

Green Chemistry in the Heart of Massachusetts

by Stefan G. Koenig, Ph.D.

Despite being the second largest city in New England, Worcester, MA, is not often recognized for its scientific contributions. Still, the city known as the “Heart of the Commonwealth” has an impressive collection of institutions of higher education at the center of scientific progress. One of these, Worcester State College (www.worcester.edu/), has received increased recognition over the past several years for its Chemistry Department’s initiative to focus on “green” chemistry.

Green chemistry is concerned with improving chemical processes by eliminating or reducing the use of hazardous substances from the outset, preventing difficult or expensive treatment of waste after the fact. The field, also referred to as “molecular-level pollution prevention,” was established in the 1990’s by pioneers Paul Anastas of the Center for Green Chemistry & Green Engineering at Yale University (www.greenchemistry.yale.edu/) and John Warner of the Warner Babcock Institute (www.warnerbabcock.com/), just around the corner in Wilmington, MA. The principles introduced in their seminal book, “Green Chemistry: Theory and Practice,” are increasingly being applied to exploratory research, as well as to mature processes and products.

Under the guidance of Associate Professor Margaret Kerr, Worcester State has placed an emphasis on green chemistry education for the better part of this decade and is regarded as one of the leading institutions in the region. Though the program began with a simple reconfiguration of traditional organic lab procedures, it has blossomed into an opportunity to explore “green options,” according to Professor Kerr. The program is “not business as usual” and instead allows students to contrast new methods with older techniques. Currently, 200 students pass through the green organic chemistry laboratory course during the academic year, joined by more than 150 others over the summer.

The revised laboratory procedures at Worcester State incorporate green chemistry principles in order to bring negative issues to the forefront; the alternative methods produce less hazardous waste so they are more environmentally friendly and safer for the students. In addition, they give students an opportunity to work on modern applications, preparing them better to work in industry where the trend is to move towards safer, more sustainable practices and products. Because it is such a rapidly growing field, Professor Kerr believes that green chemistry is an area where students can actively be part of the solution, taking on responsibility and helping to make their own future cleaner.

The recognition that future generations of chemists need to be educated in a different way comes from the realization that though chemical products have greatly enhanced lives, they can also present undesirable toxic effects downstream. Improved training in toxicology and sustainability is designed to help graduates better grasp these potentially deleterious effects. Worcester State’s efforts are now part of a network of several institutions of higher learning across the country. In addition to the lab course, the department also offers an upper-level elective lecture course and further developments, including advanced research projects, are underway.

In 2008, the program was awarded a three-year, \$200,000 grant to fund equipment purchases by the Stoddard Charitable Trust. The addition of sophisticated instrumentation, including several spectrophotometers and an analytical

ultracentrifuge will undoubtedly enhance the green chemistry program, particularly when it is expanded to include advanced laboratory research. And by all measures, the students are very keen to take part in a broadened program. Last year they rewarded Professor Kerr's efforts with the George I. Alden Excellence in Teaching Award, granted annually by student vote.

The focus on green chemistry at Worcester State College is part of a larger development ultimately leading to a sustainable existence and a green economy. The principles outlined by Anastas and Warner are steadily making their way into the consciousness of current chemistry practitioners. Yet the true sea change will occur when rising generations of chemists learn these precepts during their initiation into the field of chemistry. When the qualifier "green" no longer needs mention, the objectives of green chemistry will have been accomplished. Worcester State is playing its part in making the next generation of chemists more aware before they embark on their careers of improving lives while also preserving the planet.