International Perfumery Congress

Words Versus Odours How Perfumers Communicate

By Dr. Wladyslaw S. Brud, Pollena-Aroma, Warsaw, Poland

A few years ago while working on a simple system of classification and files of new aroma chemicals and specialties which appeared in our laboratory as offers from around the world, I invented simple odour profiles which allowed us to describe and compare odours of various products. Many of them, offered under trade names with different descriptions and prices, after careful study appeared to be the same or very similar chemical. Odour profiles as an easy method of odour comparison, based on mean results of odour evaluation by a team of perfumers, was the best way of classification of the products.

The main problem in creation of the profile was selection of proper words for odour description (see figure 1). Usually manufacturers for marketing and promotion purposes use very elegant and convincing descriptions of their new products. Although the odours may be really outstanding, the descriptions are usually misleading and ambiguous. However certain words are used regularly by most companies and perfumers.

As the basis of my work on simple odour profile I reviewed circa 200 leaflets and notices on new aroma chemicals and specialities and selected words which were most often used as odour descriptions. From this group I made a second selection of these words which had general meanings and which described a group of similar odours. For example "rosy" and "civette-like" are single odours and using them one has in mind single fragrant material. Using words "floral" or "animal" one thinks of groups of odours of similar type. "Rosy" and "civette" belong to these two groups respectively, as do "jasmine" and "castoreum." This way, after some discussions

 0272-2666/86/0004-2701$02.00/00

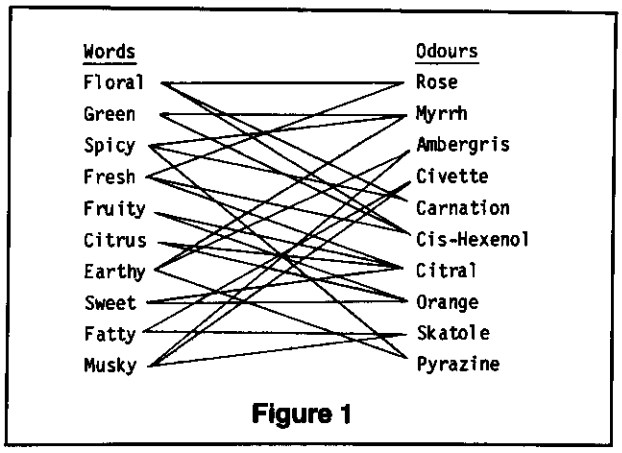

Figure 1

with several perfumers, our Odour Profile was established and appeared in a series of articles covering a number of new products supplied by leading manufacturers.[1-4]

The idea of the Odour Profile is shown in figure 2. With ten odour qualifications (with one extra for special quality) and a four point scale in each quality, we were able to describe any aroma chemical or specialty and have reproducible results with our group of perfumers. In other words, two similar or identical products gave

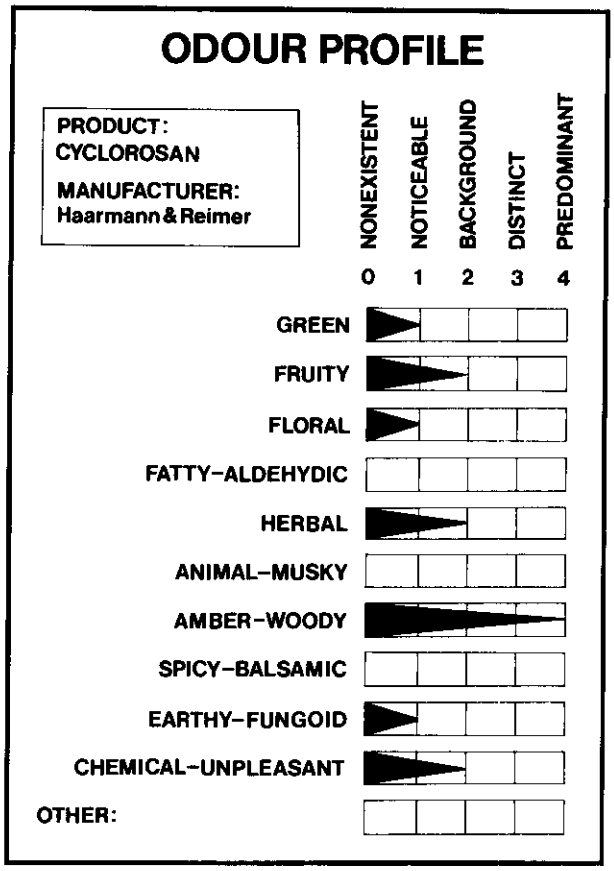

Figure 2

similar or identical profiles, and products with similar profiles were similar in their odour properties and in most cases gave the same results when used in compounds. Consequently the problem for which the profile was created has been solved. We have a simple method of odour comparison which can be stored, e.g., in computer memory, and dealing with new products we can easily go through profiles to find a similar one without smelling numerous samples.

A new problem appeared when we went further into practical applications of the system and when some manufacturers sent me samples of their novelties with profiles already prepared by their own perfumers. We discovered that profiles made for the same product by different perfumers were different and that the same words were used for quite different odours. So we got to the same point as many other researchers, i.e., "Odour Description and Odour Classification," the title of an excellent book on the problem published by Harper and coworkers nearly twenty years ago.[5]

Many systems have been proposed for odour classification, the oldest one by Linneaus. They are collected in numerous reviews, such as those by Boelens[6] and Harder.[7] Some of them con-

Figure 3

tained also some kind of quantitative evaluation of components of the odour pattern. Without going into details I will mention Crocker and Henderson's work with four qualifications and 8-point scale[8] and Randebrock's polarity profiles.[9] In most cases the words used were understood by authors as self explanatory and no examples of odorants were given as standards for odour qualifications used. Two of the works which gave some idea what was meant by certain descriptions were the old Zwaardemaker classification system and the quite new DROM "odour ring" using twelve odour descriptions with certain auxiliary terms and a few examples of fragrant products as typical for each group (see figure 3). This "odour ring" was prepared mainly for descriptions of odours of compounds but represents the same idea as my odour profiles with use of ring segments instead of peaks and three instead of four odour intensity levels.

