SCIENCE

Breaking the binary

Queen's interdisciplinary project strikes a collaboration between engineering and fine art

BY BOON H. CHANG AND SONJA GRGAR

From the well known Queen's rivalry between artsies and science students, to the current depictions of the sciences and the arts in media and other forms of public discourse, we are constantly bombarded with the idea that the two are distant poles of knowledge which never reach a significant overlap in everyday life.

However, one of the projects undertaken by this year's TEAM program at Queen's set out to dissolve this old stereotype through an interdisciplinary collaboration between the engineering and fine art departments.

TEAM stands for Technology, Engineering & Management. It is a core course for fourth year chemical engineering students, but is open to all other engineering departments, commerce, and the sciences.

The program was founded in 1994 by Barrie Jackson from the chemical engineering department, and John Gordon from the school of business with what Jackson describes as a basically "pedagogical" purpose.

It is designed to connect students with people in the industry through various special projects. For example, some of this year's students are working with NOVA petrochemicals in Sarnia to develop a control system for a distillation unit in the company's plant.

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— Jamie Allen, TEAM student

Two research intensive projects are done in cooperation with DuPont, and a couple of other collaborations have been established in the brewery industry at the London-based Labatt's.

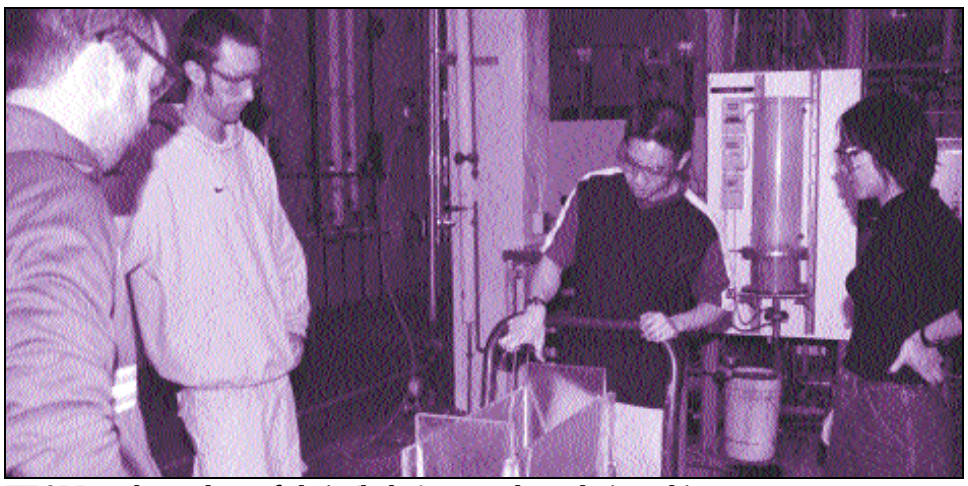
"We believe that although fundamentals are essential, they are by no means sufficient. Today's employers are looking for people who can function well in multidisciplinary teams, are people who can take ownership for their learning, and people who can communicate effectively," said Jackson.

Jackson mentioned that TEAM projects consistently generate excellent rapport with industrial clients. In 1998, the program was awarded the Council of Professional Engineers Medal of Distinction in Engineering Education, which is the highest national award in Canada.

One of the groups in this year's TEAM class is working on a project that employs chemical electrolysis in the etching of metal plates used in the Intaglio printing process in fine art.

"Queen's fine arts wants to build a metal etching unit for their purposes," said Bobby Lohaburananont, a TEAM chemistry engineering student.

"In Intaglio printing, you create a metal plate which has your piece of art on it,"



TEAM students show of their 'baby' — an electrolytic etching apparatus.

PHOTO BY BOB HUISH

described Andrew Dreyer, another TEAM member, "and you can print it onto multiple sheets of paper multiple times, so you can try different ink patterns using the same design."

Unlike engraving, which involves the direct scratching of the metal, etching traditionally uses a chemical process to remove the metal.

"The entire purpose of the etching process is to take the surface of a flat piece of metal, and indent it preferentially where they've uncovered the 'ground' or protective covering," explained Jamie Allen, another TEAM project member.

"The ground is essentially a waxy substance that protects the plate from whatever chemical action you're trying to do to it. That covering, wherever it's removed, those lines become indented in the plate so that you can apply ink, wipe off the majority of the ink, but leave some ink in the grooves," said Allen.

