# The Perfumer

By J. R. ELLIOTT

The aura of mystery, secrecy and glamor surrounding the perfumer has created many misconceptions of the man and his work. The most recurrent of these are that he is an exceptionally fortunate individual who inherits his talent from a long line of perfumers, and that he possesses a large, well-guarded "black book" of formulas representing the concentrated wisdom of his forbears, which gives him a very special advantage over the ordinary man seeking a place in perfumery. These misconceptions or myths, which have too often discouraged prospective students of perfumery, are not based upon facts.

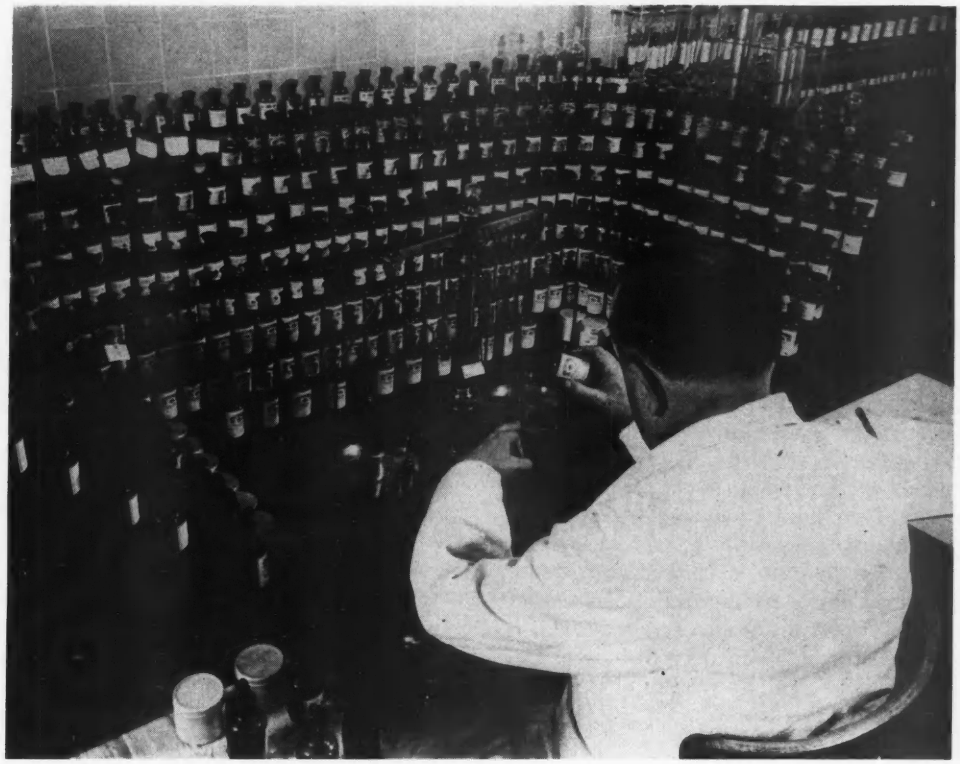
Occasionally a perfumer does come from a family of perfumers, a situation more common in Europe where it is quite customary for the son to follow the profession of his father. This is advantageous in so far as the prospective perfumer can start his training at an early age. Nevertheless, the perfumer's talent can be acquired only by effort and experience —not by inheritance. The son of a perfumer must work to earn his skill as did his father before him.

The "black book" is the most persistent of the myths. The mere possession of a book of formulas accumulated or inherited, does not and cannot qualify a man as a perfumer; in fact, a book of formulas is practically worthless by itself. Fragrance formulas are, like high fashion, constantly being re-styled and re-furbished in an effort to make them sell better. An initial formula may require as many as fifty adjustments by the perfumer before it will finally win customer acceptance. Paradoxically, this same formula may be unacceptable to another customer, and again require a new series of adjustments before acceptance can be obtained. What really matters is not how many formulas a man has tucked away in a black book, but rather how effectively he can manipulate them.

The four basic requirements for a man to become a perfumer are patience, an active imagination, an odor memory, and a modest chemical background.

