's *Chemistry World*. For those of an adventurous experimental disposition, there was a two-page guide to home smoking with recipes. The major feature was on the natural food dye revolution. It is decades ago that the tartrazine (F D & C Yellow No 5 E102) controversy burst upon the world.



Chemical Formula for betanin

Beetroot

Now most food manufacturers would wish to label 'no artificial flavours or colours'. As always things come at a price. The BSF Symposium lecture on the problems of sugar substitution proves the point. These food colours were very stable and water soluble. Cooking temperature would have tended not alter their hue. Contrastingly, natural colourings can present challenges: solubility, pH, temperature, light and air can all provide complications.

The article then brought on memories of my own involvement with natural food colours. BBA (now part of IFF) used to produce chlorophylls. Working with botanicals is a quality assurance (QA) challenge. It is easy to draw up a specification for sucrose, not so simple for grass. One issue was that it has been known for some enterprising farmers to spray a trailer load of grass with water. This would increase the weight and their payment.

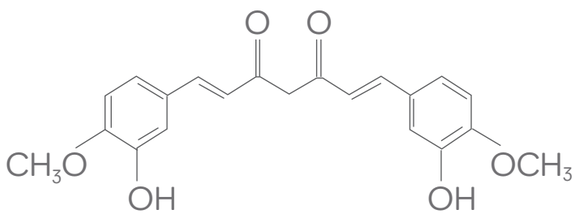
Chlorophyll was my 'electric light bulb' moment in QA senior management. In my annual QA report for the Main Board I had a series of complaints about our chlorophyll products. Some products were formulated for oil type systems and others for aqueous systems. The problem was some customers and inexperienced sales and administration staff did not know this. When an unknowing customer just asked for chlorophyll they could be sent the wrong product. I well remember one complaint which was for a colour mix for cakes (an aqueous system in this context). They had been supplied the oil system version and the results was uneven distribution of the green colour with little green specks in the finished cake. This caused a string of complaints from consumers about 'mouldy' cakes that were less than 24 hours old.

The solution was a two-pronged approach: -

- More involvement of the head office sales administrators with the products (training and site visits)
- Tuning up the customer technical support documentation and procedures (e.g. more technical support customer visits)

This I learned in 'MBA speak' was Relationship Marketing. I then proceeded to learn more about customers by taking the Post Graduate Diploma in Marketing of the Chartered Institute of Marketing. I am often asked how I have become not only a Chartered Chemist but also a Chartered Marketer. Now you know; it was by being involved in customer technical support, part of the mix in Relationship Marketing (covered in ICATS Module 8 – Marketing and the Business Environment in the Aroma Trades).

To return to *Chemistry World,* it explores some of the classes of natural colours. The section headed *Red lolly, yellow lolly,* gives a succinct overview of the carotenoids. Other colours covered are betanin from beetroot (not surprisingly for strawberry ice-creams). The water soluble pigments include the anthocyanins. If you remember your school chemistry these can have a behaviour like titration indicators, with their hue depending on the pH (acidity) of the environment. A vibrant yellow pigment curcumin is extracted from turmeric. It is not good in beverages but performs well in confectionery.



Chemical formula for curcumin

As you might expect in this modern world the regulatory area is complex. Food products such as beetroot may not have to be declared. The article states *'As long as you don't change the ratio between the colour and the rest of the material .... It doesn't become a colour ingredient'.* As you might also expect USA regulations are different to EU regulations. Coppered chlorophyll is permitted in Europe but not in the USA. This is a useful summary article so do read it if you have access to *Chemistry World.*

After heavy duty regulatory affairs, I needed something to lighten the mood. This was provided by the *New Scientist* (9th July 2016) article The Emperor's new loos - do not read this during or after a meal! The article informs us *'Good, clean fun? Sharing a bath [group - Roman style] could mean sharing fellow bathers' pubic lice and eggs from intestinal worms'.*

It appears that public health was an issue then and there were public health warnings too [classical style – not iPad or Twitter versions]:

Anybody urinating here will incur the wrath of Mars
Forum arch Thigibba, Tunisia

To the one defecating here beware of the curse
Outside a house in Pompeii

Shit with comfort and good cheer,
so long as you don't do it here
Vesuvian Gate Pompeii

As always my normal plea to our ICATS IFEAT Diploma students and other readers of our Newsletter, please do read round the subject in the trade and general scientific press. It broadens the outlook and as the tail end of this news review shows, it can also lighten up the day.

Vesuvian Gate Pompeii

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