Messiah College and the Engineering Department Announce a New 'Hands-On' Learning Laboratory a.k.a. the 'Collaboratory'

"The tragedy of life is not death . . . it is to die with convictions undeclared and service unfulfilled."

— Ernest L. Boyer, Sr. ’48

The Engineering Department announces the creation of a Collaboratory for Experiential Learning. The Collaboratory is an interdisciplinary laboratory where students, faculty, and community partners collaborate to develop appropriate technologies and creative applications that address pressing problems of our world.

Vision

The Collaboratory fosters scholarship that serves the needs of today while building character for the needs of tomorrow.

Purposes

- To create a stimulating learning environment that produces creative and imaginative solutions to pressing problems in our community and around the world.
- To encourage a scholarship of integration and application that demonstrates the relevance of academic knowledge for social issues.
- To develop an ethic of service and civic responsibility in the formative years of professional development.
- To showcase the creative projects and solutions developed by partners in the Collaboratory.

The Collaboratory advances the mission of the College and the Engineering program, building on strengths and past achievements of the Department. The Engineering Department administers the Collaboratory, but it provides learning opportunities for a variety of majors. It is a place where students, faculty, and community partners explore together how faith, work, and the needs of our world intersect, a place for learning to commit gifts and talents to God’s Kingdom work. Initially, the Collaboratory will support the College’s successful Genesis solar-racing team, student service-learning projects in West Africa, land mine abatement projects, aviation activities, and a variety of capstone projects developed by senior Engineering students.

We are presently seeking a location and establishing leadership for the Collaboratory. Look for updates on this exciting initiative in the fall newsletter.
Harsco Corporation Provides the Collaboratory with a $200,000 Matching Grant

The Harsco Corporation will provide Messiah with a $200,000 lead grant to fund the Collaboratory for Experiential Learning over the next two years; Messiah will match Harsco's grant by raising an additional $200,000.

"As with the Genesis solar car project, our main objective in this partnership is to broaden the quality of hands-on education for our future generation of leaders. Innovation, initiative, and teamwork are fundamental to long-term success in any calling," says Derek Hathaway, Harsco chairman and CEO. "Our continued relationship with Harsco is greatly strengthened by both organizations' commitment to equipping students to find applicable, real-world solutions to significant social and technological needs."

The faculty, staff, and students of the Engineering Department thank Harsco for partnering with us to launch the Collaboratory.

Initiatives of the Collaboratory

The Collaboratory is an interdisciplinary laboratory where students, faculty, and community partners collaborate to develop appropriate technologies and creative applications that address pressing problems of our world. Our current initiatives are outlined below and on the following two pages.

A Collaboratory Project

Land Mine Abatement Project

by Don Pratt

"In over 70 countries around the world, an estimated 110 million land mines threaten the lives of civilians, killing or maiming 26,000 people each year, and creating socioeconomic problems in developing countries. Currently, the most prevalent method of clearing mines uses metal detectors, which are slow, dangerous, and ineffective against the newer non-metallic mines. Compounding the problem is the addition of 10 new mines for every one removed. Even if the placement of new mines were halted immediately, removal of existing mines using current technology would take more than 10,000 years. Clearly, new methods of mine removal must be developed if this problem is to be dealt with effectively."

So begins a paper by Sarah Macpherson, a junior Engineering student, and me (Associate Professor of Engineering). Also accepted for publication, our paper, presented at the Fourth International Symposium on Technology and the Mine Problem in Monterey, California, in March, surveys the various methods currently in use for finding antipersonnel land mines and suggests some new directions for research.

Sarah has been working on the land mine problem for the last two years and will soon be starting her own research on a possible solution. Sarah's idea is to use ferrets to sniff out the mines and, hopefully, even uncover them. The ferrets, which are too light to set off a mine, are very intelligent and have an excellent sense of smell, so Sarah is hoping they can be trained to find mines. Of course, they're also cute and fun to work with!