Theoretical aspects of odour description and classification were usually based on various odour-structure ideas and aimed at so-called primary odours which should correspond to certain basic odour reception systems (receptors). Hence these works were usually more on the physiological side of the problem than for perfumers' practical needs. At times various categories of words were used in the same system, i.e., hedonic and very general terms together with nearly chemical definitions, e.g., "repulsive" and "caprylic" (Zwaardemaker) or "camphor-like" and "heavy" (Harper). This happened most often in systems created for research works on odour recognition and differentiation.

The most important aspects of the practical side of odour description systems are very well

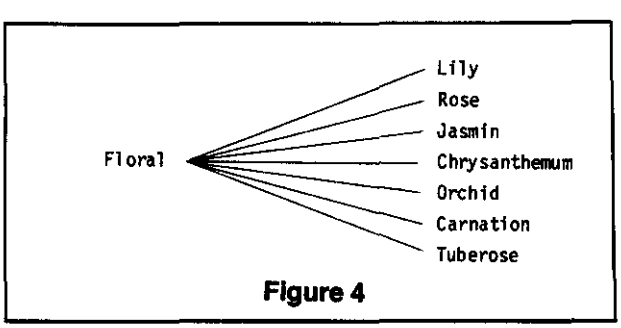

Figure 4

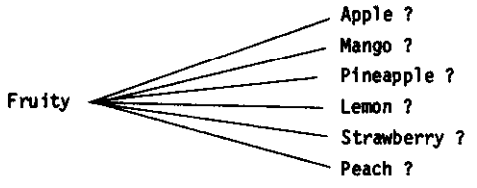

Figure 5

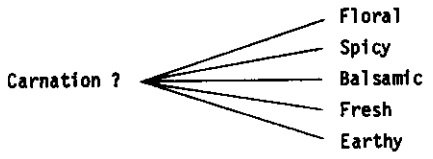

Figure 6

Table I. Data Sources

Company	Number of Answers
Allen-Mak (Pharmachim)	4
Bush Boake Allen	7
Charabot	5
Dragoco	4
Drom	7
Firmenich	10
Givaudan	7
Haarmann & Reimer	17
IFF	6
Lautier	5
Mane	1
Naarden	14
Pollena-Aroma	10
PPF	7
Robertet	6
Roure Bertrand Dupont	10
Total	120

defined by Harder.[10] Two most significant points should be emphasized.

- Use of proper words (qualifications, valencies etc.) to describe odour (odour pattern).
- Quantitative description, strength scale of each qualification contribution to whole pattern.

These two variables were used as the basis of my odour profiles but, as I said before, when we analysed understanding of my system by possible users, we found that the most important part of it is exact definition of each word (term) used. Any perfumer asked "Do you know what floral odour or fruity odour means?" can feel offended by such a stupid question. But there are many flowers and fruits (see figures 4 and 5). From this point of view even some stinking orchids are floral. On the other hand if we take one of the most popular flowers like carnation, it is very likely that the word floral will never appear in the description of its odour (see figure 6).

All of these questions and problems well defined in the literature suggested my simple idea: let us ask perfumers. At least professionals should know the language they are using or if they differ in opinions (and of course they do) perhaps we can find some common ideas which used by a majority can be accepted by all of us.

For that purpose I used terms from my odour profile and elaborated a questionnaire which was sent to numerous perfumery laboratories. From 200 copies distributed 120 came back, very often with interesting comments. As shown in Table I, leading world perfumery centres were kind enough to help me in this work. I used the word "help" although after I received all the answers, the problem looked more complicated than before.

The questionnaire consisted of a two column table with the left hand column headed "Odor Descriptions" followed by this list:

Green	Amber
Fruity	Woody
Flowery	Amber—Woody
Fatty	Spicy
Aldehydic	Balsamic
Fatty—Aldehydic	Spicy—Balsamic
Herbal	Earthy
Animal	Fungoid
Musky	Earthy—Fungoid
Animal—Musky	Chemical

The right hand column was blank under the heading "Name of Substance." The instructions read: "Fill, please, only one name of fragrant substance (essential oil, aroma chemical or known specialty) which you associate (first choice) with each of the Odor Descriptions given below."

The twenty terms were an extension of my basic odour profile which contains six terms using two words, i.e., fatty-aldehydic, animal-musky, amber-woody, spicy-balsamic, earthy-fungoid, and chemical-unpleasant. To check these combinations I added to the questionnaire all the above words separately.

Let us look at some figures: 507 products were named, 110 products were assigned as typical to

more than one term out of which one product was named as standard for six different terms, two products five times, eight products four times, twenty-eight products three times and seventy-one products twice. Nearly four hundred of the products were selected only once (by one person for one quality). (Aldoxal was named as a standard for six odour descriptions: fatty, aldehydic, fatty-aldehydic, herbal, fungoid and chemical. Costus root oil and opoponox res. were both named as standards for five odour descriptions: fatty, animal, animal-musky, amber, amber-woody; and amber-woody, balsamic, spicy-balsamic, fungoid and earthy-fungoid; respectively.

There were some other minor problems with analysis of the questionnaires. First of all quite a number of respondents are used to writing top secret formulas so nobody can read them. Secondly there is not only problem of odour description but also product's nomenclature. Nearly all possible synonyms were used plus numerous trade names for well known chemically defined products. Many of my respondents also used trade names of products which are unknown outside their companies.

