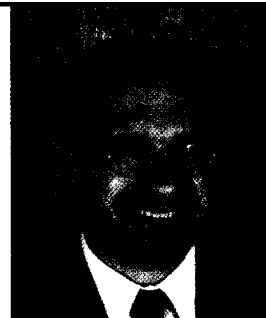


## Chemical Reaction



# Higher Learning

Cosmetic science students hit the books in the new millennium. **BY STEVE HERMAN**

**Education is not filling a bucket but lighting a fire.**

—William Butler Yeats

COSMETIC SCIENCE is typically a “learning-by-doing” profession. For the last 20 years, the New York area has offered an alternative: cosmetic science as an academic discipline via the Fairleigh Dickinson University Masters in Cosmetic Science Program. The Good Shepherd for most of those years was Dr. Sal Gimelli, to whom many of us individually, and the industry as a whole, owe a tremendous debt of gratitude. Dr. James Dougherty recently assumed command of the program. Coming from the industry, with an extensive background in polymer chemistry, he brings a new set of assets to FDU. That the program has endured to serve a new generation of budding scientists is a tribute to the vision and dedication of Dr. Gimelli.

The university also deserves credit for tapping such a worthy successor.

In its 20 years of operation, the program has seen several revisions of the core curriculum. Dr. Dougherty has reviewed the required and elective courses, and with constructive input from the industry and SCC representatives, has arrived at the new structure shown below. The inclusion of Applied Colloid and Surface Science signals the intent to strengthen students’ theoretical preparation. The biological, dermatological, and toxicological aspects of cosmetic science likewise have increased emphasis. The new core requirements reflect the growing need in our industry for researchers with broad technical competence, from the Gibb’s Equation to Langerhans cells.

The Perfumery schedule (see p. 16) provides a detailed view of one of the elective course’s scope. Becoming a perfumer requires a five-year apprenticeship, surely not a likely goal for a one-semester course. The focus was rather on a broad view of how the perfume industry functions, the science and applications of perfume materials, and the specialized jobs that are

essential cogs in a successful modern perfume company.

The interaction of fragrance materials with surfactant and emulsion bases is of great importance to all cosmetic marketers, and serves as a useful example of what an FDU student can learn in depth. The chemist is familiar with the components of a lotion (water phase, oil phase, emulsifiers, humectants, etc.) and shampoos (primary surfactant, secondary surfactant, salt, etc.), but rarely is acquainted with the chemistry of fragrance materials. Fragrances have a tremendous number of possible ingredients (around 3,000!) with a stunning diversity of chemical functionalities: alcohols, aldehydes and ketones, nitriles, macrocyclics, heterocyclics, and so on. These materials have varying polarities and possible surface activity, exhibit diverse reactions in hostile environments, and can interfere with active ingredients.

When a fragrance is placed in a base, it is no longer simply a “perfume oil.” It becomes a multitude of unique chemicals, partitioning in phases and interacting with components of the base. Most cosmetic emulsions are oil-in-water. For these emulsions, the fragrance can migrate to the internal >>>>

### NEW COSMETIC SCIENCE CURRICULUM

*A total of 32 required and elective courses are needed to complete coursework*

#### Credits Required Courses (20 credits required)

- |   |  |
|---|--|
| 3 | Skin-Care Raw Materials & Formulations |
| 3 | Hair-Care Raw Materials & Formulations |
| 2 | Cosmetic Science Laboratory            |
| 3 | Applied Colloid & Surface Science      |
| 3 | Product Development                    |
| 3 | Microtoxicity and Biochemistry         |
| 3 | Dermal Pharmacology & Immunology       |

#### Cosmetic Science Electives (6 credits required)

- |   |  |
|---|--|
| 3 | Perfumery, Quality Assurance, Color Cosmetics, Claims Substantiation, Sensory Evaluation, Biochemistry or Applied Organic Chemistry for Cosmetic Science |
|---|--|

#### Free Electives (6 credits required)

## PERFUME COURSE SCHEDULE

Week 1	Olfaction—Chemoreception—History
Week 2	Fragrance Chemicals
Week 3	Natural Products
Week 4	Fragrance Creation
Week 5	Fragrance Duplication
Week 6	Field Trip to Fragrance Supplier
Week 7	Fragrance Applications—Personal Care
Week 8	Fragrance Applications—Household Products
Week 9	Aromascience, Aromatherapy, Pheromones
Week 10	Safety, Regulation
Week 11	E-Nose, Discussion Suskind Perfume
Week 12	Fragrance Evaluation
Week 13	Marketing
Week 14	Oral Reports
Week 15	Final

