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What influence do new fragrance materials have in perfumery?

Anthony F. Morris, Firmenich SA, Geneva, Switzerland

It would be illogical to talk about perfumery matters with which I am not personally familiar, so I am restricting my discussion to developments since the late 1950s. The big events in the perfumery industry from the late 1950s through the 1960s were the beginning of takeovers and mergers, and technological advances in the commercialization of two very important chemical processes. One wonders how the perfume industry would have developed if these takeovers had not been so drastic—after all, what had been a fairly large number of medium and small size companies was transformed into fewer and very much bigger conglomerates. Some people lamented these changes; some still do. Others saw the opportunities in the time of change. Whatever one's views, it was a great upheaval. The new world did not take place overnight, as was dreamed, and it is still being molded.

This period was a time of change too from the perfumers' point of view. Chemicals such as geraniol, citronellol, linalool, and hydroxycitronellal had been made from natural oils, and we saw the first samples of materials available from the Roche and Pinene processes. They were rather different from those already known. What are your memories, remembering having used the sweet full-bodied fruity geraniol from citronella or its rather truer quality from palmarosa, and then suddenly using the new synthetic wonder geraniol, far purer chemically but smelling like rusty old tin cans? Similarly, the contrast of the floral linalool ex Bois de Rose to the purer, less floral, somewhat green metallic synthetic linalool. Or hydroxycitronellal ex citronella, smooth and wonderfully floral, to the new grade smelling of the gasworks. It seemed that "progress" was moving backwards! There are always times with a new technology when the fundamentals of perfumery are seemingly

under attack—in this case the idea seemed to be "that chemical purity is more important than odor," but the cycle passes. The perfumer helped by insisting on the development of qualities wholly acceptable to his use. Of course the "natural" grades continued to be available and still are today, the new qualities did not replace them. Looking back, how did you judge the synthetic hydroxycitronellal, citronellol, and geraniol? Did you quickly discover their merit and their weakness, and apply your creativity to take maximum advantage of their development?

Although with these synthetic grades we probably only related their use to functional products, the same problems associated with the use of new fragrance materials (NFMs) apply whether they are new qualities or completely

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original.

Talking of fragrance materials (FM) one can say that no two have the same odors; no chemical really smells like another; each FM possesses its own individuality. Not only does each one have a different odor when evaluated on a smelling strip but its "shape" (its ability to diffuse, its volume, its tenacity, its substantivity) is unique. The individuality of a FM is further increased by the way its shape is modified by the environment, by alcohol, soap, aerosol, other perfume materials, etc. Herein lie the clues to the use of NFMs in perfume creation: a realization that each one is an individual and that its performance has to be unravelled.

One cannot take an existing formula and replace a woody or a floral note or any other by a new woody or floral note and retain the balance of the fragrance. Certainly the odor will be modified but usually the perfume becomes unbalanced and so unfinished. Sadly, often because of shortage of time, a perfumer will discard the new material if the perfume is not rebalanced after the first few attempts. Perhaps a perfumer will start with a NFM by seeing how it will harmonize in some simple accords but better still, hopefully the perfumer will, before trying it in any perfumes or accords, really evaluate the complexity of the NFM's odor and determine its shape in some depth.

I believe that *originality* in perfume creation comes from creative thought and the use of NFMs. What we are all most interested in is success; the personal satisfaction of creating a beautiful new fragrance. However, originality is not a golden path to success unless certain important principles are applied. Too original a perfume may be creatively beautiful but have poor acceptance, and the use of new material for newness' sake is not good creativity. The degree of originality in a fragrance has to be carefully controlled to suit the type of product and the client. A familiar note with a twist of originality is often the most successful result.

Having expounded my views on originality and the importance of NFMs, I would like to explain my way of trying to appreciate the value of a new body. I make a habit of smelling an NFM not once or twice throughout its life on a smelling strip, but five or six times, and at work in the office and at home. New FMs are like rough-cut diamonds that have to be examined in depth, and each odor character (facet) appreciated. Perhaps the first impression of a hypothetical material X is floral and muguet, rather fresh. By repeated and very careful smelling, by discussion with colleagues we discover a somewhat linalool citrusy character, a woody undertone, and a lovely wax floralcy. During one to two weeks, the way to cut the diamond, or the way to use the NFM, unravels.

Next, its performance in product needs to be

assessed. Is it diffusive in alcohol or soap? What character becomes apparent in aerosol? Is it full-bodied, thin or flat? Is it substantive to skin, hair, cloth? And, of course, what is its stability in a range of products? The full complexity of its odor has been studied and its shape, and how its shape is changed by different environments, and its technical performance have been evaluated.