One very positive aspect of the poll was that answers were really individual. No relation between the company for which the respondent worked and products he listed was observed. The only exceptions were some very rare specialties which usually came from a company's own production. However it was quite common that a competitor's specialties were listed as best standards for certain odours.

Results of the Questionnaire

Green

This odour description was relatively easy as nearly 60% of the answers concentrated on two products—galbanum and cis-3-hexen-2-ol (see Table II). At first glance, galbanum chosen by ⅓ of the respondents seems the best standard for green odour. However, study of other terms and the wide range of qualities of this product change that clear picture. Galbanum for some people is earthy, herbal or earthy-fungoid, i.e., not considered as pure standard of one odour type (see figure 7). Therefore, in my opinion, the best solution is to agree with the twenty-seven perfumers who chose cis-3-hexen-2-ol as green odour standard. The advantage of this selection is that it is available as pure chemical while galbanum, depending on the source and method of preparation, can differ in odour quality. To conclude, I suggest cis-3-hexen-2-ol as standard for green odour with galbanum as auxiliary one.

Table II. Green

	Selections
Galbanum res.*	42
cis-3-Hexen-1-ol*	27
Triplal*	9
cis-3-Hexenal*	7
cis-Hexenyl acetate*	7
Ligustral*	5
Vertocitral*	4
Aldehyde AA*	2
Methyl 2-octynoate*	2
Phenylacetaldehyde	2
Violet green	2
Agrumen aldehyde*	1
Allyl amyl glycidate	1
Cucumber	1
Cyclal C*	1
Helional*	1
Hexenyl formate	1
Hivertal	1
Liffarome	1
Methyl-2-nonynoate*	1
Petitgrain oil	1
Verdinol	1

* Selected also as standard for other descriptions.

Fruity

The situation here is similar to the green group (see Table III). Two products (and two fruits) dominate: undecalactone (so called aldehyde C14 or peach aldehyde) and ethyl methyl phenyl glycidate (EMPG so called aldehyde C16 or strawberry aldehyde). Although both fruits are very different in odour, the type of odour is definitely of the same group. Most of the other products selected here are of similar character (allyl esters, Frambinon, nonalactone, Fraise, etc.). Only four people considered orange oil as fruity and only one person selected mandarin oil. This means that citrus fruits are generally not recognised as fruity quality, which gives them a special place in profiles and when appropriate, it should be emphasized, as a special note. We concluded that undecalactone should be accepted as the fruity odour standard with ethyl methyl phenyl glycidate as an auxiliary one.

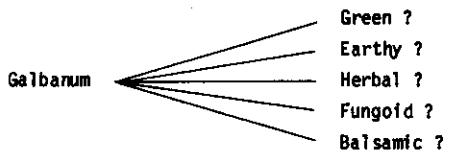

Figure 7

Floral

Floral odours obviously had more meanings for my respondents and were as different as flowers are (see Table IV). However, three flowers dominate: rose (thirty-two selections—rose oil, phenethyl alcohol, geraniol), jasmin (twenty-three selections—jasmin absolute, alpha-hexyl and alpha-amylcinnamaldehyde) and lily of the valley (twenty selections—hydroxycitronellal, muguet aldehyde). Therefore bearing in mind the symbolic role of the rose as the flower of flowers, there is no doubt that rose oil of Rosa Damascena should be used as standard for floral odour with jasmin as the auxiliary standard covering over 50% of answers.

Table III. Fruity

	Selections
Undecalactone	45
Ethyl methyl phenyl glycidate	24
Amyl acetate*	11
Frambinon	4
Orange oil	4
Allyl amyl glycidate*	2
Allylcyclohexanepropionate	2
Allyl heptanoate	2
Allyl hexanoate	2
Nonalactone	2
Verdox	2
Analine	1
Allyforte	1
Apple essence	1
Banana aldehyde	1
Benzyl butyrate	1
Cassis	1
Cyclohexyl acetate	1
Damascenia	1
Decyl acetate	1
Fruit 205	1
Fraise 333	1
Isobutyldimethylbenzyl carbinol	1
Maltol	1
Mandarin oil	1
Mirabelle 2000	1
Osmanthus	1
Peonyl acetate	1
Pigwa aldehyde	1
Pineapple	1
Vanillin*	1

* Selected also as standard for other descriptions.

Fatty-Aldehydic

There is very surprising variety of opinions on fatty odour (see Table V). Some of the products selected as standards for this odour are really astonishing (e.g., linalool, hydroxycitronellal, Tonalide, Lyral, styrax). More than half of the products selected here appear only once. It means that this particular odour quality is not very clear and except for limited consensus on fatty alcohols selected by about one fourth of the respondents, there is no general direction as what should be the standard.

Contrary to the fatty group, in the aldehydic group aliphatic aldehydes C10-C12 cover nearly all answers with 9-undecenal leading the list (see Table VI). But all of them appear also on the fatty-aldehydic list (see Table VII and VIII) which shows that these two qualifications are the same for many perfumers. Therefore I suggest to use "fatty-aldehydic" as the odour description

Table IV. Floral

	Selections
Rose oil	22
Jasmin absolute	16
Hydroxycitronellal*	15
Phenethyl alcohol*	8
Hedione	6
alpha-Hexylcinnamaldehyde*	6
Ylang ylang oil	6
Cyclamen aldehyde	5
Lilial	5
Linalool	5
Muguet aldehyde*	4
Geranium oil*	3
Lyral*	3
Geraniol	2
Tuberose absolute*	2
alpha-Amylcinnamaldehyde*	1
Benzyl acetate*	1
Citronellol*	1
Florarium	1
Helional	1
alpha-Ionone	1
Methyl anthranilate	1
Methyl dihydrojasmonate	1
Methyl jasmonate	1
Mimosa absolute	1
Phenylethyldimethylcarbinol	1
Tilia resinoid	1
Terpineol*	1
Verflor	1

* Selected also as standard for other descriptions.

