



ENGINEERING NEWS

Solar Scholars update



(Left) Dean Eastlake '09 and (center) Leon Leid '08 assemble the solar photovoltaic arrays for the new Solar Scholars™ pavilion, just off the southern end of Frey Hall (right).

The Solar Scholar's™ project first appeared in the Engineering News two years ago, when we were just embarking on the adventure of bringing solar energy to Messiah's campus. It has been my privilege to advise a quality team of students over the past two years as this project has gone forward. One of the highlights of the Collaboratory is the unique opportunity of bringing together students of various majors and disciplines to work on technical projects. Leon Leid is an English major who has been a member of our Solar Scholars™ team since nearly the beginning. The following is Leon's perspective on working with the Solar Scholars™ team.

—Steve Frank, EE/CE Technician
and Solar Scholars™ project advisor

Messiah's Solar Scholars™ training facility is nearing completion! If you haven't seen the

site yet please stop by and check it out. It's simply beautiful.

For those of you new to Solar Scholars™, here is a short summary. Solar Scholars™ took root in the spring of 2006 after receiving a substantial grant from the Sustainable Energy Fund (SEF). With the help of Gannett Fleming, Inc. and the excellent guidance of Steve Frank, a team of Messiah students spent the next few semesters designing the 3KW photovoltaic (PV) system. Solar Scholars™ installed the system behind Frey Hall in the spring semester of 2008 with Wohlsen Construction and other off-campus friends supplying labor and tools for much of the heavy construction work. They also erected a wonderful pavilion which not only protects the components but is an educational tool in itself. It has a green (in color and environmental benefits!) roof.

The roof has several inches of soil in which are planted low growing perennials. These plants help reduce the amount of run-off rainwater.

The PV system and the green roof will work together to display examples of renewable energy to Messiah's visitors. The PV system will serve as a training facility for engineering students and Collaboratory members. The facility will also be a key tour stop for thousands of elementary school students who visit the Oakes Museum each year.

The project has a few remaining items to wrap up: write software that will enable real-time data to be accessible via Internet from offsite; install computer and monitor for interest of on-site visitors; provide on-site educational information so that Oakes Museum visitors can learn first-hand about

Chair's Corner



Our department's theme for the year is "Transition, Again!" Yes, leadership of the department will be changing again in January 2009. Randall Fish, our new electrical engineering professor, will be assuming the chair's responsibilities at that time. Scriptures have many things to say about changes in leadership for all of us. When Moses was about to die, he instructed

Joshua (Deut 31:78) to "be strong and of good courage"; "it is the Lord that goes with thee. He will not fail thee."; "fear not, neither be dismayed." All three of these pieces of advice are applicable to us as students, staff, faculty, and administrators. Let us be strong, depend on the Lord, and not be afraid as we enter this new academic year.

This year the department begins the last year of the three-year transition to the full implementation of the Integrated Projects Curriculum (IPC). ENGR 302 Seminar II, ENGR 488 Project III, and ENGR 489 Project IV will be initiated this year and complete the seven IPC courses. Students are engaged in projects with five IPC groups: Transportation, Disability Resources, Communications, Energy, and Water. The IPC program gives practical

opportunities for students to apply their academic learning to real needs.

I want to especially welcome the Class of 2012 as they begin their studies here at Messiah College and also welcome back our sophomores, juniors, and seniors from a summer of work, mission trips, and rest. Some of our students and faculty traveled to such places as Ethiopia, Honduras, Burkina Faso, Mali, and even Florida to implement projects. Read the articles in this newsletter to see and hear the wonderful results!

May the Lord's blessings be upon each of our students, faculty, and staff as the new academic year begins.

Professor Erikson
Chair, Department of Engineering

Flight tracking project presented at Christian Engineering Educators Conference

During the last week of June, Geneva College hosted the 2008 Christian Engineering Educators Conference (CEEC), in Beaver Falls, near Pittsburgh, Pa. Messiah College was represented by Harold Underwood, who presented a paper co-authored by Cary Cupka, research & development coordinator for Mission Safety International (MSI). Published in the proceedings, the paper entitled "Lessons Learned: Developing Flight Tracking and

Messaging Systems for Christian Nonprofit Organizations" addressed features of the partnership developed over the past three years between Messiah College and MSI, project work completed by three years of Alternative Aviations (AAS) engineering senior project groups, and benefits of the Collaboratory and the Integrated Projects Curriculum (IPC). This project, formerly known as AAS, now seeks adoption by the Collaboratory under the name Flight

Tracking and Messaging Solutions (FTMS) and is transitioning into the IPC. Future work includes the need to upgrade a micro-processor and user interface currently used by JAARS Automatic Flight Following System (AFFS), so as to make it manufacturable and marketable. Although normally scheduled on a two year cycle, the next CEEC is tentatively planned for June 2009 at Baylor University, in Waco, Texas.

