On the job

Becoming a Flavor Chemist

Inside a flavorist training program

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How does one go about becoming a flavorist? Does one go to a flavor company and say, "I want to be trained to become a flavorist"? I don't think so!

The first hurdle in this discipline is its relative obscurity. Not many people outside the food and flavor industry know of — or have even heard of — flavor chemistry. The science and art of flavor chemistry is not taught at a university or college. In the United States, there are several short courses offered at such institutions as Rutgers and the University of Missouri, St. Louis. However, these usually are attended by people already in the flavor industry (as opposed to aspiring academics) who are looking to acquire expertise not offered by their present employer. In the United Kingdom, the British Society of Flavourists (BSF) sponsors various flavor training courses, and the University of Reading is recognized as a center of flavor chemistry.

The Flavorist's Job

Flavorists work many years evaluating a multitude of chemicals (both natural and synthetic), essential oils, fruit concentrates and plant extracts that make up the palette of available ingredients. Each flavorist will develop a unique technique over time, cultivating a palette of preferred ingredients that will stamp their personality on the finished work. During this time, flavorists should establish a good rapport with their colleagues, because they will be the ultimate critics.

With this in mind, the flavorist must remember always to be patient — creativity does not happen overnight. Flavor creation is a long process, so enjoy it; remember to have fun.

Creation

Flavors are a complex blend of many ingredients combined in such a way to create specific flavor nuances. When working on a grilled hamburger flavor, for instance, a flavorist must know what combination of ingredients makes up the grilled part of the flavor and which ingredients impart a meaty hamburger character. The ingredients then are blended, tasted and re-blended until the desired effect is achieved. The flavored product then is evaluated by the customer for approval or comments — is it OK, is it terrible, is it good but needs a slight adjustment to make it more grilledlike or meaty, etc.?

The flavorist then modifies the flavor according to the customer's desire. The process is repeated until the customer is satisfied. It is paramount to remember that what the customer likes is not always what the flavorist likes.

In his or her work, a flavorist works closely with research chemists who, with the use of the most modern analytical techniques, determine which chemicals found in nature are really of value in the flavor-creation process. Many chemicals found in nature are prone to rapid spoilage through oxidation, smell or taste bad, or are poisonous or allergenic. The trained flavorist knows which natural chemicals to delete and how to replace them with similar chemicals that have been proven to be safe and stable.

Becoming a Truly Good Flavorist

Before considering a career as a flavorist, one must possess certain attributes — namely, keen organoleptic senses, patience, imagination, culinary creativity, artistic skills, communication skills, knowledge of the

Membership Details for the British Society of Flavourists

The details herein, in addition to contact information and applications, are available online at www.bsf.org.uk.

Membership of the British Society of Flavourists (BSF) is based solely on a personal basis. Grades of membership and conditions of entry are given in the following extract from the constitution and rules:

i) A **fellow** shall not be under 30 years of age and shall have been engaged as a creative flavorist for a period of at least 10 years. Applicants must be sponsored by at least two voting members. At the discretion of council, persons who fall outside the above requirement may be elected as fellows.

ii) An **associate member** shall be one of the following:
   a) a full-time creative flavorist with at least four years of experience
   b) a flavor application chemist or food technologist responsible for flavor blending, assessment and evaluation for a period of at least five years
   c) a person of such standing in the flavor-producing or flavor-using industries as satisfies the membership committee that he/she is eligible for membership; an associate member must be proposed by two voting members

iii) A student member shall be a new entrant to the flavor industry, not yet able to qualify as an associate. After student membership, he/she may apply for associate membership under a) or b) of paragraph ii), above. A student member must be proposed by one voting member.

iv) Affiliate members will include those persons employed in the flavor manufacturing industry who are not eligible for other membership categories. Technical and marketing consultants and commercial and technical managers will be eligible if a direct relationship to the flavoring industry as such can be shown to the satisfaction of the membership committee. An affiliate member must be sponsored by three voting members.

Voting members are fellows, associates and those affiliates who are serving or who have served on council. Applicants who are not able to find the requisite number of sponsors should give fullest details of experience in order that the membership committee can allocate the correct grade of membership.