Sarah has spent many, many hours studying the current methods of de-mining, and has carefully thought out her approach. She hopes this work will someday pay off in terms of saving human lives and preventing suffering. Sarah plans to test her idea by comparing the sensitivity and reliability of the ferrets with current state-of-the-art vapor detection hardware. If the ferret idea works, it would be a fast and inexpensive way to clear mines. Hopefully, through the efforts of Sarah and people like her, a workable solution to this horrible problem will someday be found.
Students are cooperating with the Society for International Ministries (SIM) on several service learning projects in West Africa. In 1998-99, a faculty-led team designed and installed solar electric power and solar water pumping systems for a medical clinic in Burkina Faso. New teams are now helping disabled people in the same region gain self-sufficiency and independence by:

- Creating human-powered irrigation systems for a microenterprise farm;
- Providing safe water with solar-powered pumps to a school for disabled persons;
- Developing human-powered personal transportation for disabled persons;
- Forming microenterprise businesses to stimulate the local economy.

In the rural village of Mahadaga, Burkina Faso, one of the world's poorest countries, young adults with disabilities work on a microenterprise farm sponsored by SIM. The farm provides workers a salary as well as opportunities to learn improved agricultural skills. Messiah students are designing human-powered pumps to draw water for irrigation. One goal is to teach clients this pumping technology so they can recreate it in their home communities. Another goal is to create designs that exercise different muscle groups, thus allowing the pumpers to do physical therapy as they work. A final goal is to expand this farm into a self-sustaining enterprise.

 Messiah students are also developing a deep well, a solar-powered water distribution system to provide drinking water for a new school for the disabled. At this school, men and women participate in internship programs and gain marketable skills. We have begun initiatives to create small businesses that will propagate sustainable water pumping and human-powered transportation technologies in the region.

The Messiah College Genesis Solar Racing Team returned home from SunRayce 99 this past June, bringing with them a 7th-place finish and an award for their innovative braking system.

The race was hampered by poor weather, with rain seven out of the nine days. Only one race day and the rest day, during which cars do not race, saw unobstructed sunshine. The Genesis car had been designed for high speed under clear skies, and was beaten by teams that could better manage to maintain a lower speed under poor conditions. However, on the one sunny day, Genesis showed what she was made of, coming from about the middle of the pack at the start and passing all the other teams to place first for the day, nearly 20 minutes ahead of the second place car.

The team arrived home after the 1,350 mile race to a hero's reception, tired but elated to have done well in a race which is very challenging even under ideal conditions. Speeches by President Sawansky and Derek Hathaway, CEO of Harso Corporation (sole sponsor of the Genesis 99 project), welcomed the team back to campus and communicated the overwhelming support provided by the College community and Harso.

The Genesis '99 team is currently being transformed into the Genesis '01 team, and has grown significantly with an influx of enthusiastic new students. The car is being analyzed and redesigned to improve performance and reliability. One of the more ambitious plans is to build a new solar array with custom-fitted cells, made using a laser cutter, designed and built by Genesis team members.

The team is looking forward to competing in the first American Solar Challenge, which replaces SunRayce as North America's premier solar car racing event. This new race, which is styled after the World Solar Challenge and is open to competitors from around the world, will be held in July 2001. Current plans call for the route to start in Chicago and end in Los Angeles, more than twice the distance of recent SunRayce competitions. This will be a most exciting and challenging event, and the team is looking forward to it with great anticipation.
Aviation Activities

Engineering students of the College have been involved in a number of aviation activities. A Flying Club, advised by Engineering faculty and sponsored by the Messiah College Student Association, includes students from many majors.

The club seeks to achieve the following goals for participants:
- Develop an understanding of the principles of aerodynamics and aviation;
- Develop craftsmanship and technical skills through aircraft construction;
- Provide opportunities to learn how to fly; and
- Foster an interest in aviation service in developing countries.

Club members constructed a working aircraft that was test flown in August 1998, and currently has over 80 hours of use. The Club is building a second aircraft. Construction is primarily aircraft-grade steel, wood, and fabric. Last year, the Club became an affiliate of the Mid-Atlantic Soaring Association (MASA). Club members receive flight instruction at nominal cost through MASA. One member of the Club took a solo flight in the summer of 1999. The Club supports and encourages aviators who serve in developing countries.