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the benefits of solar power; and install a grid-tie connection with Frey Hall. We hope to complete all of this before the academic year is over.

I have been a member of Solar Scholars™ almost since inception and it has been amazing to watch this project grow from ideas into lots of linear CAD drawings and finally into an actual photon-harvesting power plant. Working with Solar Scholars™ has been an incredible experience. As an

English major working with mostly engineers, I have learned a lot about electricity, renewable energy, teamwork, and what makes engineers tick. I got to help with all aspects of the project. I did a variety of things like researching products for purchase, attempting a CAD drawing, installing electrical components and wiring, installing conduit, and painting the array poles. I delighted in learning about solar power while at the

same time helping to create a product that will hopefully continue to teach many others in the future. I consider this interdisciplinary experience a highlight of my time here at Messiah College and wish to thank all the Messiah students, faculty, and employees as well as the many off-campus partners for their invaluable contributions.

—Leon Leid, senior English major and
Solar Scholars™ team member

Making water and sanitation more accessible in Mali

The Collaboratory Disability Resources Group continued with its research project to make water and sanitation more accessible to disabled persons in West Africa. Last May, a team traveled to Mali, Africa, to collect data on some of the design modifications implemented during the January 2008 trip, and to install a new pump superstructure with more design changes. The team consisted of: Dean Ray Norman, Professors Lamarr Widmer and Barbara Ressler, and accounting student Adam Lenon.

Well water is usually transported back to the home in 20–30 liter containers, which are heavy and awkward to use, particularly for disabled persons. Professor Widmer and Adam Lenon spent much of the trip meeting with local craftsmen to discuss ways to modify the containers so they are easier to transport. Professors Norman and Widmer also interviewed people who used our modified latrines and latrine seats, to determine any necessary design changes.

Professor Ressler traveled to oversee the construction of a new cement superstructure around a well pump. The new structure would contain design changes developed by Collaboratory students. These changes would make pumping water easier for persons with little use of their legs. Unfortunately, construction was delayed so we do not know what the final structure looks like—the next team will need to make their observations in January 2009.



“The new structure would contain design changes developed by Collaboratory students.”



Left: World Vision workers and Professor Ressler get water at the new pump site in Mandiakui, Mali. The superstructure will be built around the pump platform. Right: Mali June 2008 site team: (Back row) Adam Lenon and Ray Norman. (Front row) Barbara Ressler, Lamarr Widmer, and Elizabeth, our translator.

Summer interns develop assistance for Asberger’s Disorder

by Harold Underwood

In April 2008, the Lancaster and Harrisburg Keystone Innovation Zones (KIZ) awarded a \$10,000 grant to Messiah College, along with a \$5,000 match from the Collaboratory, for a summer research project at Messiah College. The research was conducted over a period of ten weeks this summer by student interns Ade Osunsakin and Tyler Smith, under the supervision of Harold Underwood and Nancy Patrick, assisted by David Gray, in partnership with SymBionyx. Background on the Wireless Enabled Remote Co-presence (WERC) technology and social coaching services envisioned by SymBionyx is described in the

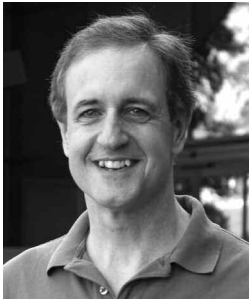
Engineering News Spring 2008 issue, and at www.thecollaboratoryonline.org/wiki/Communications_Group.

Summer research resulted in a preliminary coach’s training manual and a prototype of WERC. The preliminary manual is designed to train job coaches and counselors in coaching clients with autism spectrum disorders through the job application, acquisition, and retention processes. The training manual includes three sections: 1) basic information on autism, 2) a job coach’s role, and 3) a step-by-step procedure to assist unemployed individuals with ASDs in attaining competitive employment.