Patience is the indispensable qualification of the man who aspires to become a successful perfumer. The perfumer develops his skill through continuous, often discouragingly hard work. Even when he has become proficient he is constantly faced with difficult situations which require much tedious effort to solve them. If he is to gain distinction in his field, the perfumer must be something of a perfectionist. In these circumstances the virtue of patience can hardly be overestimated.

Imagination is creative mental power, the ability of the mind to form mental pictures involving the sensory perceptions. Why some persons possess an extraordinary amount of creative power is a much discussed but still unsettled point among psychologists. The existence of this quality in an individual is constantly reflected in all phases of his life by a driving search for new ideas and activities.



Every accomplished perfumer possesses a highly developed imagination, for imagination is the essence, the heart of perfumery. Fragrances are created in the imagination long before they are executed in the laboratory. If an individual aspires to become a perfumer but lacks imagination, he is only wasting his time.

The ability too examine an odor, file it away in the memory, and then recall it at will is the very foundation of the perfumer's skill. This is an ability which is laboriously acquired rather than one which is inherent in the individual. Smell is the least used of the five senses. Consequently, that portion of the mind concerned with its memory must be strengthened by experiences, a process which takes time, practice and concentration. Fortunately, the person who cannot develop a reasonable odor memory is a rarity.

The complexity of the application of modern fragrances in such diverse products as cosmetics, lipsticks, powders, lotions and industrial re-odorants makes it increasingly desirable that the perfumer have some knowledge of the chemistry relative to the technical aspects of a fragrance.

Discoloration of a fragrance oil in soap, deterioration of a fragrance in a powder base, odor change due to polymerization, fragrance performance in either alkaline or acidic media, and stabilization of aldehydes, are a few of the situations encountered in perfumery that require some understanding of chemistry. The newest entry in the fragrance field, industrial re-odorants, is demanding an increased knowledge of chemical engineering and physical chemistry for its large scale application.

The basic training of the sense of smell is the first educational step to be undertaken by the student perfumer. This procedure requires an understanding of five points:

(1) The physiology of smell
(1) The mechanical technique of smelling.
(3) Odor fatigue, its recognition and avoidance.
(4) The artistic placement of single odors in the perfume category.
(5) The recognition of the usefulness of unpleasant odors.

The sensitivity of the sense of smell is amazing. Quantitatively, it can detect certain substances in concentrations of only millionths of a gram per liter of air. Qualitatively, it can readily differentiate between such closely related (atructurally) chemical bodies as cyclohexanol and cyclohexanone, which differ in composition by only two hydrogens.

The olfactory surface is known to be a mucous area about an inch square located in the upper passage of the nose approximately at the bridge. This active surface, technically described as the olfactory epithelium, consists of cells covered with microscopic

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other equipment are absolutely required in this process. Open flames or an accidental spark will cause the launching of "Cosmetniks" to join "Sputnik" and "Muttnik" in outer space. When all of the solvent has evaporated, heat is discontinued and mixing continued until the color is uniform. Store the finished product in polyethylene-lined drums.

Because of the hygroscopic nature of the product, water-proof or water-repellant packaging should be used. Materials include laminated glassine, saran, saran-coated foil, polyethylene or polyethylene bonded to glassine, foil or paper. The film is formed into packets or envelopes on fully automatic or semi-automatic equipment which fills 8 to 15 grams of the crystals into the container and crimps or heat seals both ends. Packets should be tested by immersing a number of them in warm water and required changes be made in the sealing operation.

Concentrated liquid rinses are creamy, colored emulsions to be diluted before use to condition the hair while tinting it. They consist of acid-stable emulsifying agents along with a modified lanolin, perfume, buffer and the proper colors.

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|---|---|
| *Ammonyx 4*[1] | *25.0* |
| *Polawax*[2] | *0.5* |
| *Tegacid regular*[3] | *6.5* |
| *Lanogel 41*[4] | *1.0* |
| *Perfume* | *0.5* |
| *Urea* | *5.0* |
| *F. D. & C. Violet No. 1* | *5.0* |
| *Water* | *156.0* |
| *F. D. & C. Blue No. 2* | *2.0* |
| *Nigrosine* | *10.0* |

The formula is given as parts by weight; by the use of proper color combinations, a full range of shades may be developed.