Table V. Fatty

	Selections
1-Decanol*	20
Lauryl alcohol	10
Undecyl alcohol	6
Heptanal*	4
2,4-Nonadienal	4
Diacetyl	3
Guaiac wood oil	3
Nonalactone	3
Octanal*	3
1-Octanol	3
Santal	3
alpha-Amylcinnamaldehyde*	2
Butyric acid	2
Costus root oil*	2
cis-3-Hexen-1-ol*	2
Hydroxycitronellal*	2
Linitol	2
2-Methylundecenal*	2
Myristaldehyde	2
Miristile nitrile	2
Orris root resinoid*	2
4-Phenyl-3-buten-2-one	2
9-Undecenal*	2
Acetoin	1
Aldoxal*	1
Allyl ionone	1
Beeswax	1
Butyl acetate	1
Castor oil	1
Citronellyl propionate	1
Damascenone	1
2,4-Decadienal*	1
Decanal	1
Dodecane nitrile	1
Empetal	1
Ethyl laurate	1
Ethyl 10-undecenoate	1
Hexanoic acid	1
Hexenal*	1
Irivone	1
Jasmolactone*	1
Linalool*	1
Linseed oil	1
Lyral*	1
Mandarin aldehyde	1
Methyl octin carbonate*	1
Muguet aldehyde*	1
Myrac aldehyde*	1
Neryl crotonate	1
Nonanal*	1
cis-6-Nonenal*	1
Nonyl alcohol	1
Permenthene	1
Pentenyl cyclopentanone	1
Phenylpropionic aldehyde*	1
Styrax resinoid*	1
Tonalide*	1

* Selected also as standard for other descriptions.

Table VI. Aldehydic

	Selections
9-Undecenal*	50
2-Methylundecenal*	27
Decanal*	17
Lauric aldehyde*	12
Intreleven aldehyde*	3
Nonanal*	2
Octanal*	2
Aldehyde TMU*	1
Aldehydol 861	1
Aldoxal*	1
Citronellol*	1
Heptanal*	1
Phenyl proionaldehyde*	1
Vinisol CNC	1

* Selected also as standard for other descriptions.

Table VII. Standard

Standard	Fatty	Aldehydic	Fatty-Aldehydic
Octanal	3	2	14
Nonanal	1	2	12
Decanal	1	17	10
Heptanal	4	1	7
9-Undecenal	2	50	8

Table VIII. Fatty-Aldehydic

	Selections
Lauric aldehyde*	41
Octanal*	14
Nonanal*	12
Decanal*	10
9-Undecenal*	8
Heptanal*	7
Intreleven aldehyde*	5
2-Methylundecanal*	3
Aldehyde TMU*	2
9-Decen-1-ol	2
Hexanal*	2
2-Methyloctanal	2
Aldehyde C-13	1
Aldoxal*	1
alpha-Amylcinnamaldehyde*	1
2,4-Decadienal	1
1-Decanol*	1
Mandarin aldehyde*	1
Muguet aldehyde*	1
Myrac aldehyde*	1
Myraldene	1
Nonalactone	1
cis-6-Nonenal*	1
Orivone	1

* Selected also as standard for other descriptions.

term with lauric aldehyde as the standard for it. Considering the similarity of other aldehydes selected here, I think that no auxiliary standard is necessary.

Herbal

With herbal quality the situation is similar to the floral but more complicated because of more

Table IX. Herbal

	Selections
Rosemary oil	18
Wormwood oil	9
Basil oil	6
cis-3-Hexen-1-ol*	6
Armoise oil	5
Clary oil*	5
Chamomile oil	5
Thyme oil*	5
Galbanum*	4
Herboral	4
Lavandin oil	4
Styralyl acetate*	4
Triplal*	4
Herbac	3
3-Hexenal*	3
3-Hexenyl acetate*	3
Aldehyde AA*	2
Hyacinth body	2
Lavender oil*	2
Ligustral*	2
LRG-1241	2
Verdyl acetate	2
Acetal R	1
Agrumen aldehyde*	1
Aldoxal*	1
Bornyl acetate	1
Cedar leaf oil	1
Cyclac C*	1
Estragon oil	1
Geranium afrique oil	1
Ho leaf oil	1
Isocyclocitral*	1
Leaf acetal	1
Lemofix	1
Marjoram oil*	1
Methyl octin carbonate*	1
Oxaspirane	1
Phenethyl phenylacetate	1
Physalis	1
Pine needle oil	1
Spike lavender oil	1
Tachrysate	1
Verbena oil	1
Zdravetz oil	1

* Selected also as standard for other descriptions.

Table X. Animal

	Selections
Civet absolute	88
Castoreum*	11
Indole	4
Skatole	4
Costus root oil*	3
Animalis*	2
p-Tolyl acetate*	2
Tonquin R	2
Ambrarome*	1
Chevral	1
p-Cresol*	1
Musk tibette*	1

* Selected also as standard for other descriptions.