**An awareness of fragrances as complex chemical mixtures is one important key to using fragrances.**


oil phase, to the micelle surface (possibly competing with the emulsifiers), into the external phase, or nestle in liquid crystal structures. Some of the fragrance chemicals even migrate into the air over the emulsion—where the consumer can smell it. Partitioning causes fragrances to change odor character when placed in lotion, can cause discoloration, or, in the worst case, break the emulsion.

In a surfactant system such as a shampoo or bath gel, the fragrance can migrate into the lipophilic micelle cores, along the hydrocarbon chains of the surfactant, at the hydrophilic surfactant head, or in the external phase. The incorporation of the fragrance, particularly at high percentages, will change the micellar shape and size, consequently altering the viscosity. Fragrances often are blamed for lowering viscosity, but some fragrances have the opposite effect. Manufacturers frequently have a standard bath gel formula to which a variety of fragrances are added at high levels, creating havoc with the physical properties from one fragrance to another. Stig E. Friberg and his coworkers provided conclusive proof of the partitioning of fragrance materials in surfactant structures.

An awareness of fragrances as complex chemical mixtures is one important key to using fragrances. Creating a successful product requires the combined skills of the perfumer; fragrance applications chemist; analytical chemist; and evaluation, marketing, and sales departments. Production, quality control, regulatory compliance, and a top-notch purchasing agent are other essential components.

The FDU students also enjoyed "Storytime," a weekly examination of a great feminine fragrance. Some of the historic fragrances considered include Jicky, L'Heure Bleue, Shalimar, and Chanel N° 5. The story of these fragrances also introduces the students to some of the giants of our industry, such as François Coty, Ernest Beaux, and Leopold Ruzicka. The students did their own presentations (as an assigned project) on more contemporary classics such as Noa, Aqua di Già, and Happy. These presentations restored some of the magic and romance to the study of fragrance, counterbalancing some of the effects of the long weeks studying aroma chemistry and product stability.

Since perfumery is an elective, not all the cosmetic science students were there. Some took the Product Development Course taught by Dr. Robert Glassman. He exemplifies another trend of the FDU program, the unearthing of new instructors to enrich the adjunct faculty.

John Carson and Sherilee Host recently joined the faculty to teach core courses, and Dr. Patricia Aikins will join next year to instruct the Applied Colloid and Surface Science course. The students have long clamored for a course in color cosmetics, and their pleas finally will be answered in spring 2002, in a class taught by another new addition to the adjunct team, Jane Hollenberg. Dr. Dougherty is committed to expanding the adjunct base to ensure the success of the new curriculum, and to guarantee the availability of a vital cosmetic education to a new generation of students. 

### References:

Previous columns (then entitled *Kosmetikos*) on aspects of the FDU program in *GCI*: "Ecole de Cosmétique," February 1999. "Back to School Night," December 1999.

For information on some other programs, see:

Lichtin, J. Leon, "Cosmetic Science at the University of Cincinnati," *C&T*, Vol. 102, Nov. 1987.

Kislalioglu, M. Serpil, "University of Rhode Island Graduate Program-Cosmetic Science and Technology," *C&T*, Vol. 107, June 1992.

A few of Friberg's papers on phase distribution:

Friberg, Stig, et al., "Stability Factors and Vapor Pressure in a Model Fragrance Emulsion System," *JSCC*, Vol. 50, No. 4, July/Aug. 1999.

Friberg, Stig, et al., "Vapor Pressure of Some Fragrance Ingredients in Emulsion and Microemulsion Formulations," *Int. J. Cosmetic Sci.*, 19, 75-86, 1997.

Steve Herman is director of R&D of AFF International. He has more than 30 years of experience in the industry, primarily in fragrance application. He serves as an adjunct professor in the FDU Masters in Cosmetic Science program, and has been active in numerous capacities with the SCC. He may be reached at (973) 244-5880, or by e-mail: [GCISteve@aol.com](mailto:GCISteve@aol.com).