The Ammonyx, Tegacid, Lanogel and Polawax are heated together to 80°C. Half of the water is heated to 85°C. with the urea. The rest of the water is mixed with the certified colors and heated to 70°C. The urea solution is slowly poured into the melted fats with constant agitation and allowed to mix until the temperature drops to 70°C. The dye solution is added and mixing continued until the temperature reaches 45°C., when the perfume is added. Continue agitation with external cooling until room temperature is reached. Fill cold, using low vacuum in the filler.

1. Onyx Oil & Chemical Co.
2. Croda, Inc.
3. Goldschmidt Chemical Corp.
4. Robinson Wagner Company, Inc.

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hairs that are in apparently continuous motion. It is believed that these cells have various receptive powers which enable them to differentiate odors, but this has not yet been proven by histological (tissue study) means. Enzymes are also thought to play an

important part in the mechanism of odor perception. A number of theories explaining the function of the olfactory epithelium have been offered, but none so far has been satisfactorily demonstrated, largely because of the tremendous experimental difficulties involved.

The sequence of events involved in smelling is generally conceded to be as follows: An odor (actually molecules of a substance exuded from a surface) is brought into contact with the olfactory epithelium of the nose by an air current. The odor registers an effect on this center by physicochemical stimulation. This registration is transmitted by the olfactory nerve to the olfactory bulb of the brain which in distributes these registration impulses to the olfactory areas where they are discerned.

The temperature of the air current, within the range of human comfort, does not appear to have much influence on the efficiency of the sense of smell. The humidity of the air, however, does have an appreciable effect, probably because of the diluting effect it has on the mucous surface of the epithelium. Whatever the explanation, high humidity decreases the acuteness of the sense of smell. In rooms air-conditioned by a non-recirculating system the optimum conditions for good smelling are 80 degrees Fahrenheit temperature, and 40 percent relative humidity.

The nose is surprisingly responsive to an increase in the pressure of the air current flowing through the nasal passage. This pressure factor has long been known to the "sand-hogs" in a tunnel-digging project, who work in an atmosphere with considerably increased pressure. They find that, under these pressure conditions, the normal body odors become almost intolerable. This extreme situation is, of course only of academic interest to the perfumer since it would not be encountered in his ordinary work.

However, even small increases in atmospheric pressure (a few ounces) can cause an appreciable gain in the olfactory response. Such a condition could be encountered in an industrial re-odorant problem, where ventilating air was being transmitted by high velocity blowers, such as might be found in large ventilating systems. There is mounting evidence that some of the peculiar distortions of industrial fragrances, when used in these applications, are due to the increase in olfactory sensitivity stimulated by the slight elevation in atmospheric pressure. Apparently this augmented sensitivity causes an abnormal recognition of certain fragrances, creating an apparent imbalance in the overall fragrance effect. Esters, as a chemical group, seem to be specially prone to this abnormal recognition.

The inhalation of minute quantities of amonia has been a favorite and successful procedure for the periodic "freshening' of the sense of smell. However, excessive use of ammonia can produce a kind of

anesthesia that in some people may last for several hours. It is interesting to note that the effect of an excess of ammonia can usually be quickly eliminated by inhaling a trace of ethyl formate. Since the formic esters are by far the most chemically reactive of the ester series, a theory has been advanced that ethyl formate functions by reacting with the free ammonia fixed on the olfactory area, to form the neutral and odorless formamide. Since it is highly volatile, it does not leave a persistent odor to interfere with further smelling.

Ozone has a definitely beneficial influence on the sense of smell of at least 75 percent of the people. It does not appear to stimulate the olfactory sense, but rather helps to maintain at a high level of sensitivity for a longer than average time. The use of a small portable high voltage, electric ozonator in a perfume laboratory is so effective that in the design of a large air condition system for a group of laboratories, the controlled ozonisation of the processed air should be carefully considered.

