

Students' invention comes to aid of heart patients

By Carol Azilian
staff writer

A group of Lawrence Institute of Technology students is on the brink of a discovery designed to save the lives of heart patients.

Eight senior mechanical engineering students from the Southfield-based college collaborated with a team of heart surgeons and bioengineers at Sinai Hospital, Detroit, to develop a new method for manufacturing a partial mechanical heart.

Although the students have only simulated the process so far, they hope to manufacture the device this fall. It will be tested in animals before it is surgically implanted in humans.

"These students are on the frontier of heart surgery and robotics," said Dr. Norman Shumway, chief of Sinai's Division of Cardiovascular Surgery.

"They've developed a way (using a robot) to manufacture the device more precisely, cheaply and effectively than it's been done in the past."

"We'll be talking with the doctors to see whether we can get a joint grant for the process."

Kantrowitz headed up the team that developed the first partial mechanical heart nearly a decade ago. It was one of the first attempts to implant cardiac pacemakers after they were developed. And, he was the first man (in the United States — the second in the world — to

perform a human heart transplant using the technique developed by Dr. Norman Shumway.

THE WORLD-RENOVED surgeon began working with LIT students nearly a year ago after Professor Craig Hoff contacted him.

"Some students had expressed an interest in working on a project in the bio-medical field," Hoff said. "I had some experience in bio-medical engineering while I was working on my master's degree."

After calling several hospitals and coming up empty-handed, Hoff finally "struck gold" at Sinai.

"We discussed a couple of ideas with Dr. Kantrowitz and Paul Freed (a biomedical engineer at Sinai). They were looking for a way to improve the process of manufacturing a partial mechanical heart."

The mechanical device consists of a cigar-shaped balloon inside a Dacron pouch. It is sewn into the aorta, the vessel that carries blood from the heart to the arteries.

"It's a system designed to replace the function of the heart and not the heart itself," Kantrowitz explained.

"We believe that a whole spectrum of mechanical devices will be needed and not just a total mechanical heart. In most instances, that (an artificial heart) probably isn't necessary because no matter how poorly the heart is func-

tioning, the patient is still alive."

The partial mechanical heart was first surgically implanted in heart patients in the early 1970s. One patient, Haskell Shanks, had been bedridden for two years prior to the operation.

"He was literally the first patient in the world sent home with a functioning mechanical heart system," Kantrowitz said. "But he died 98 days later of an infection and kidney failure — exactly the same way Barney Clark died."

"Since then, we've been working (with the Cellular Chemistry Department at University of Michigan's School of Public Health) on a way to solve the infection problem," Kantrowitz said. "It took us (more than) five years, but we've come up with a method for preventing infections."

Previously, a disadvantage of the partial mechanical heart — which required tubes leading through the skin to a machine that pumped air into and out of the device — was that the opening in the skin presented a constant risk of infection.

But, through research grants (the federal government has contributed more than \$15 million over the past 20 years), the surgeons and engineers have been able to work out the problem, Kantrowitz said.

LIT'S ROLE in the project was to engineer a more efficient method of manufacturing the "balloon."

Previously, the cigar-shaped balloon

was handmade by dipping a wax form in an elastic substance.

Too many imperfections resulted from that process, making the balloon less durable than it should be, according to Hoff.

"If there are flaws in the balloon, it will cause a stress buildup and eventually the balloon will break," he said. By using a robot in the manufacturing process, the elastic substance can be sprayed evenly and precisely, Hoff said.

The students, with the help of a computer, programmed the robot to go through the motions of spraying the elastic substance onto the cigar-shaped wax form.

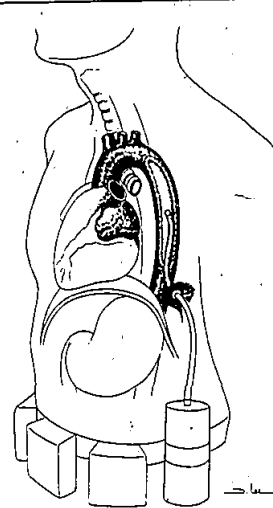
Because the robot arm has a limited number of movements, the students constructed a special motor to rotate the wax form as the robot sprayed.

"It wasn't exactly a breeze," admitted Sally Armstrong, one of the students involved in the project. "We ran into problems and had to figure out a way to solve them."

Besides Armstrong, the other "inventors" were: Keith Polak, Sandra Connolly, Leslie Nuler, Carla Miller, Tony Otero, Wayne Marchio and Luigi Minna.

Polak said the experience was helpful in preparing him for the future job market.

"There's a lot more to engineering than what you learn in books," he said.



The partial mechanical heart is deflated while the left ventricle pushes blood into the aorta. The inflated balloon pushes blood into the arteries, including those that feed the heart.

Students have other nifty inventions

By Carol Azilian
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Glimpses that light up entire buildings by solar energy, robots that send out an anti-nuclear air message and beamed-up go-carts to travel easily on land and water were among the myriad of inventions created this year by seniors at Lawrence Institute of Technology, Southfield.

Every year, mechanical engineering seniors put on the "inventor's caps" and either come up with a brand new idea or modify an old one.

The projects designed to give the students a "feel" for the future job market.

"It gives them the chance to be together a lot of theory we've tried to teach them for their first three years," said J. Brehob, chairman of the mechanical engineering department. "They'll have hands-on experience in applying theories."

Two students — Jon Sallows and Jihad Hahucha — patterned their project after a relatively new invention called a solar illuminator.

The cylindrical object captures sunlight and reflects or scatters it throughout a room or building using a system of mirrors and lenses.

"WE SAW THE IDEA in a magazine and decided to try it out," said Sallows. "There wasn't much research done on this so we had to design most of it ourselves."

Their four-by-four-foot prototype, which cost slightly more than \$100 to build, can light up a 200-square-foot room.

"The initial cost is usually very high, especially if it's being used to light a building," said Sallows. "But, in the long run, it's cheaper than electricity. Sunlight is also more pleasing than incandescent light," he added.

A solar illuminator is currently being used in the new Civil Engineering Building constructed underground at the University of Minnesota, Sallows said.

On cloudy days and at night, a high intensity light can be used to illuminate the building.

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