The WERC prototype was tested by neurotypical persons playing the role of the client and researchers playing the role of the coach. The current version streams audio and/or video between the client and the coach via the internet, with wireless camera/mic set and headset at the client end, for mobility. However, the group hopes to take advantage of emerging technologies in future versions of the prototype, to improve upon this performance. Future work will also involve testing with multiple Asperger’s Disorder clients, and developing a coach monitoring system for multiple clients.

Department welcomes Randy Fish as new faculty

by Harold Underwood



Randy Fish, Ph.D., joins the department this fall, as our newest full time faculty member. In addition to his teaching responsibilities, involving engi-

neering and physics courses, Randy will officially assume the chair position, as of January 2009. While Dr. Fish is new to our department, he brings a range of experience in engineering education, research, industry, and management. Since 1994, he has been teaching electrical engineering at Eastern Nazarene College (ENC), including courses

on topics such as Circuit Theory, Electronics, Digital Logic, Signals & Systems, Applied Digital Signal Processing, and Microcomputer Interfacing. In addition, he has also taught a graduate level class in the MITRE institute, and has served on several occasions as a guest lecturer in a graduate level computer science class at UMASS Amherst. Prior to returning to academia, he spent 14 years working in industry at Honeywell, Raytheon and Signatron Corporations, as well as some smaller start-up firms. During his experience in industry, he held positions ranging from project and design engineer, to group leader, director, and vice president of engineering. Most recently, he has served as Principal Scientist for Intelligent Information Access with

MITRE Corporation, a position he continues to hold on a part-time basis during his undergraduate teaching, allowing him to actively pursue his research interests, and bring these back into the classroom. Some of his recent research includes applications involving handwriting and speech recognition along with natural language processing associated with Electronic Medical Systems. As a professor, Randy has a passion for making himself available to his students and a reputation for his sense of humor both inside and outside the classroom. Now that he has relocated to Messiah College, Randy resides with his wife, Sue, in Dillsburg, Pa.

Faculty members serve as guest lecturer at technical school in Ethiopia



Ethiopian students listen to a guest lecture by Harold Underwood at Mekelle Institute of Technology (MIT) in Tigray.



Harold Underwood joins Ethiopian students at the fountains, dry until rainy season begins.

Partial sponsorship by the Timothy Project based in Wheaton, Ill., and the Messiah College Collaboratory enabled Harold Underwood to serve, by invitation, as a guest lecturer and consultant at Mekelle Institute of Technology (MIT) in Tigray, Ethiopia, during the first three weeks of June. As suggested by Dean Soori at MIT, Harold addressed topics of electromagnetic

wave propagation, transmission lines, and antennas for a group of 35 second-and-third-year students. He also served as a consultant on a local FM community radio project, sponsored by the World Bank, and conducted by MIT as a pilot project for the Ethiopian government. Harold also enjoyed learning how expatriate Indian and Japanese faculty are teaching communications and

electrical engineering at this new school in the developing country of Ethiopia. Harold connected with several Ethiopian students and has passed on contact information for a few of these to his Communications Group students for further exchange and collaboration by e-mail.

Designing “Design Squad”

by Don Pratt



Professor Don Pratt (left) and Messiah engineering students Emily Howell '09 and Paul Gustafson '09 work on a prototype on the set of “Design Squad.”

“Design Squad” is an award-winning PBS Television program produced by WGBH Boston. This fast-paced “engineering reality” show is designed to get 12–18 year-old kids interested in engineering and technical careers by bringing the exciting, creative side of technology to life. Two teams of students compete for a college scholarship by designing and building machines to solve problems posed by real clients. After the second season, the show had an opening for the director in charge of all the technical aspects of the show, including designing the challenges for each episode, teaching the cast members how to design and build prototypes, and working with the post-production staff editing footage, checking factual information, and creating animations and voice-overs. I became aware of this opening last January, and was intrigued by the opportunity to impact an entire generation of future engineers (nearly 1 million kids tune in to watch the show each week). After a three month selection process involving a pool of candidates from across the country, I was offered the position and immediately accepted.