This may all seem time-consuming but now, when the simple accords are tried, I have a good feel for the new "toy." Its value in muguet notes is perhaps obvious but with what other muguet bodies will it harmonize, how will it blend with the usual muguet building blocks such as cinnamic alcohol, citronellol, linalool, etc? It is unlikely to perform like hydroxycitronellal. We found it had a fresh linalool note; therefore how will it work with bergamot, linalyl acetate, lavender, coriander, petitgrain? How does its woody character develop in combination with sandalwood, with para-tertiary butyl cyclohexyl acetate (ptbcha), with patchouli, cedar? And its waxy note, does it help in tuberose, cassie, jasmine, rose?

In making these trials, very valuable accords can often be developed if the NFM is blended with other materials of similar dry-out life on a smelling strip or by producing accords using the material X as a top note, and combining it with other muguet notes, one a middle-note material and the third an end-note ingredient. As you can imagine there are many possibilities, but these trials in this "period of incubation" will stand you in very good stead whenever you use the NFM X in future perfumes.

The study of NFMs in the way I have explained is for me a very good way of developing creativity, especially in young perfumers. In fact, the study of how basic perfumery materials interact with each other is of fundamental importance in order that a perfumer really understands the perfumery materials with which he has to mold his fragrance designs. All too often one hears of perfumers "learning" perfumery by copying the classic perfumes. To discover the accords responsible for the classic perfumes is fine, as long as the aspiring perfumer has first put his nose to the grindstone" and developed by trial and error his own way of working. Creativity, an artistic feel for perfumery, exists as a latent quality to a greater or lesser degree in everyone, but it needs to be harnessed. If it is directed down well-worn paths it will remain dormant. If it is allowed freedom and given judicious advice it can develop from the initial crude results and blossom into the so much desired balance between originality and familiarity. Originality in the early stages of development is absolutely essential, even to the extent that the attempts at perfume blends are out of focus, gaudy, or too unique.

Continuing my theme of creativity, a subject

on which every perfumer will surely have his own clearly defined views, I would like to touch on a further technical development in perfumery, which is gas liquid chromatography (GLC). This started to be of major importance in the perfumery industry in the late fifties and early sixties, not only to the research chemist but also to the perfumer. Its value is without question and I do not intend to discuss its use or how its linking with mass spectrometry (MS), etc., has changed our life. It has helped to unlock many secrets in natural products and indeed in house specialties. But although some misguided individuals believed that with GLC and MS computers, etc. the perfumer would go into decline, it was realized that these advances in technology only help the perfumer to do his work better. Not all the secrets of natural oils, absolutes, and classic specialties can be unlocked or decoded. We now have very much better reconstitutions of jasmin, rose, absolutes, etc., than before; and with the continual increase in demand for perfumes and by the help of these reconstitutions, we can use these classic reconstituted notes in a wider range of product areas. But I do not believe nature has been equalled, nor have the classic specialties been reproduced by technical progress. What perfumer would prefer to use a reconstitution over the natural rose otto when he is creating in alcoholic perfumery?

GLC has brought us a long way; it is a wonderful tool; but in use as a standard piece of equipment in a perfumer's laboratory, I fear it is hindering the development of individual creativity for some perfumers. Its value is being abused, and too often used at the expense of original thought and hard work. To copy is easy to a degree; to create is hard work but infinitely more satisfying for the artist.

When I speak of trends in perfumery, I am referring to all areas of perfume creations, not merely to the various odor classes in fashion, but also the sheer change in performance of a perfume demanded by the need for product success in these times. We have seen not only the odor trends of the green note, the musk, the exotic floral notes of tuberose, jasmin and the others, but also the technical performance of a perfume to be a "sock it to you" type to give great diffusion to a detergent or soap, to be substantive to hair, skin and fabrics in shampoos, hair sprays, aerosol deodorants, fabric softeners, and so on. These are important factors today in any perfume, which were not so forcefully demanded before the 1960s. The realization that certain fragrance materials will give substantivity, great diffusion, etc., is in many cases the reason for their commercial success.

If we look at the fragrance chemicals that have developed in importance during the 1960s and

the 1970s we can leave aside the classic building blocks such as phenylethyl alcohol, terpineol, amyl cinnamic aldehyde, linalool, etc. which have been used in large amounts for innumerable years. (Of course with the Roche and Pinene processes we did see the change of qualities already mentioned.) I would like to make some comments on those chemicals which for me have had an important impact on perfumery development, trends and thinking since the late fifties. Some materials, such as methyl ionone alpha iso, hexyl cinnamic aldehyde, ptbcha, Lilial, Vertofix, and sandalwood chemicals such as Sandela, had already been known—some for very many years. But because of their sheer performance (their outstanding shape to price ratio) they are now basic building block materials.