The effects of certain drugs such as cocaine should also be noted. Individuals with sinus troubles who have had their nasal passages treated with diluted cocaine solution know how peculiarly and intensely their perception of odors is increased. This circumstance is mentioned because the chemical analogues of cocaine (the novocaine series) are occasionally encountered in medical aerosol sprays.

Some very interesting experimental work has been done with the novocaine group as olfactory stimulants to increase the efficiency of the re-odorants in the various room deodorizing sprays. However, the risk of inviting a full scale investigation of these (and perhaps all) aerosol room sprays by the Food and Drug Administration is so great that perhaps this field is best left alone. The Food and Drug Administration would have the best possible argument for an investigation, since these novocaines are clearly classifiable as drugs. Furthermore they are practically odorless, so that no authentic claim could be made for their use as perfume ingredients.

Most of the smelling done by the perfumer is accomplished by dispersing a drop of the fragrant material under examination on a small piece of blotting paper. By wafting this test paper under the nose, a small quantity of the fragrance is transferred into an air current, and thence into the nasal passage to the receptors in the olfactory epithelium.

Most perfumers prefer a stiff strip of blotting paper about ¼ inch in width and 4 inches in length. The blotter should be dipped into the fragrance liquid to a depth equal to its width. This depth of "dip" allows the quick and uniform distribution of the liquid throughout the tip of the blotter. The liquid should be completely absorbed before the blotter is placed under the nose.

The act of holding the blotter under the nose is

not quite as simple as it sounds. A curious phenomenon, equivalent to right-handedness or left-handedness in writing is involved. Right-handed people seem to smell best through the left nostril, whereas left-handed people smell best through the right nostril. Ambidextrous people find little, if any, differential in smelling through either nostril. The student should consistently use that nostril which is most effective for him.

Odor fatigue, physical exhaustion of the sense of smell, is a phenomenon connected with the physiological mechanism of olfaction. In some manner not clearly understood, during the state of fatigue the image of an odor remains impressed for an abnormally long time on the sensory apparatus, so that it blocks out the perception of subsequent odor impulses received during this abnormal period.

Odor fatigue is extremely annoying to the perfumer, as it temporarily puts him out of action. Some individuals whose sensory receptors are readily saturated are more quickly susceptible to fatigue than others. The onset of fatigue, usually recognizable by a diminishing ability to differentiate odors, is brought about in two ways: the prolonged smelling of a single odor type, and the smelling of certain chemicals. The ionones are notorious for the speed with which they will produce this kind of fatigue. The onset of fatigue may be substantially delayed by the continuous introduction of a minute quantity of ozone in the smelling room.

The inhalation of traces of diluted ammonia vapors will speed up the restoration of the sense of smell after fatigue. In fact some perfumers use this procedure systematically, as a prophylactic treatment during the course of their working day.

The most satisfactory method of avoiding odor fatigue is to eliminate or control its cause. A practical procedure is to conduct as much of the preliminary experimental work as possible with standardized, dilute solutions of aromatic materials. A separate, small laboratory equipped with dropper-type bottles of aromatic materials in 10 per cent diethyl phthalate solution can be maintained. By working on a drop-counting basis a great number of experiments can be performed without taxing the sense of smell and bringing about fatigue.

When an approximate formula has been "roughed in" with this dropwise procedure, the counted drops are translated into unit weights and the formula established mathematically. This formula is then prepared in the regular laboratory with straight aromatic chemicals after which perfecting adjustments are made.

Using this procedure, at least 75 percent of the basic experimental work of a formula can be accomplished with diluted materials, thus minimizing the major cause of odor fatigue. Better still, this method will increase the effective working time of the per-

fumer's sense of smell and therefore his work output.

An appreciation of the artistic possibilities of single aromatic chemicals is an essential acquisition for the student perfumer. This appreciation should not be confused with the more complex placement of these aromatic materials in the various basic fragrance classifications. Rather, it involves the realization of these aromatics as useful fragrance materials, not "stinking chemicals" as the layman so often describes them.