Membership Details for the Society of Flavor Chemists

Candidates must meet certain criteria in order to be accepted as certified members of the Society of Flavor Chemists (SFC), as outlined in the organization's bylaws (details available at *www.flavorchemist.org*).

A candidate must:

a. Be an artistic, scientific worker who devotes his or her time almost exclusively to the independent creation of a wide variety of finished flavors, building these compositions from basic natural/synthetic flavor raw materials, such as those found on recognized industrial lists.
b. Have completed a minimum of seven years of training under the direct supervision of one or more individuals who must themselves have been certified members during the entire training period.
c. Exhibit a working knowledge of the flavor industry — namely, raw materials, laboratory procedures, production processes, legal/regulatory considerations, and the economics involved in the creation, production and utilization of flavors.
d. Be sponsored by one or more certified members who either were responsible for supervising the training or could substantiate the training requirements.

In very exceptional cases in which an applicant has not trained under or completed his or her training under certified members, membership may be considered for a candidate who has worked for a minimum of 10 years, devoting his or her time primarily to the creation of finished flavors. The candidate must meet the same qualifications (c, above) and be able to exhibit to the membership review board knowledge of a wide range of flavor types.

Election of certified members shall take place upon recommendation of the membership committee and a two-thirds vote by the voting members present.

sciences (chemistry, biology, botany and food science are useful), and honesty.

People ask me, "What is the difference between a flavor chemist and a perfumer?" I usually answer them in this way: They both work in similar ways and use similar raw materials; however, the similarity ends there. A perfumer has more leeway in his or her creations. The job of a flavor chemist is more demanding because not only must a flavor smell good, it must taste good as well. A perfumer can make a fantasy strawberry, while the flavor chemist has to duplicate nature.

Hot tip: Be wary of Internet research

There is a great deal of information on flavor chemistry available on the Internet, with a recent Google search netting some 2,790,000 results. Online information varies from the credible to the ridiculous, so use good judgment. A flavorist never should look for information on the Internet until after he or she has conducted their own evaluation. Only after you have done your own work should you compare notes. In many cases, the flavorist's own notes are better or more useful than what they find published. Doing one's own work is the only way to learn this craft. The best rule of thumb is, when conducting research yourself, make sure to take good notes and exchange information with your colleagues.

Let us examine each step one must take to become a flavor chemist.

If you cannot recognize an apple from an orange by odor, forget it! A keen sense of smell is absolutely essential in order to work as a flavorist. If you cannot smell products, you will not be able to tell the difference between an apple and an orange when tasting them.

We actually only taste sweet, bitter, sour, salt and, most recently, umami flavors. In truth, it is the aroma of a food that provides its distinctive character. For example, when a person has a bad cold or sinus problem, they cannot smell; therefore, they cannot identify specific foods.

Once a flavorist is tested for organoleptic skills and passes, they will begin a training program. Some trainees will be sent to the analytical department to learn how to use the gas chromatograph/mass spectrometer (GC/MS), where they will become an expert in detecting molecules as they elute for the GC and enter the MS. The trainee will use only the information received from the instruments. If you start as an apprentice in a flavor lab, working for a certified flavorist, your day should look like this:

You will do compounding of flavors given by your mentor. You may compound the same flavor up to two dozen times until the certified flavorist is satisfied that the results have been achieved. You will act as their hands while working at the bench.

Compounding is one of the most important aspects of the lab — understanding what works well together and what does not. Learn about your diluents; they are your life's blood when creating flavors. Knowing which solvent can be used for a certain application can save time and aggravation. Most of all, ask a lot of questions. Answers are free; mistakes are not.

In many instances, you, a flavor trainee, will evaluate a flavor in sweetened water, hard candy, cakes, ice cream, etc. You will make the test products for flavor evaluation. You also will do spray drying on a lab scale, work on reaction products (if your company has an interest in this area), work in production by helping to scale up a flavor, if necessary, taste and smell up to six chemicals a day, and make samples to send to clients.

Indexing Materials

Becoming familiar with materials is the key learning process. While doing all of the above, you must evaluate as many new chemicals each day as possible. An index card should be set up for each flavor ingredient with which you come into contact. This card should contain the following information:*

Name of ingredient/synonym
FEMA GRAS number
CAS number
FDA number
Found in nature: y/n
Natural
Kosher
Flash point
Physical state
Odor
Taste
Used in
Supplier

Note: You should make a comment for each category as you evaluate an ingredient.