Lilial, for example, was first made in 1921 but has perhaps only really been the success we know today since the 1950s. Perhaps its development was held back because it is not a chemical of great value in fine perfumery. In addition to its muguet note, it possesses a fatty, grease character which needs to be toned down, but in functional product areas *Lilial* is among the most outstanding of chemicals for diffusion and substantivity. Finding ways of toning down its slight chemical character and using its performance qualities brings in the creative challenge. Such a successful accord has been the harmony of *Lilial* with methyl ionone and anisic aldehyde—these two sweet floral notes balancing out the dry floralcy of *Lilial*.

Methyl ionone gamma was first marketed as *Italia* in 1903 but until the 1950s was reserved mainly for fine perfumery. However, during the fifties and sixties it was realized that the alpha iso isomer was the most effective in many product areas besides alcohol. And so by improved process development methyl ionone alpha iso

with its much sought-after powdery woody floral character has become the enormous volume item of today.

Hexyl cinnamic aldehyde was once used far less frequently than its amyl homologue but today perhaps the scales are reversed in preference for the hexyl cinnamic aldehyde.

Para-tertiary butyl cyclohexyl acetate, known under many names, also came to be the basic building block we know today because of its great effectiveness, very much helped by the success of Camay soap. Similarly, Vertofix, an outstanding product from the technical performance point of view whether in alcoholic solution, soap, detergent, or aerosol products, is today a building block perfumery material, but it often needs its cedary character to be modified by other woody or floral notes to produce its rich elegant woodiness to the best effect.

Sandela and related materials have excellent shape but again need to be blended with trace amounts of cuminic aldehyde, anisic acetate and other materials to soften the harsh, somewhat synthetic character.

Price/performance ratio is the important factor in the development of any NFM. In fine perfumery the limitation of price is somewhat less than in the functional product areas, and so the opportunity to try new chemicals can be greater in toiletries and alcoholic solution.

If we examine the various odor categories, I can see that important NFMs have been developed during the last 20 years in the rose, jasmin, muguet, woody, green, musk, oakmoss, citrus, amber, and fruity notes. To my mind, no outstanding NFMs have been offered in the spicy and herbal areas. However, you may beg to differ or know of ones of which I am not aware. My list reads as follows:

- Rose—rose oxide, rosalva, rose ketones
- Jasmin—hedione, jasmolactone, cis-jasmone
- Muguet—Lilial, Lyril, Mayol
- Woody—Vertofix, Sandela (and related materials), ptbcha, Osyrol and Cedroxyde
- Citrus—Citalva, dihydromyrcenol
- Amber—Fixateur 404, Ambrinol
- Fruity—raspberry ketone, Furaneol, Corps praline
- Musk—Tonalide, Galaxolide 50, Musk DTI, Versalide, muscone, civettone, among others
- Moss—orcinol chemicals
- Green—cis-3-hexenol, nonadienal, jasmacyclene, undecatrienes, pyrazines, Agrumen aldehyde and its key chemical, hexenyl salicylate, Stemone

This list is not exhaustive, but covers a range of materials which are reasonably well-known. To comment on all of these products would be too time-consuming. Those which stand out include rose oxide, hedione, Citalva, dihydromyrcenol, Fixateur 404, the moss chemicals, the galbanum chemicals, Agrumen aldehyde,

and the musks.

A colleague of mine, Max Erni, had a great deal to do with the success of rose oxide and hedione. Rose oxide, very poorly understood for many years by many perfumers, today has its rightful place as an important top-note material in both fine fragrances and detergent powders. Its ability to diffuse from a product is exceptional. Hedione, by its sheer beauty of odor and its wonderful effect in accords of all odor types for all products, has been the most trend-setting NFM of the last decade—perhaps the greatest effect since the aldehydic effect of Chanel 5.

Citralva, introduced in the middle sixties, was a startling new product which seemed to be the dream of smelling somewhat like citral and yet stable in difficult media. However, first trials showed it to be very different in effect and use to citral (as is usually the case) and so for some perfumers it was abandoned. Those who persisted to find ways of controlling its fierce chemical character and fatty top note were rewarded. Combinations with other citrus, spicy, green, and herbal notes enabled its power and stability to be exploited.

Fixateur 404 is now the classic amber note known to all, but again problems of overdosing can often be seen and it has to be carefully controlled.

In the green notes, it has undoubtedly been Agrumen aldehyde that has played a major role, either as itself, or in more recent years in the form of its key chemical. "Back to nature" and the green trend have often gone hand in hand.