Capstone Projects

Engineering students at Messiah College are required to complete a working capstone Engineering project that applies what they have learned in their preparatory courses to a real-world problem. Students typically undertake their project in teams of two. Recent projects have included the following:
- Motor Break-In with Computer Interface for an Artificial Heart
- Implantable Radio Telemetry Thermometer
- Algorithm for the Digital Suppression of Noise
- Hybrid Electric Vehicle Conversion
- Space Frame Design for the Genesis Solar Car
- Steering and Wheel Carrying Components for the Genesis Solar Car
- Inertia Fricion Welder
- Continuously Impedance-Matched Telescoping Antenna
- Speed Control System for a Wind-Powered Generator
- Design and Test of Land Mine Detection Equipment
- Hand-Powered Trike
- Talking Bus for the Assistance of Blind Passengers

An Invitation to This Year’s Conference on Senior Engineering Design Projects

April 28, 2000

The Engineering Department cordially invites you to come to our Eighth Annual Conference on Senior Engineering Design Projects. It is scheduled for the afternoon of Friday, April 28, 2000, in Frey Hall Room 110. The projects will include:

- **West Africa Pumping Project**: Stuart Honey, Bryan Ondraski
- **Interactive Test System**: Dale Johnson, Matt Walsh
- **Silicon Laser Machining**: Bill Song, Sam Borthwick, Brad Field
- **Variable Valve Timing**: Jael Boone, Alex Haus, Phil Shenenderger

There will be a refreshment break during the afternoon. For more information, call Dr. Don Pratt at 766-2511, ext. 7169.
West Africa Pump Project Prepares for Trip to Burkina Faso in July 2000

(1 to r) Back row: Brian Ondrasik, Dale Johnson, Matt Walsh, Peter Tasch, Jonathan Lloyd. (1 to r) Center row: Jon Bergey, Stuart Heisey, Don Everet, John Paul Peterson, Steve Forry, Mike Foster. (1 to r) Front row: Florence Johnson, Erin Calpin, David Vader, Julie Walsh, Colleen Cramin.

Please pray for the West Africa Pump Project (WAPP) as they prepare to implement their water resources project in Burkina Faso. This interdisciplinary team of 12 students plus advisors aims to apply classroom learning to real-world problems (see "Initiatives of the Collaboratory"). Please pray that God will enable the team to provide safe drinking water with solar power in a school for disabled persons and design human-powered pumping and irrigation systems for a microenterprise farm. Through the project, we also hope to create sustainable businesses and employment opportunities in one of the world’s poorest countries.

We desire to grow in the grace and knowledge of our Lord and Savior Jesus Christ. Pray that God will enable us to meet these needs of our clients today, and that through this project we will learn to be Kingdom builders for a lifetime. Finally, join us in thanking God for already providing over half of the needed funding!

Contact Dr. David Vader at 766-2511, ext. 2630, for further details.
Notes from Our Alumni

Here are updates from our alumni:

"Who would have thought I would end up in grad school? Not I. Well, I was doing some research in the area of Systems Engineering (how to get parts in door A and product out door B the fastest, most efficient way using your available resources), and I threw it past my boss. He thought it was a great idea and now I'm going down to Maryland two nights a week taking classes.

"Thanks to you and the rest of the Engineering staff for allowing and encouraging me to enjoy my education and pursue it with confidence."

—Bill Pezzit '97
VoithUSA

"Engineering major Rachel Morey '02 is in Oakland, Calif., this year with Bart Campolo's urban ministry group "Mission Year." With the motto to "Love God, love people, because in the end nothing else matters," Mission Year works to reach the inner city through community service, involvement in a local church, and being present and involved in people's lives. Rachel asks for your prayers. If you would like to write, her address is 1606 81st Ave, Apt. #1, Oakland, CA 94621.

"We closed on our new house today and will move in tomorrow. Just thought we would update you on our new address: 111 Plympton Court, San Jose, CA 95139.

"If you are ever in San Jose, look us up. Keep in touch."

—Curt R. Eysser '95
Research, Development and Engineering
LifeScan, Inc.

A Higher Calling: The Careful Engineer and the Good Samaritan

by Harold Underwood

(Excerpt from his Faith & Learning Integration Paper, January 2000)

A Christian engineer may have a broader vision and capability of developing Responsible and/or Appropriate Technology, but in the creative process needs to be careful. By "careful" I do not merely mean cautious, although caution and safety-consciousness may be fully appropriate throughout the process of developing that technology from identification and formulation of the problem to testing and application of it. Rather, I mean "care-full," full of love for God and His creation, including fellow human beings and their relationships with one another, as God commanded His people to be. One way to love another care-fully is to provide a product or service that meets a basic human need.