Under "Odor," you should list how long an ingredient remains on a smelling blotter. Does it last for 1 h, 2 h, 3 h or 4 h? Does it last on the blotter overnight? This is very important to know, especially when duplicating flavors. Which ingredient lingers the longest on the blotter? This point is important because these long-lasting materials also are the most heat stable — a key factor in the creation of flavors for cakes, hard candy, etc.

Your index card system should include another group of cards that list where the chemical could be used. For example: apple–strawberry–caramel. With this setup, you can bring up each specific flavor you are working on and obtain ready leads.

At my company, five flavor ingredients are examined every day. The flavor chemists and trainees also play a game called "Who am I?" in which five flavor ingredients, not named, are given to each person to identify. These evaluators cannot compare notes until everyone gets together to review the week's evaluations.

*A version of this system is featured in Gerard Mosciano's regular *P&F* magazine column, "Organoleptic Characteristics of Flavor Materials."

At least one or two hours a week should be spent with peers and mentors in going over comments for each ingredient. It's important to remember that this is a very subjective process; not everyone will agree on what an ingredient smells like, tastes like or where it could be used. However, by comparing notes and comments, evaluators will find that they agree most of the time with their colleagues. My advice to flavorists is to insist that your perceptions are right, even when they are wrong. This is important. A good flavorist must be an individual and do what feels right until proven wrong.

The Architecture of Flavorist Training

My company recently started a training program with a University of Indiana graduate who has a degree in nutrition. Here's how she has spent the past year and a half:

Week one

- Become familiar with the lab — where things are located.
- Learn about what a flavor company is.
- Begin to learn how to compound flavors.
- Find out which diluents are water-soluble (W.S.) and oil-soluble (O.S.). Learn the differences among natural (N), artificial (A), and natural and artificial (N&A) designations. Start preparing and shipping samples.

Month one

- Learn more about compounding (continue to prepare and ship samples).
- Begin spray drying flavors.
- Learn how to make dilutions — a standard drink to test flavors, emulsions and extracts.
- Start to serve on the sensory panel for testing and evaluating raw materials.

Month six

- Start working on small projects.
  1. Simple combination flavors
  2. Applications (coffee, lip balm, chocolate, toothpaste, etc.)
- Continue on the panel in testing and evaluating raw materials.
  1. Start researching and reading about chemicals and essential oils.
  2. Start to learn about formulating a flavor using certain chemicals (or "notes") for certain characteristics.
- Continue preparing and shipping samples.
- Start on the QC panel to check raw materials and finished products from production.

Year one

- Continue preparing samples.
- Continue to participate on the testing panel for raw materials.

- Continue QC panel testing for production.
- Continue working on small projects.
- Start simple flavor formulations and flavor matching.
- Attend first trade show.

Currently (one year, six months)

- Continue doing all of the above.
- Start to research material for the Society of Flavor Chemists (SFC) syllabus.
- Start bigger projects independently.
- Continue learning about flavors from the senior and junior flavorists.

Other duties include washing labware, disposing of garbage daily, grocery shopping, mopping the floor and other daily sundry tasks. In addition, a trainee is expected to do some work on their own, as well as the work assigned during the day. These tasks include:

Read: Read all the classics written by such authorities as Guenther, Arctander, Bedoukian, Lawrence, Heath, Merory, etc., and more recent authors, such as Derovira Sr. and Wright. The early industry dealt mainly with spices and perfumes. One should be aware of the origins of many of the spice oils and essential oils we use today. Ernest Guenther's *Essential Oils, Volume 1* brings the adventure of distillation, expression and maceration of essential oils to life. It is very fascinating reading on basic raw materials. Steffen Arctander's *Perfume and Flavor Materials of Natural Origin* describes most of the essential oils used today. Paul Bedoukian's *50 Years of Perfumery & Flavoring Materials* goes into where to use aromatics.