It is surprising that the oakmoss chemicals have been known since the 1930s but have only in more recent years become commercially available. It is also surprising that the derivatives of myrcene and ocimene did not originate from the companies exploiting the Pinene process for linalool, geraniol, citronellol, etc. These myrcene and ocimene chemicals have, however, because of their excellent shape and creative thought, become trend-setters.

Finally, the musk chemicals. Where did the musk trend start? Did it really begin with the hippies or did it start in the very musk nature of Astral soap, or did the important dosing of the white musks in detergents in the middle sixties to give great substantivity, start it?

With two avenues of research for NFMs: 1) purely chemical breakthroughs of process, new raw materials, original thinking for new structures; and 2) from examining natural products, we find that the types of NFMs vary considerably. In the first classification all types of new bodies can be developed, but in the second group we are now left with only the very powerful chemicals to be of real interest. All the valuable chemicals present in reasonable amounts

have already been identified. This of course brings about a change in the evolution of the perfume business today. How does a perfume house best utilize these very powerful materials? Very often they remain captive, but the other possibility is to promote them commercially as a specialty base. This has been an important influence in the reappearance of the specialty base as a standard tool of the creative perfumer. During the 1960s the specialty went into a decline, perhaps due to GLC technology—the false belief that now nothing is secret and that creativity and beauty are no longer essential. However, Wardia, Animalis, Muguet 16, and Dynamone are as important today as ever.

The cycle has been completed. Very often these very strong materials are difficult to handle, to blend in, and can be more easily and rapidly put to good effect in the form of a beautiful base.

For a new chemical to be a success today it has to have something special, unique, an advantage over existing materials. For a large company to develop a NFM it has to be sure it possesses these characteristics. Less than one percent of new chemicals made become a commercial entity. And yet, too frequently a perfumer will discard a new body because of lack of time and effort to really see how it will perform.

Despite this, the last 15 to 20 years have seen an enormous number of new and very fine fragrance materials discovered. Can this rate of development continue at its exponential rate of growth? Are we in an exceptional period never to be seen again? Will, for example, the problem of the moment—safety—have an effect on the number of new chemicals commercialized? The consumer, during the period under review, has become more and more aware, more and more demanding on subjects of safeguard of the environment, safety in drugs, cosmetics and hence in perfumes.

It is certainly a good point that our own industry has set up its own internal safety control system with the International Fragrance Association (IFRA) and the Research Institute for Fragrance Materials (RIFM) and that we do not have outside organizations dictating our way of working.

Each NFM brought into use today is safety tested on humans by the perfume house concerned and usually at an independent research establishment—this costs money! Each factory for the manufacture of NFMs is spending more and more on anti-pollution controls—this costs money! Will these increases in development costs restrict the number of NFMs to those of exceptional odor and shape?

The safety control of existing perfumery chemicals and natural products has already overcome the first hiccups. Phenylacetaldehyde,

citral and cinnamic aldehyde were shown to be suspect but happily the quenching effects of phenylethyl alcohol, limonene, and eugenol were proved acceptable. From the perfumer's point of view he would welcome sensible control of his perfumes, but hopes the correct balance of safety testing with experience in judgment will prevail. The marketing company of a product must be satisfied that his product is safe—from the point of view of manufacture, from the point of view of consumers' safety, consumers' confidence in the product, and for the company's own well-being. Let us hope that the present state of flux, where each company has its own safety limits, can be rationalized and that we can come out into the clean fresh air and clear sunshine.

The theme of my talk is that NFMs are often instrumental in trend-setting and in producing outstanding perfumes. Man by his nature continues to seek innovation.

I have picked out the following successful products which have had a very important impact on the market during this period of review. My list reads:

Perfumes:

Cabochard	Havoc
Fidji	Amazone
Calandre	Halston
Super Estée	Eau Sauvage
Chanel 19	Aramis
Aliage	Pierre Cardin
Paco Rabanne pour Homme	

Soaps: Camay, Fa, Atlantik, Shield

Shampoo: Herbalessence

Looking at this list, I am sure that many of you are aware that NFMs are present in many of these products, and I like to believe, played an important part in their being a success. For example, the new nuances in the green themes found in Fidji, Aliage, Amazone; the floral jasmín effects in Calandre, Chanel 19, and Eau Sauvage; the important woody characters in Havoc and Halston. In the soap field, among the

outstanding innovative successes have been Camay (USA, mid fifties), Fa, Atlantik, and now Shield. How much of their success, originality of fragrance and technical performance can be related to NFMs? In shampoos, the outstanding fragrance effect has been in Herbalessence; an original combination of green notes gave it distinctiveness and success.

Perfumery is certainly an *ism* (defined as any distinctive doctrine or practice) and

I = innovation

S = success

M = motivation.

All of these are ours by creative thought and NFMs to make the perfume that "stands out from the crowd."