

The Avery Ashdown Exam and the Chemistry Olympiad

by Mindy Levine

When Danny Chiao, a current high school senior at Acton-Boxborough Regional High School, was confused about the theory and practice of NMR this past summer, he knew exactly where to turn. “I went to Dr. Kotz’s room, and he gave me an impromptu four-hour lecture,” Danny said. “It was like a one-on-one tutorial from a great chemist.”

Danny, together with 19 other high school students, participated in a two-week intensive chemistry study camp at the United States Air Force Academy (USAFA) that afforded him instant access to chemistry mentors like Dr. Kotz.

Chemistry study camp

For two weeks this summer, the 20 participants in study camp woke up at 7 AM to study chemistry. Each morning, the students listened to four hours of lectures on various chemistry topics. Some of the mentors, like Dr. Ron Furstenau, used interactive demonstrations to enrich their lectures. For example, as part of his lecture on collision theory, Dr. Furstenau asked two students to pretend to be colliding particles. During another lecture, he burned rocket fuel to demonstrate aspects of chemical kinetics.

Afternoons at chemistry study camp were devoted to laboratory experiments. The students were expected to complete three experiments during the five-hour session. By evening, Danny said, “We were all pretty exhausted.” Despite the intensity of the camp, the students seemed to enjoy themselves. “Everyone who is eligible to come back next year will return,” Danny predicted. Even though the students competed against each other, Danny said, “it was still a collaborative atmosphere. I definitely plan to stay in touch with everyone.”

Qualifying for the study camp

In order to be eligible for the study camp, the students had to successfully complete multiple qualifying exams. First, the students took a chemistry exam given by their local ACS section. In the Northeastern Section, this exam is called the “Avery Ashdown exam.” Students who perform well on this test then take the National Chemistry Olympiad test. Then, the top 20 scorers on the National Chemistry Olympiad are invited to the USAFA for the two week study camp.

Avery Ashdown exam

This exam is named in memory of Professor Avery Ashdown, who was a professor of chemistry at MIT for many years. The Ashdown exam was first administered in 1971,

and it has been used as a qualifier for the National Chemistry Olympiad since 1984. This exam consists of 100 questions, which test both first- and second-year high school chemistry.

The top scorer on the Ashdown exam receives a \$500 prize from Simmons College, termed the “Simmons Prize.” The next four scorers also receive cash prizes for their achievements, and the five next scorers are awarded honorable mentions. These awards are presented to the students at the May NESACS meeting. This past year, Ryan McKinnon of Phillips Academy received the Simmons Prize. Reflecting on his experience, Ryan said, “These exams helped me recognize my own potential.”

United States National Chemistry Olympiad (USNCO)

Top performers in the Ashdown exam (and in other local sections’ qualifying exams) then proceed to the USNCO. This exam consists of three parts:

1. A sixty question multiple-choice section
2. An eight question free-response section
3. A practical laboratory exam

Steve Lantos, a chemistry teacher at Brookline High School, and chairperson of the NESACS High School Education Committee, has been involved in the Ashdown contest and the USNCO since 1989. He currently chairs the committee that writes the laboratory exam questions. This section of the exam, which was added in 1994, consists of two open-ended chemistry questions. Some examples of questions from previous years include, “Extrapolate and prove absolute zero,” and “Determine how many atoms thick the zinc coating is on a galvanized washer.”

The exam-writing committee receives a substantial amount of feedback (both positive and negative) about the laboratory section. The lab questions are substantially different from “cookbook” experiments – experiments that merely force students to follow a “recipe” - that many students are familiar with from their lab class in high school. “Kids really appreciate the challenge, the fact that they are not being told how to do something,” Mr. Lantos said. “This, to me, is real science.”

International Chemistry Olympiad (IChO)

At the end of the two-week study camp, four students are selected to participate in the IChO. The IChO began in 1968 in Czechoslovakia, as a way for Czechoslovakia to foster contacts and collaborations with other countries. While only three countries participated initially, the IChO has since expanded significantly. The United States first participated in 1984 and celebrated its 25th anniversary of participation this year, with a gala reception at the 238th ACS meeting in Washington, DC.

Professor Seth Brown, Associate Professor of Chemistry at the University of Notre Dame, was a member of the first United States team to participate in the IChO. Professor Brown explained that his career choice was a natural outgrowth of this participation. “My experience taught me that I was pretty good at chemistry,” said Professor Brown. “It taught me that there are lots of interesting people from all over the world who are interested in this subject, that there is something very rich and rewarding to participate in.” Twenty five years after his participation in the IChO, Professor Brown continues to study chemistry as a faculty member at the University of Notre Dame, where he researches organic and inorganic reaction mechanisms.

Goals/future directions

“My goal every year is to increase participation in both the Ashdown exam and the USNCO,” Mr. Lantos said. This goal can be accomplished in numerous ways, for example, by reaching out to local high school chemistry teachers and through advertising in publications such as The Nucleus. In a typical year, approximately 120 students from our section participate in the Ashdown exam, and Mr. Lantos would like to see this number increase. The increased participation of students from under represented high schools and regions would be particularly welcome.

“The goal of the Chemistry Olympiad is to recognize the achievements of outstanding high school chemistry students,” said Dr. Brown. “We are trying to promote international awareness of chemistry and to encourage students to achieve in chemistry.”

Danny said that for him, participating in the Ashdown exam and the USNCO was a rewarding experience. “I decided to study for Ashdown because I did poorly on a chemistry test and figured this would be a good way to get motivated,” Danny said. “Now I plan on majoring in chemical engineering and pursuing a career in that field.”