As an example of carefulness, consider Jesus' parable of the Good Samaritan (Luke 10:25–37). When the traveling man is victimized by robbers who leave him wounded and half dead, the priest and the Levite who first find him, pass by on the other side—a cautious approach. The Samaritan, however, sees him, feels compassion, and decides to take care of his needs. According to the customs of the day, he bandages his wounds, which were anointed with oil and wine, then carries him to an inn, paying money to the innkeeper to care for him further—a careful approach with attention to detail. Can we blame the first two who pass by the wounded man? Many of us know someone who got hurt or even killed by playing Good Samaritan. Often the risks of getting involved can be very real. The Good Samaritan in Jesus' story took a risk. Did he know if the robbers were still around? He goes ahead and takes care of the wounded man's needs anyway, spending time and money to do it as Jesus wants a good neighbor to do.

Not always is it as easy to see a person's need as it may have been in Jesus' story. Whether in the medical or the Engineering profession, oftentimes identifying and defining the human need may be the toughest part of the problem. Then the challenge becomes how to use available resources to meet the need in an appropriate, helpful, and hopefully long-term way. The Good Samaritan could have left the wounded man by the road after anointing and bandaging his wounds. However, he instead provides for his longer-term care and protection by bringing him to the inn. In this act, the Good Samaritan showed he was at least as concerned about the safety and well-being of the victim as he was for his own.
Scholarship Grant Awarded on Appropriate Engineering

by Carl Erikson

A Scholarship Grant was awarded by the College in May 1999 to Assistant Professor of Engineering Carl Erikson for his proposal titled "An Integrated Microenterprise High Rise Building for Innovative Teaching and Research Opportunities for College Students and Helping Urbanites Help Themselves." The end product will be a feasibility study detailing a possible implementation plan for renovating abandoned buildings or residences in urban centers in the United States or around the world, with the intent to establish microenterprises for the local industries and to provide service and research opportunities for students and faculty. The following paragraphs are taken from the proposal.

Background/Context

This year, greater than 50% of the world's population of 6 billion people live in cities. By the year 2020 it is estimated that 65% of the world's population of 8.1 billion will live in cities. Basic subsistence needs of food, shelter, energy, jobs, etc., for these urban areas will be exacerbated.

Appropriate Technology principles, normally associated with rural areas, can be applied in these urban areas to help the urbanites help themselves by developing microenterprises which will assist in sustaining their families. In addition, these principles can be taught and concretely demonstrated to college students as well as providing research opportunities for various class and senior projects. Several Departments of Messiah College are interested in being involved: Engineering, nursing, natural sciences, education, business, art, the Agape Center, and extracurricular groups such as Habitat for Humanity, Earthkeepers, and the Temujin Community Initiative.

The vision is to purchase an old or condemned building from the city of Harrisburg, Philadelphia, or another accessible site, develop a sound plan to renovate it, obtain outside funding, and begin the actual renovation/implementation with specific microenterprises in mind for each floor. The results of this concept would provide a model for other cities in the United States and around the world.

A minimum of a four-story building, preferably an old warehouse or large multi-story residence, is desired. For example, each floor could be developed around the following themes:

1st Floor - Small stores and learning centers - fish/meat market, flowers/vegetables, furniture shop, learning center for day and evening use, non-emergency medical clinic.

2nd Floor - Woodworking for furniture, wooden toys, etc., using hand- or leg-powered tools.

3rd Floor - Fish (aquaculture) and small animals (chickens initially for eggs/meat; mink used to feed fish and as fertilizer.

4th Floor - Flowers, vegetables, or mushroom production.

References:
2. Ibid, p. 3.
Bicycle-Powered Microenterprises
by First-Year Engineering Students

This year's ENGR102 Introduction to Engineering class of 62 students were given the challenge to design, build, and test a scaled prototype of a human-powered (via bicycle) device which performed a useful function which could be turned into a profitable microenterprise in a Third World country.

Project teams of three students each came up with 22 devices, which included:
- a grain mill
- several table saws
- a lathe
- several washing machines
- several lifting mechanisms
- several water pumps
- an air pump
- a potter's wheel
- a battery charger
- a belt sander
- a juice blender

Maximum use of recycled materials and choice of one of two power take-off modes were part of the design criteria. These photographs show the power take-off interfaces and a few of the finished devices.