Smelling and tasting: This is a whole new vocabulary for most people. A good flavorist must smell and taste at least five new ingredients each day. One should take notes and, at the end of each week, have someone test you to see if you remember what certain chemicals smell and taste like. Without this new vocabulary, you never will become a flavorist.

Production: Become involved in the production of flavors. Seek to work in the factory, filling in for someone who is on vacation. This provides the best training for learning how to compound in the lab. You will appreciate the difficulty of producing some of the concoctions you have created in the lab in a 250 cc beaker.

This process will teach you how to give proper mixing instructions in your formulas. For example: "Add powders first and then solvent, and heat gently, if necessary, until dissolved. Cool and add other ingredients. Add (a very volatile ingredient) last."

Do the same with spray drying or dry blending. Until you have been physically exposed to the process, you have no real feeling for what is involved.

Analytical department: This is the best way to examine new raw materials and to actually see the differences in quality from batch to batch and supplier to supplier. Not all things are created equally.

Know your company's products: Spend extra time evaluating finished flavors so that you know what in-house flavors are good in various applications. It doesn't make sense to constantly reinvent the wheel when you already may have excellent wheels. You have to take the time to discover them.

Ethnic taste and cooking: A flavorist should read cookbooks and be able to navigate around the kitchen. Experiment with different ethnic dishes at home, or at least go out once a week to a different ethnic restaurant in order to experience the entire world's flavors, not just those found at the local fast-food hamburger or pizza joint. The Food Network on cable television is another excellent source of information regarding flavors throughout the world.

Personal hygiene: We all keep ourselves clean and dress properly. However, when working in a closed atmosphere in which odor and taste are our living,

we should observe and extend the following courtesies to our fellow workers.

Avoid the use of perfume, strong after-shave lotions and hair spray. This is very distracting to others and saturates the wearer to the degree that their organoleptic senses are impaired.

Avoid smoking at work and all together, if possible. Smoking contaminates the air and dulls your organoleptic senses. Have you smelled the breath of a smoker lately?

Respect your work area and that of those around you. Keep your space clean, and return all bottles of ingredients to their proper shelf space when you finish a project. Keep bottles free of residue from drips to avoid extra odors.

In your spare time (if you have any), you also are expected to know the shelf life of each raw material, as well as the proper containers for the storage and shipment of raw materials and compounded flavors. One also should keep abreast of all the latest products and processes available, attend as many trade shows and seminars as management will allow, stay informed about raw material shortages and prices, etc., and read as many trade journals and magazines as possible.

Regulations

The flavor and food industries have been inundated by regulations on what can and cannot be done. Every country or region has a different list of regulations regarding which ingredients are allowed in foods and which ones are not. You must be aware of kosher, halal and organic standards throughout the world. You also must be familiar with the workings of:

- The Alcohol and Tobacco Tax and Trade Bureau (TTB), formerly the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF)
- The United States Department of Agriculture (USDA)
- The Occupational Safety & Health Administration (OSHA)
- The Code of Federal Regulations, Volume 21 (21 CFR)
- Good Manufacturing Practices (GMP)
- The Food Chemicals Codex (FCC)
- The United States Pharmacopoeia (USP)
- Right to Know Laws (RTK)
- Proposition 65
- The Flavor and Extract Manufacturers Association (FEMA) Environmental Protection Act (EPA)
- The U.S. Department of Transportation (DOT)
- Genetically Modified Organisms (GMO)
- The Food Additives Organization (FAO)
- The World Trade Organization (WTO)
- The Toxic Substances Control Act (TSCA)
- The Codex Alimentarius
- The European Union (EU)
- The World Health Organization (WHO)

As you can see, the process of becoming a flavor chemist is long and tedious. And any experienced flavorist knows that the learning process never ends. New things are being discovered constantly, and situations are always in a state of flux.

This is only the beginning. Although one can become a certified flavor chemist (according to the SFC) after seven years of active work in flavor chemistry, it takes an additional 10–15 years of working at the bench before one may be qualified as a senior flavor chemist. During this phase of your career, you must demonstrate the ability to work with others and to train new flavorists. When you become a team leader, you are a true flavor chemist.

But never become complacent. The day will come when you will say to yourself, "I know everything about making flavors." The next day, you will receive a project and know nothing about it. The learning process never ends!

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