When you press that against a piece of paper, not only do you get the ink, but you also get an embossing effect," he added.

Traditionally, metal not covered by the ground is dissolved away by dipping the plate into acid bath, consisting mostly of nitric acid. Acid byproducts can include nitric oxides, which are harmful to many bodily systems, including the nervous system.

This year, TEAM is developing a process that allows the removal of the metal while avoiding the use of nitric acid.

The caustic acid and dangerous byproducts will be replaced with electric power which will supply the energy for an electrolytic reaction. Also, aluminum will be used instead of the traditional, but more expensive zinc and copper.

"It's a pretty simple process. We've got it set up with direct current, like a battery. You basically have your power source, and you have wires running off your negative and your positive to two plates that are in your solution, an anode and a cathode," said Dreyer.

"The anode is the plate that the artist would use for the printing, so it will have the exposed areas," he added.

"You get oxidation or a loss of electrons at the anode, so basically what you're doing is taking atoms off that plate, and putting them into solution by making them into ions. You're giving those electrons to ions at the other end, and putting metal ions onto your cathode," continued Dreyer.

"Essentially, you're just removing material from one side by providing an electric potential for it, and then putting that material back on the other side by providing the opposite electrical potential," clarified Dreyer.

The group has completed the basic design of the unit, and is now waiting to get the right solution components. Although they are optimistic, and believe that the unit they are building will work, TEAM members are realistic about how far the project can go.

"The intent of the TEAM program is to not actually implement the equipment. We're going to propose a design to the art department, then they'll have to take that to whoever funds their endeavors," said Allen.

Many fine arts students are apparently really excited about the project. Professor Otis Tamasauskas who is representing the fine art department in this project stated that in addition to health benefits, "the efficiency of the electrolytic etching process should allow students to achieve results quicker, enabling them to sustain a creative drive through a rigorous art process."

Some of the difficulties that TEAM encountered stemmed from the fact that the electrolytic etching process is so unique.

Tamasauskas commented that the project aims to accomplish "something no other university or art school has ever done," and Dreyer admitted that "it's not something that everyone's doing, so it took a while to get some contacts."

With this project, TEAM comes one step closer to bridging the gap between engineering and art. "It's nice and all to work in industry and make a company money, but when you can actually make something with which people can make artwork, it's rewarding," said Allen.

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Tamasauskas elaborated on that sentiment by pointing out that the cooperation between art and science has a historical dimension.

He said that "chemistry, physics, and the fine arts have lived happily together in printmaking" ever since it was discovered that a chemical treatment of lithographic limestone with a drawing made with a greasy crayon could yield multiple images.

That collaborative spirit certainly seems to be thriving in the TEAM project. Tamasauskas emphasized that the Queen's engineering department "has always been very receptive and co-operative, allowing a good collaboration between the two areas of study."

"It's neat to have that joint between creativity and technology. It shows that technology isn't just about numbers," commented Dreyer.

"It gave me more hands-on experience, other than just sitting in front of a computer," added Sonia Ho, another TEAM student.

This kind of cooperation between scientists and artists gives a powerful edge to both disciplines.

"When the engineers solve technical problems with imagination and science, the artist's work becomes better, which allows them to reach farther with their imagination so that the impossible becomes a reality," concluded Tamasauskas.

The electrolytic etching project demonstrates that the idea of unity and interdependence between sciences, technology, and the arts is not a dream of utopian harmony.

It is a practical possibility capable of dissolving bridges between different areas of human knowledge for the greater benefit of us all.

Science Spectrum

Science news from around the world and beyond

HIV home test kit

Researchers at Michigan Tech in Houghton, U.S., may make lives of people infected with the HIV virus a little bit easier with their latest design — a home test kit that will allow people who suffer from the disease to monitor their own condition at home. The kit would save both on time, and medical costs of the patients. It involves a combination of cell receptors, proteins which regulate the entrance of substances into a cell, and certain dyes. When the HIV virus interacts with the cell receptors in order to penetrate the cell, dyes which have been combined with the receptors elicit fluorescence which can be monitored, and which indicates the amount of active HIV particles. If the amount is too high, that would indicate to a patient that they need to visit a doctor to reassess the efficacy of the drugs that most AIDS patients take in order to control the level of HIV particles in their blood. Once the kit is fully developed, patients will draw small samples of blood from their finger. The sensor in the kit will determine the amount of HIV particles in the blood, and will then transmit that information to the tester.

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