I spent most of my spare time during the rest of the spring semester working with the WGBH production staff brainstorming potential challenges and talking with prospective clients. I was told I could hire two assistants, and ignoring the suggestion that I pick up a couple of MIT grad students, invited two of my engineering students, Paul Gustafson and Emily Howell, to come work with me for the summer. After classes ended in May, we headed for Boston, where we were soon busy assisting with building the set and getting ready for the cast to arrive. Toward the middle of June, six enthusiastic students arrived and began a week of “boot camp” we put together to get them ready for the show.

While I can’t share specific details about the challenges, a typical shooting sequence went like this. After we selected a design challenge and worked out the details with the client, engineering (i.e., my assistants and I) would prototype possible designs and begin ordering parts. Each design challenge had to have at least two possible solutions, so we spent a lot of time building and testing prototypes. At the same time, a camera crew would film the client talking about the problem and challenging the cast to find a solution. This footage was edited into the “pre-roll” which we would show to the cast at the start of the first day of filming. Every challenge was a well-kept secret, and the pre-roll was always accompanied by whoops and cheers when the cast found out what they were going to do. After watching the pre-roll, the cast was divided into two teams and eagerly headed off to their workshops, which had been built on the set. With cameras rolling, they would brainstorm ideas, search the web, and begin building their prototype solutions. During filming, I was one of two directors, with the other (artistic) director focused on making the “right shot,” to tell the story in the most interesting and exciting way. We worked very closely together, usually right behind the cameras, whispering about what they were doing, whether they were going to finish on time or if their design would work, and all the time trying to stay out of the camera shot. While we

really did strive to be as “hands-off” as possible, we had to step in fairly frequently to give them direction on a specific idea or to remind them of proper safety practices. Of course, this would stop the cameras, so you won’t ever see any of these moments on the show!

While they were brainstorming, we encouraged the teams to construct “sketch models,” which are scale mock-ups using simple materials used to try out ideas. By the end of the first “build” day, each team had settled on an approach and begun construction of their machines, which continued into the second day of shooting. Most challenges had only two build days, with three set aside for the travel shows. Again, I can’t share details, but I can tell you that one of these travel shows involved taking the entire cast and crew to Jamaica—you’ll have to wait until the show airs to find out what we did there!

After the cast finished building, we had a “prep” day for engineering to come in and do some tweaking to make sure the designs were safe and would work properly. We tried very hard not to make any major changes, or to sway the results one way or the other. In fact, most of the time our work was unnoticeable, but we did sometimes do little things like tightening up wiring and re-welding questionable joints. Paul and Emily worked especially hard on these days, and honestly, I don’t know what I would have

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The cast and some of the staff members from “Design Squad” relax for a moment during filming at Harvard University Stadium.

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ENGINEERING NEWS • FALL 2008
OUR MISSION

The mission of Messiah College is to educate men and women toward maturity of intellect, character, and Christian faith in preparation for lives of service, leadership, and reconciliation in church and society. Graduates of the engineering program will therefore be technically *competent* and broadly *educated*, prepared for interdisciplinary work in the global workplace. The character and conduct of Messiah engineering graduates will be *consistent* with Christian faith commitments. We accomplish this mission through engineering instruction and experiences, an education in the liberal arts tradition, and mentoring relationships with students.

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done without them. They both had very positive attitudes and a wonderful “can-do” spirit that over and over confirmed my decision to hire them. In fact, both the cast and crew fell in love with them, and there were many tears when we packed up to leave at the end of the summer.

After the prep day came the “finale,” which was a day of shooting with the client. The cast members would describe their solutions and demonstrate their prototypes for the client, who would then evaluate the two machines and pick the one he or she liked best. This sounds simple enough, but traveling to the see the client and setting up the cameras took hours, and getting the right shot usually required multiple takes, so it was always a full day. Once a winning team was selected, the team members each got 100 points, after which the cast was shuffled into new teams and the process was repeated with the next challenge.

The schedule pushed us all very hard, but it was exciting to be part of the production of a high quality television program. I came away with a much greater apprecia-



Professor Pratt give two cast members some pointers on the safe use of a power saw on the set of “Design Squad.”

tion for how much work it takes to put together a show, and of course, we’re just starting post-production, so there’s still a lot of work to do. The finished episodes will begin airing sometime late summer or early fall 2009, and I hope many of you will have a chance to tune in. While you won’t ever see Paul, Emily, or me on camera, you can

bet that we were just behind the scenes every minute, and I hope you will enjoy the results of our work. And, be sure to look for the engineering staff from Messiah College in the credits!