

OKLAHOMA REVAMPS GRADUATE PROGRAM

Chemistry department takes **MODULAR APPROACH** to coursework and puts research up front

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THE 28 STUDENTS who entered the University of Oklahoma's chemistry graduate program this fall are "newbies" in more ways than one: Not only are they beginners at the school, but they're also the first to experience a completely revamped curriculum. That curriculum—more than a decade in the making—was inspired by the chemistry department's participation in the Carnegie Initiative on the Doctorate and by the American Chemical Society's 2012 report "Advancing Graduate Education in the Chemical Sciences," two efforts to modernize Ph.D. education and training.

Over the years, "we had experimented piecemeal with changing our curriculum, but it was basically putting Band-Aids on what we already had," says Michael T. Ashby, the professor who spearheaded the

revamp. "Last year, we decided basically to burn everything to the ground and start from scratch."

As part of the overhaul, the department switched to a so-called modular approach composed of shorter, more focused classes and eliminated chemistry divisions—such as organic or physical—at the graduate level. (It still has divisions at the undergraduate level to help organize the curriculum and manage teaching loads.)

"The chemical sciences have become very interdisciplinary," says Ashby, who studies the mechanisms and kinetics of inorganic antimicrobials and antioxidants. "Although I'm in the inorganic division, half my group are microbiologists and half are chemists. My actual research doesn't have much inorganic chemistry at all.

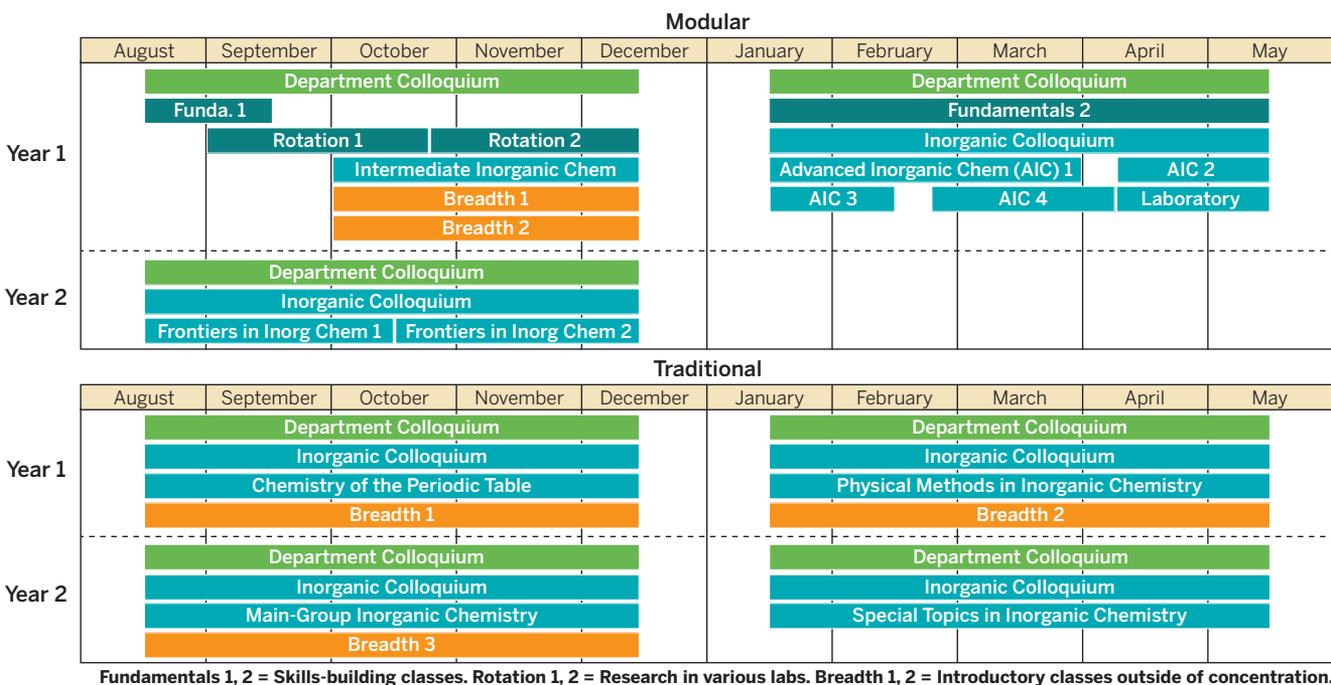
That's part of the issue with having formal divisions at the graduate level. It doesn't make a lot of sense anymore."

Because the chemistry department has such a biological bent, some students entering the grad program have gaps in their chemistry backgrounds. The new curriculum has the flexibility to bridge those gaps up front. For example, during the first five weeks of this semester, seven students took an accelerated program in physical chemistry to bring them up to speed to join their fellow students when regular introductory graduate classes began in the sixth week.

The flexibility comes from the modular approach that the department has adopted. Instead of teaching three-credit, semester-long classes organized by division—the older, more traditional approach—the department has broken the coursework into one-credit, 12.5-hour modules. Students take 16 credits of coursework, down from the 21 credits required by the old curriculum. They will finish those classes in three semesters, rather than the traditional four.

In their first semester, students take modular classes that fulfill their "breadth" requirement. For example, students planning to focus on inorganic chemistry might fulfill their breadth requirements with modules in organic or physical chemis-

CURRICULUM AT A GLANCE The University of Oklahoma's new modular curriculum gets students out of class and into the lab faster. Shown here is a comparison of schedules for a hypothetical inorganic student.



try. After that, they focus exclusively on their own program of study, following an individual development plan crafted with the help of their advisory committee. The chemistry department uses these plans to know which courses it needs to offer in any given semester.

One point of the modules is to minimize repetition of material among different classes. Ashby has been teaching kinetics in a modular format for more than five years. Students take the first module on kinetic theory and then choose two more from chemical kinetics, biological kinetics, and a laboratory. As a result, kinetics is now taught in one place instead of being distributed among the different subdisciplines that use it.

THE MODULES also make more efficient scheduling possible. No graduate classes meet on Fridays, so students have a three-day block in which to do research.

Even more important, students get into the lab faster in Oklahoma's new curriculum. "Research is now front and center in the first semester with laboratory rotations," Ashby says. "Rotations are not typical in a chemistry department. That's more of a biology thing."

During their first semester, students do two seven-week rotations. Most students join a lab in December of their first year. Convincing chemistry professors, most of whom didn't go through rotations themselves, of the value of rotations was a challenge, Ashby says. But "because the students now have this intimate experience of research in their first semester, they're in a more informed position in selecting a research director."

"The big news is that here's an institution that has really taken on in a big way the reconception of graduate education," says Larry Faulkner, president emeritus of the University of Texas, Austin, and head of the commission that produced the 2012 ACS report. "Much of what Oklahoma has done is worthy of note by other people."

Bassam Shakhshiri, who commissioned the report when he was ACS president, finds it "gratifying that the ACS report helped to a certain extent in making all this happen."

The ultimate hope is that the new program will help students graduate faster. "The key is to ramp up the students' ability to do original research," Ashby says. "That means getting out of the classroom. This curriculum allows us to do that." ■

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