This appreciation is acquired by irksome practice somewhat comparable to the daily "scale exercise" of the musician. A successful self-instruction procedure is to select five different aromatic materials to be systematically smelled during the course of each day, using the blotter technique previously noted. This procedure establishes the groundwork for the development of the odor memory and the ultimate placement of these aromatica in the various fragrance classifications.

The perfumer should approach this acquisition problem with an open mind. He should allow his appreciation to develop freely and naturally, with no interference from preconceived ideas of other individuals. When he has acquired this appreciation it should be "his" in every sense of the word. Failure to do this may cause the subsequent stages of learning to be unnecessarily difficult.

It is interesting to note that many perfumers of long experience often automatically pass each bottle of raw material under their noses before using it, as a constant "refresher" of their basic memory.

It is a curious phenomenon of perfumery that intensely disagreeable or repulsive odors may become surprisingly flowery, even sweet, when diluted with solvents or when exposed to air.

Civet, indole and skatole are nauseating to the layman when smelled for the first time. Yet when they are diluted in alcohol, they become extremely flowery. In fact a good jasmin fragrance cannot be made without some member of this group.

Castoreum, with its leathery, smoky, animal note is not at all attractive in its free state. Yet it adds a surprisingly velvet richness to flower fragrances, especially tuberose. Traces of castoreum immensely improve many fantasy bouquets.

In another odor class, galbanum oil which is intensely "green" and disagreeable in its pure state, yet when it is diluted, it acquires a lilac-hyacinth freshness.

Pyridine and its chemical homologs, with their unpleasant ammoniacal odors, are not attractive in their pure form. When they are diluted they acquire a musk-like sweetness. In fact they are the basis for many artificial musk compositions.

The perfumer should carefully evaluate unpleasant odors as part of his learning program, for if at

some time in the future he is asked to evaluate a new chemical, this experience may be valuable.

The need for a careful appraisal of new chemicals with apparently unpleasant odors must be emphasized at this point, because the new field of industrial perfumery increasingly makes use of chemicals that were formerly rejected because of so-called "unpleasant" odor reaction.

When the student perfumer has studied the above five points and can honestly say that he appreciates the fragrance possibilities of the various aromatic materials, then he is ready for the next step in his training, the building of an odor memory.

Memory is the mental recollection of sensations experienced in the past. One of the disconcerting discoveries which the student perfumer makes occurs when he appraises his odor memory for the first time. He suddenly becomes aware that most of his olfactory memory consists of vile, pungent and penetrating smells, with very few pleasant odors included. The foregoing training suggestions for acquiring appreciation are intended to lay the groundwork for building up pleasant odor memories.

Of the memory mechanisms associated with each of the five senses, the visual memory is by far the most highly developed. Its influence extends far beyond its conventional domain, and plays an important part in the identification of odors. For example, it is amazing to see how many people, if blindfolded and asked to distinguish a rose from a carnation, are confused and can only hazard a guess as to the identity of each flower. This is because they are dependent on their visual memory for recognition of an odor.

If an individual were permitted to see and smell each flower before being blindfolded, the chances are that he would make the correct identification since the fragrance of each flower would have been associated with a mental picture.

A variation of the visual association demonstrated above is the basic principle employed in building an odor memory for fragrances. As the student perfumer continues in his study of the various odors (both single and complex) he will gradually discover that with each odor stimulation his mind will form specific mental pictures or geometric figures. He should encourage and fix these pictures or forms in his visual memory by concentrating upon them and repeatedly subjecting himself to the stimuli producing them. The student should not regard the bizarre shape and color in which these picture-forms often appear as mild mental aberrations, but rather as normal psychological experience.

These picture-forms begin to arise only after a series of stimulations by each odor. Their origin appears to be completely spontaneous. The task of the student is not to question the nature or origin of these forms, but to promptly take advantage of them

by imprinting them on his visual memory, making certain each time that they are correctly associated by name with their odor stimulus.