Table XI. Musky

	Selections
Galaxolide*	34
Musk ketone*	12
Musk ambrette*	11
Ambrettolide*	8
Musk tonquin*	7
omega-Pentadecalactone*	6
Traseolide	6
Exaltone	4
Exaltolide	3
Musk R-1*	3
Musk tincture*	3
Musk xylol*	3
Lactone MC15	2
Muscone	2
Musc tibette*	2
Tonalid	2
Ambergis tincture*	1
Celestolide	1
Fixolide	1
Irovolide	1
Musk A	1
Musk DT*	1
Musk moskene	1
Musk W1	1
Musk T	1
Musk 171	1
12-Oxahexadecanolide*	1
Tonquitone	1

* Selected also as standard for other descriptions.

diversified opinions (see Table IX). Products selected in this group showed that this term is often associated with green. This type of combination was also used in the drom ring where green-herbal quality is represented by hexenyl products, galbanum, isocyclocitral, and others. I do not agree with that combination because a majority of my respondents selected different

Table XII. Standard

Standard	Animal	Musky	Animal-Musky
Musk tonquin	2?	7	30
Musk ketone	-	12	8
Castoreum	11	-	4
Musk ambrette	-	11	3

Table XIII. Animal-Musky

	Selections
Musk tonquin*	30
Tonquinone	13
Muscarome	10
Musk tincture*	9
Musk ketone*	8
Shangralide	5
Ambrettolide*	4
Castoreum*	4
Civettone	4
Grisambrol	3
Lactone MC15*	3
Musk ambrette*	3
Ambrarome*	2
Costus*	2
Galaxolide*	2
Mesion	2
Muscone*	2
Tibetogene	2
Ambergris tincture*	1
Ambranol AB 455	1
Ambrette seed oil	1
Animalis*	1
Animalone	1
Fixateur 404	1
Incolore hexine*	1
Lactoscatone	1
Muscol	1
Musk DT*	1
Musk R-1*	1
Musk xylol*	1
Nepalide	1
omega-Pentadecalactone*	1

* Selected also as standard for other descriptions.

Table XIV. Amber

	Selections
Ambergris tincture*	43
Labdanum*	25
Ambroxan	14
Ambroxide*	9
Grisalva*	4
Ambroin	3
Fixateur 404*	3
Amber 83	2
Ambrene	2
Costus root oil*	2
Amber 162	1
Amber oliffac	1
Ambracene*	1
Ambrettolide*	1
Ambrinol*	1
Ambronate	1
Benzoin Siam res.*	1
Cedramber*	1
Dihydro-gamma-ionone	1
Ethyl vanillin	1
delta-Ionone	1
12-Oxahexadecanolide*	1
Sclarambrol	1

* Selected also as standard for other descriptions.

Table XV. Woody

	Selections
Cedarwood oil	43
Sandalwood oil*	21
Patchouly oil*	17
Vetiver oil	14
Cedryl acetate	3
Bacdanol	2
Cedre HE	2
Isolongifolanone*	2
Oak moss absolute*	2
Timberol	2
Vertofix*	2
Amyris oil*	1
Cedroxyde	1
Cyclododecyl formate	1
Iso E Super*	1
Isolongifolene ketone	1
Lichen decoloree	1
Sandela	1
Trimofix*	1
Vertenex	1
Vetiveryl acetate*	1

* Selected also as standard for other descriptions.

natural oils which represent several different odours but of similar character and quite unlike a green one. The selection of the standard here must be an arbitrary one, but on the basis of most frequent selection I will suggest rosemary oil. Additional argument can be used to support this suggestion. This particular oil was the basis of the first world alcoholic perfume, Aqua Regina Hungaricae, which in the fourteenth century was promoted in Europe by Polish born Queen Elisabeth of Hungary.

Table XVI. Amber-Woody

	Selections
Cedramber*	16
Ambroxide*	15
Acetylcedrene	8
Iso E super*	8
Labdanum*	7
Vertofix*	7
Kephalis	5
Bisambrene	4
Cedroxyde	4
Ambreinol*	3
Ambracene*	3
Fixateur ambra	3
Amberwood	2
Cashmeron	2
Cyclambrene	2
Fixateur 404*	2
Opoponax*	2
Patchouly oil*	2
Sandalwood oil*	2
Texadrene	2
Vetiveryl acetate*	2
Ambergris tincture*	1
Amber 162 B	1
Androne	1
Calamus oil	1
Cedraclaire	1
Clary oil*	1
Copaiba balsam*	1
Costus root oil*	1
Dihydroambrate	1
Eugenol*	1
Exaltex	1
Grisalva*	1
Isolongifolanone*	1
Lauralia	1
Liscetone	1
Trimofix*	1
Verbeniax	1
Vetiver oil*	1
Woodrone	1

* Selected also as standard for other descriptions.

Table XVII. Spicy

	Selections
Clove bud oil*	47
Eugenol*	25
Cinnamon bark oil*	12
Pepper oil*	10
Nutmeg oil*	6
Pimento berry oil*	6
Bay oil	3
Basil oil*	1
Celery oil	1
Coriander oil	1
Elemi oil	1
Iso E super*	1
Isoeugenyl acetate*	1
Laurel oil	1
Marjoram oil*	1
Mace oil	1
Sanette oil	1
Thyme oil*	1

* Selected also as standard for other descriptions.

Table XVIII. Balsamic

	Selections
Benzoin Siam res.*	52
Tolu balsam*	19
Peru balsam*	17
Vanillin	5
Labdanum*	4
Myrrh*	3
Amyl salicylate	2
Cinnamic alcohol*	2
Eucers res.	2
Olibanum*	2
Opoponax*	2
Styrax*	2
Amyris oil*	1
Balsamite	1
Copaiba balsam*	1
Dynamone	1
Fir oil*	1
alpha-Ionone	1
Methyl cinnamate	1
Resin d'Orient	1

* Selected also as standard for other descriptions.

Animal-Musky

Civet was an overwhelming selection as the symbol of animal odour (see Table X). Castoreum was second selection.

The musky odour is well defined by variety of synthetic musks with Galaxolide leading the group (see Table XI). But when you look at the animal-musky list, you will see many of the same products listed as standards for the separate terms (except civet but with castoreum, Civettone and Galaxolide) which in my opinion means that this mixed quality is more useful in practice

Table XIX. Spicy-Balsamic

	Selections
Styrax res.*	23
Cinnamon oil*	11
Isoeugenol	8
Tolu balsam*	8
Clove bud oil*	7
Opoponax res.*	6
Cinnamic alcohol*	5
Nutmeg oil*	5
Olibanum res.*	4
Cascarilla bark oil	3
Peru balsam*	3
Benzoin Siam res.*	2
Clary oil*	2
Isoeugenyl acetate*	2
Isoeugenyl benzyl ether*	2
Labdanum res.*	2
Benzyl cinnamate	1
Cassia oil	1
Cinnamyl cinnamate	1
Cubebs oil	1
Epicene T	1
Eugenol phenylacetate	1
Eugenyl methyl ether*	1
Fir oil*	1
Ginger oil	1
Guaiacwood oil*	1
Gurjum balsam	1
Isoeugenyl methyl ether	1
Maize absolute	1
Myrrh res.*	1
Orris absolute*	1
Patchouly oil*	1
Pepper oil*	1
3-Phenyl-2-propanol*	1
Pimenol	1
Pimento berry oil*	1
Thyme oil*	1
Tonka beans absolute	1
Vetiver oil*	1
No answer	15

* Selected also as standard for other descriptions.

than the more general ones (see Tables XII and XIII). With all the above comments I suggest to use only this mixed quality with musk tonquin as the standard covering both terms.

Amber–Woody

My original odour profile contained amber-woody together as a quality. Even before I started this work some perfumers commented that these two qualities cannot be combined as they represent different odours. The analysis of the answers in this poll showed that both are very distinct (none of the products was selected as standard for both amber and woody odours) and easily recognized while the mixed one hardly gives a good standard except two specialties covering together 25% of answers (see Tables XIV, XV and XVI). Therefore I propose to separate them and use amber as qualification with ambergris tincture as the basic standard with labdanum

Table XX. Earthy

	Selections
Patchouly oil*	22
Vetiver oil*	18
Geosmin	8
Isobutylquinoline	7
Oak moss absolute*	6
PADMA*	4
Patchone*	4
HADMA*	3
Racinol	3
alpha-Terpineol*	3
Ambrinol*	2
Galbanum res.*	2
Geovertal	2
Isocyclocitral*	2
Lavender oil*	2
Methylthiopropionaldehyde	2
Stemone	2
Sylveol	2
Wurzelkorpermittel	2
Borneol*	1
Cyclotropal	1
Dimethylcyclormol	1
Eugenyl methyl ether*	1
Geranium oil*	1
Huminol	1
Hydratropic aldehyde*	1
HAPGA*	1
Irone	1
Isobutylmethoxypyrazine	1
Isoeugenyl methyl ether*	1
Isopropylquinoline*	1
Mastic	1
Methylcyclocitral	1
Musk alpha*	1
NADMA	1
1-Octenol-3*	1
Orris concrete*	1
Pyralone	1
Quinoline	1
Tuberose absolute*	1
Vetiverol	1
Vetiveryl acetate*	1

* Selected also as standard for other descriptions.

Table XXI. Fungoid

	Selections
1-Octen-3-ol*	38
HADMA*	11
PADMA*	6
Cryptone*	5
Myrrh res.*	5
Opoponax res.*	5
Champignone	3
Hydratropic aldehyde*	3
HAPGA*	2
Hyacinth body*	2
Isojasmone*	2
Methyl-2-furoate	2
Musk alpha*	2
Mycolide	2
Tepyl acetate	2
Aldoxal*	1
Alginol	1
Benzyl tiglate	1
Corps 114	1
Deltalactone	1
Dimethylfurmate	1
Ethyleneglycolallylether	1
Fenotyl	1
Isonitrile	1
Jasmone	1
Jasmopyrane	1
Jeseniol	1
Methyl-2-nonynoate*	1
Methyl salicylate*	1
Mycolide*	1
Nonadienol-1,3 acetate	1
2-Octanone*	1
Octyl lavendon	1
Phenetyl alcohol*	1
Primeverol	1
Primeveryl acetate	1
Reseda body	1
Rosetyl	1
Scantol	1
Thyme oil*	1
Tree moss absolute*	1

* Selected also as standard for other descriptions.

Table XXII. Standard

Standard	Earthy	Fungoid	Earthy-Fungoid
HADMA	4	11	21
Oakmoss abs.	6	-	5
1-Octen-3-ol	1	38	5
PADMA	4	6	5
Hydratopic ald.	1	3	2

as the auxiliary one; woody will be represented by cedarwood and sandalwood oils.

Spicy–Balsamic

A similar situation as above appeared in the spicy-balsamic group. None of the products selected as spicy appeared on balsamic list. Although twenty-three people selected styrax as a spicy-balsamic standard, the variety of other answers showed that this term cannot be used without confusion. On the other hand, there is no doubt that clove bud oil and eugenol mean spicy for most of the perfumers. Therefore these two are suggested as standards. Balsamic is even more clear as benzoin Siam is unquestionably the leader of the list (see Tables XVII, XVIII and XIX).

Earthy-Fungoid

Patchouli oil and vetiver oil are on the top of the list for the earthy term (see Table XX). Both of them are considered "woody" by nearly the same number of perfumers. The variety of other answers and number of products selected is rather confusing.

Similar situation is found in the fungoid group especially because of many products which appear on both earthy and fungoid lists (see Tables XXI, XXII and XXIII). Therefore although the earthy-fungoid list is more varied than the other two, I suggest using this mixed quality with hydratrop aldehyde dimethyl acetal (HADMA) as standard. Although only twenty-one respondents selected this product as earthy-fungoid standard, for eleven it was "fungoid" and still for another three it was "earthy." It should be emphasized that if one of these qualifications is used in description of new product, it is usually used together with the other one. Therefore I am sure that only the mixed quality is necessary to complete a profile of an aroma chemical. Phenyl acetaldehyde dimethyl acetal (PADMA) is proposed as the auxiliary standard as it is earthy, fungoid, and earthy-fungoid for nearly the same number of perfumers (four, five, and six, respectively).