When at a later date he is required to examine a mixture of unknown materials, as is the case in matching a fragrance, the mental appearances of these forms will furnish him with clues as to the identity of many of the materials present. This method cannot give a complete analysis of a fragrance because of the obvious complexity of an elaborate mixture, but it will give a remarkably good "view" of its principal components or "top notes."

It is astonishing to see how effective properly cultivated psychological associations are in actual practice. The majority of the fabulous "noses" in perfumery employ this method or some personal variation of it, as a means of identifying odors. Strangely, many of its users are not clearly aware of the mechanism.

The second phase in the building of an odor memory is the faculty of being able to recall a single odor (or a complete fragrance) at will. This is comparable to the musician's ability to run over a melody in his mind and virtually "hear" it. The skilled perfumer can often so vividly recall an odor that it seems to be right under his nose.

There is no known system to develop this faculty. It appears spontaneously after much experience; it is the most difficult part of the odor memory to develop, and the easiest to lose by disuse or carelessness. Once this faculty has made its appearance, it should be maintained at peak efficiency by a systematic, daily, "recall" practice session involving a few selected odors. Because of the monotony of this procedure, the perfumer must discipline himself against the tendency to neglect it, otherwise this valuable faculty will gradually decline.

As seen from the previous discussion, the odor memory is divided into two parts—identification and recall.

The "identification" phase is concerned with the recognition of odors and the analysis of complex fragrance effects. It is used to classify the fragrance effect under observation as to type, to pick out as many of the major components as possible. This procedure furnishes the basic information upon which the process of duplication of a fragrance begins.

The general fragrance classification is usually readily identified, but the individual components can be identified only after concentrated effort over a considerable length of time. The imperfections of this system are shown in the fact that only rarely can a good match be made of a given fragrance. A good approximation is ordinarily the best that can be done.

The "recall" phase is primarily concerned with creative perfumery. It is the mechanism by which the perfumer visualizes his ideas before translating them into reality. Its operation can be illustrated by

an example of flavor combination: If the average person were asked how he would like vanilla ice cream with a sauce of chopped onions, he would squirm with revulsion at the thought. Yet undoubtedly he has never tried this combination to verify its taste by personal observation. His reaction towards the mixture is based upon his memory of the two materials and his power of intensely visualizing their compatibility in his mind. In a somewhat similar manner the practicing perfumer employs the recall phase of his odor memory as a comparative guide for creating combinations that are pleasing and avoiding those that are not.

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## FLUORIDES AND THE SOLUBILITY OF POWDERED TOOTH ENAMEL

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will react with fluoride ions to form fluorapatite or calcium fluoride. The resulting fluoride-containing layer is more resistant to acid than the original enamel surface[32]. By using powdered enamel of a specified particle size range and controlling reaction time, concentration of reagents, temperature, source of enamel and rate of stirring, the decrease in solubility produced by fluorides can be measured with good reproducibility. The *in vivo* significance of these results will not be evident until adequate correlation with appropriate clinical studies has been made.

Procedure

*a—Preparation of Dental Enamel*

The roots of extracted human teeth which had been stored in 5 per cent formaldehyde solution are removed mechanically and the crown sections shaken in a 5 per cent solution of Oronite NIW for 24 hours. The crowns are then brushed with a tooth brush and washed thoroughly with water. Reasonably clean crowns free from fillings or cavities are selected, dried, and cracked in a diamond mortar. The major portion of the dentin is removed by sorting and the remaining fragments ground until they pass through a 30-mesh screen. About 90 per cent of the dentin is removed from the ground material by flotation in a mixture of bromoform and acetone of specific gravity 2.70. The heavier material, which represents almost pure enamel, is then ground finer in a diamond mortar. The enamel that passes through a 100-mesh screen but is retained on a 200-mesh screen is then further purified by flotation in pure bromoform using the technique of Manly and Hodge[33]. The resulting enamel is washed in acetone and distilled water, dried at 105°C. and stored in a dessicator until used.

*b—Treatment of Enamel*

A sample of enamel weighing 0.1300 ± 0.0005 gram is added to a 50 ml. round bottom tube having an inner diameter of about 1 inch. Twenty-five (± 0.2) grams of the solution to be tested are added and