Table XXIII. Earthy-Fungoid

	Selections
HADMA*	21
Oakmoss absolute*	5
1-Octen-3-ol*	5
PADMA*	5
Sylveol	5
Allyl furoate	3
Galbanum res.*	3
Isocyclocitral*	3
Myrrh res.*	3
Eugenyl methyl ether*	2
Fionon	2
Hydratropic alcohol*	2
Hydratropic aldehyde*	2
Isopropylquinoline*	2
Opoponax res.*	2
Patchone*	2
alpha-Terpineol*	2
Algene	1
Basil oil*	1
Borneol*	1
Cedes absolute	1
Citronella oil	1
Corps 114*	1
Corps racine	1
Cryptogenyle	1
Cryptone*	1
DADMA	1
Forestone	1
Fucus Crispus	1
Geosmin*	1
Gurjum balsam*	1
Homocarenol	1
Hyacinth body*	1
Huminol*	1
Isoborneol	1
Lovage oil	1
Methyl-2-nonynoate*	1
Methyl vinyl carbinol	1
Mousse corps	1
Musk alpha*	1
Mycolide*	1
2-Octanone*	1
Patchouly terpenes	1
Phenyl ethyl methyl ether	1
Piconia	1
Rosadofol	1
Tea tree oil	1
Tree moss absolute*	1
gamma-Turiol	1
Verdoracine*	1
Vetiver oil*	1

* Selected also as standard for other descriptions.

Table XXIV. Chemical

	Selections
Diphenyl ether	10
Acetophenone	8
Benzyl acetate*	5
Bromostyrene	5
Acetone	2
Benzophenone	2
Benzyl cyanide	2
Etozen	2
Isoamyl acetate*	2
Isobutylquinoline*	2
Methyl benzoate	2
Methyl-2-nonynoate*	2
Myrcene	2
Pyridine	2
Salicylaldehyde	2
Styrene	2
Terpinolene	2
Triplal*	2
Aldoxal*	1
Allyl amyl glicydate	1
Amyl ketone	1
Anisole	1
Benzaldehyde	1
Benzene	1
Butyl alcohol	1
Capuvert	1
Citronellol*	1
Citronellyl oxyaldehyde	1
Decanal*	1
Delta-3-carene	1
Diphenylmethane	1
Ethyl acetoacetate	1
Epitane	1
Formaldehyde	1
Geranitrile	1
Heptanal*	1

Table XXV. Odour Profile Stand

Odour Description	Basic Standard	Auxiliary Standard
Green	cis-3-Hexen-1-ol	Galbanum res.
Fruity	Undecalactone	EMPG
Floral	Rose oil	Jasmin absolute
Fatty aldehydic	Lauric aldehyde	
Herbal	Rosemary oil	
Animal musky	Musk tonquin	
Amber	Ambergris tinct.	Labdanum
Woody	Cedarwood oil	Sandalwood oil
Spicy	Clove bud oil	Eugenol
Balsamic	Benzoin Siam res.	
Earthy fungoid	HADMA	PADMA
Chemical	Diphenyl ether	Bromostyrene

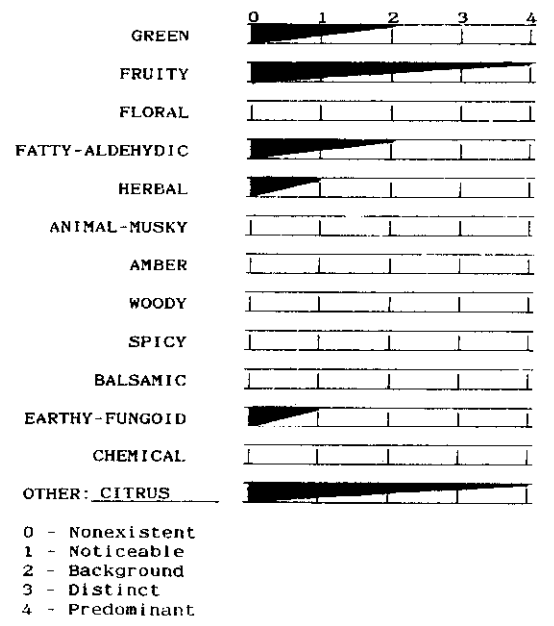

Figure 8

Chemical

Table XXIV shows that it was a hopeless task to achieve any reasonable consensus on a chemical odour standard. Nearly any kind of product can be called chemical from aldehydic 9-undecenal to fruity amyl acetate or green Triplal. It should be admitted that chemical is very inexact, thus there were numerous products on the list and many unanswered questionnaires. Some people suggested that the word "pharmaceutical" is a more accurate description of a specific note which appears quite often in new products. My suggestion is to keep the word chemical and specify for it two standards: diphenyl ether as basic and bromostyrene as auxiliary. These products will give the best description of this odour type.

On the basis of my respondents' work and speculations presented here a list of Odour Profile terms and basic and auxiliary (if necessary) standards is proposed (see Table XXV). This system will be used in the near future in preparation of odour profiles of numerous new aroma chemicals and specialties.

Odour profiles with all additional data on new products are intended to be a kind of guide or index of new aroma chemicals and specialties according to their odour with use of a simple system which allows for easy comparisons, easy search in files and computerisation of the rec-

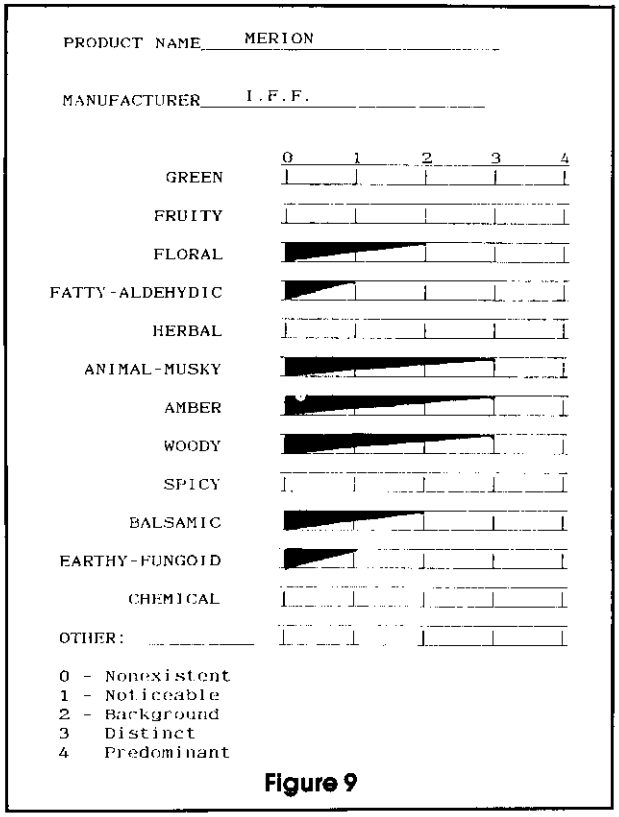

Figure 9

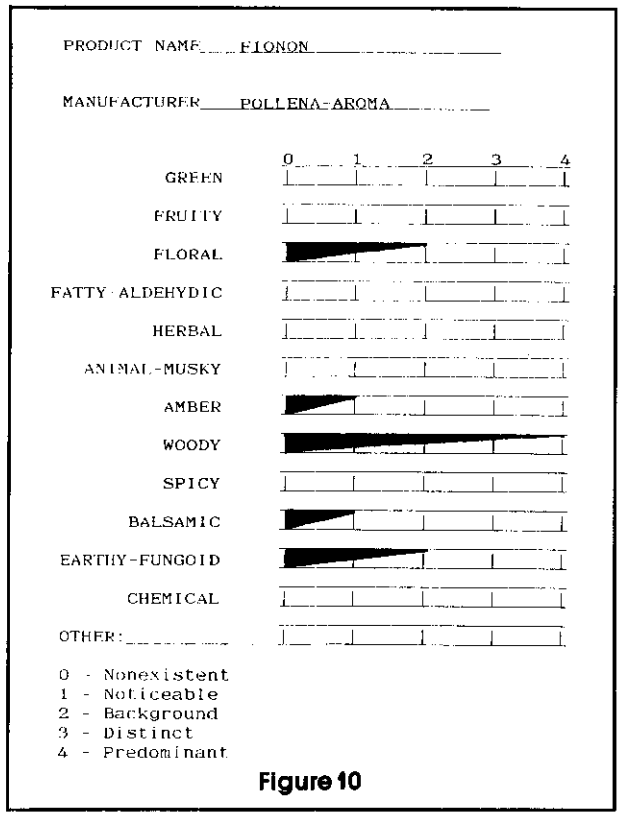

Figure 10

ords. Such an index can be used until the products become disclosed aroma chemicals and will find their place in such publications as Arctander, Muller or other books.

The main goal of my work is to help perfumers in their search for the best components for their new creations. Suppose we need to extend our formula with good fruity note with some green and aldehydic tones and traces of herbal and earthy-fungoid notes. If we check the profiles, maybe to our surprise we will find that what we need is citral (see figure 8). This may be received by some people as a joke or as offensive to perfumers' knowledge and odour memory. Yes, perhaps with example of citral it is true, but when we consider more complicated odour patterns, looking through profiles could be the only way to find exactly what we need. For example let us look at the wonderful bouquet of Merion from IFF or the very specific pattern of Fionon from my factory (see figures 9 and 10). If you can remember their full odour patterns among thousands of other products, "chapeau bas." But if you are not 100% sure of it, perhaps my work can help a little.

All your comments will be very much appreciated. If you will find my profiles useful, let me know. If you think it is a useless waste of time, let me know as well. If you have in mind any alterations or improvements, I shall be very grateful.

Acknowledgement

Let me acknowledge the invaluable aid of my friend and collaborator Mr. Z. Marczewski, Pollena-Aroma Chief Perfumer, who worked on Profiles and made many helpful comments on this work.

This paper was presented at the International Perfumery Congress, Portimao, Portugal, February 11-14, 1986.

References

Address correspondence to Dr. W. Brud, Pollena-Aroma, Klasykow 10, 03-115 Warsaw, Poland.

1. W. S. Brud, Cosmetic World News, **84-85**,42, 1981
2. ibid., **100-101**,46, 1983
3. ibid, **102-103**,58, 1983
4. ibid., **106-107**,28, 1984
5. R. Harper, E. C. Bate-Smith, D. G. Land, Odour Description and Odour Classification, London, 1968
6. H. Boelens, An Introduction to the Relationship Between Chemical Constitution and Olfactive Properties, Naarden Research Department Publications
7. U. Harder, Parfum. und Kosmet., **54**,106, 1973
8. E. C. Crocker, F. Henderson, Am.Perf.Ess. Oil Rec., **22**,325, 1927
9. R. Randerbrock, J.Soc.Cosm.Chem., **16**,653, 1965
10. U. Harder, Parfum. und Kosmet., **58**,29, 1977

Additional Bibliography

R. Harper et al., Perf.Ess.Oil Rec., No. 1, p. 1-15, 1968
D. G. Land et al., Flavour Industry **1**,842, 1970
R. H. Wright, Perf.Ess.Oil. Rec., November 1968
D. Kastner, Kosmetik, **42**,209, 1961
U. Harder, Manufacturing Chemist, **52**,30, 1981