MESSIAH COLLEGE

Engineering News

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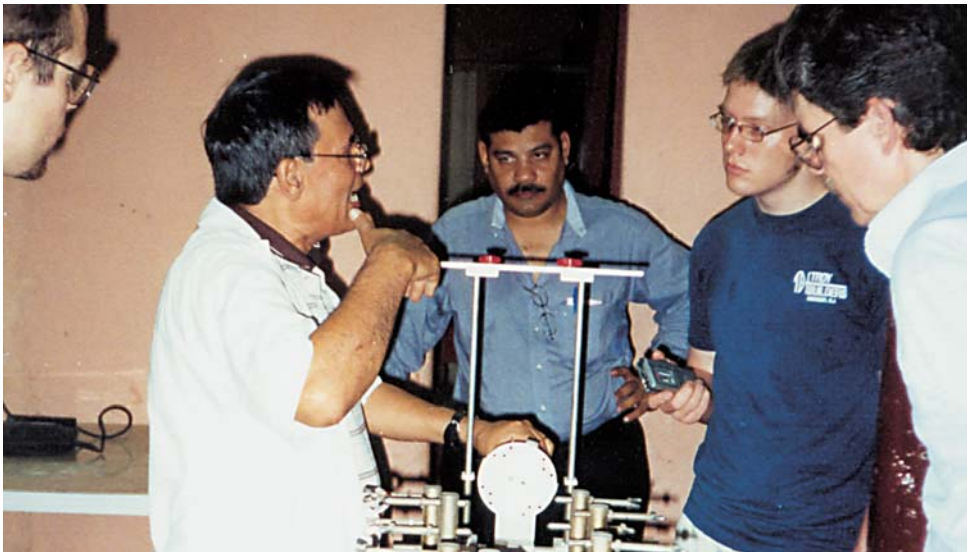

Aaron Dahlstrom '03, Brian Thompson '05, and Don Pratt listen to an explanation of how Nicaraguan doctors make prosthetics.

MCLAP team visits Nicaragua

by Dr. Don Pratt

"Then I saw the children come running down the path to meet us, and my heart went out to them as I thought of the terrible danger that they live with every day."

Last spring ('03), a group representing the Messiah College Landmine Action Project (MCLAP) traveled to Central America to study humanitarian demining and victim assistance in two mined countries, Nicaragua and Honduras. Aaron Dahlstrom, Nathan Shaffer, Brian Thompson, and I spent the last week in May and the first week in June touring a live minefield, participating in mine risk awareness for school children, and visiting three prosthetics clinics.

The day we spent with Organization of American States (OAS) workers doing mine-risk education was a particularly moving experience. After several hours in a 4x4 traversing difficult terrain, we approached a small school deep in the mountains along the boarder between Honduras and Nicaragua. As we got near the school, our guide pointed to a nearby hillside and said, "We found eight landmines over there two days ago." A few minutes later, he pointed to a field and said that they had found two landmines there only yesterday. Reaching the school only minutes later, I have to admit I was afraid to get out of the truck! Then I saw the children come running down the path to meet us, and my heart went out to them as I thought of the terrible danger that they live with every day. Later, as we passed out notebooks, rulers, pencils, and other school items with pictures of mines and the words "Danger—don't touch!" emblazoned on them, I was moved to tears as I thought about how important it is to try to teach them to be as safe as pos-

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sible in such a dangerous place. What a tragedy that so many of the mines must be found by children!

Another day was spent at a minefield watching military deminers, called "sappers," locating and removing landmines placed around an ammunition dump left over from the Sandinista–Contra conflict of some 20 years ago. After a briefing by the army colonel in charge of the operation, we drove to a position where we could see the sappers at work. Again, I was scared to think that I was driving and walking around in an area that was known to have landmines. The army personnel treated us with the greatest care, but we knew that the possibility existed that we might inadvertently find a mine, and that realization scared me a great deal. The truth is, I don't recall ever being as afraid as I was on this trip (especially riding with the taxi drivers), but that was actually one of the purposes; to experience what it is like to live in a country where mines are a part of your daily life. It's not a good feeling.

The rest of the trip was spent traveling to three prosthetics clinics, where we were able to interview survivors of landmine accidents and see doctors at work making artificial limbs. We were amazed at the skill of the doctors and technicians, and the beautiful work they were able to do with the most basic and rudimentary equipment. The students were particularly interested in some of the machines used to shape and mold the various parts, and they took many pictures and made a lot of notes in their logbooks. We returned with many ideas for projects that would help the prosthetics clinics.

"We were amazed at the skill of the doctors and technicians, and the beautiful work they were able to do with the most basic and rudimentary equipment."

Brian Thompson '05 tries protective gear worn by deminers.

Interviewing the survivors was very sobering. While their injuries varied greatly, most of the stories were eerily similar: a walk through a field or down

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Nathan Shaffer '05 and Professor Don Pratt crossing the barrier outside the minefield led by Nicaraguan Colonel Montenegro, head of the demining operation.

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a mountain path interrupted by a flash and bang and the sensation of flying through the air. One person told of losing his brother and having his cousin seriously injured while he himself lost a leg and partial use of his arm. To this day, he doesn't know which of the three of them set off the mine. We were ashamed to learn that most of the mines still killing and maiming today were likely made in the United States and given to the Contra rebels.

In short, the trip changed our lives. We now have a much better idea of what it's like to live in a mined country and what it takes to actually find and remove mines in a real situation. We all had the chance to try on the protective gear worn by sappers, and experience how heavy and hot it was, especially in 90 degrees and 100 percent humidity. Talking with actual mine victims was very eye opening — it brought the reality of the problem home to us. But I think for me it was the faces of the children that provided the most vivid memory of the trip. I can't bear the thought of them playing and growing up in a place so poisoned with hidden dangers. The students returned sobered by the reality that so many people experience danger from mines on a daily basis and excited about the possibilities for using their engineering gifts to assist these people. In addition, we made many personal contacts and built relationships that will allow us to organize trips and projects in these countries in the future. Hopefully, future MCLAP projects will be able to make a difference in the lives of these people.

Student externs with Black & Decker

by Zack Eakin

Over this past summer, while most of my friends were either taking summer classes or working the usual summer jobs, I was blessed with an externship opportunity at Black & Decker's world headquarters in Towson, Maryland. I heard of the opportunity through an email that was sent out to the engineering department from the internship office. I then gave my resume to them, and they sent it on to Black & Decker. I was later contacted for an interview in Towson, which is where nearly all engineering work is done for DeWalt power tools and a portion of Black & Decker's power tools as well. Within a few weeks they offered me a position. Upon hearing that, I was most looking forward to spending my paychecks in the company store. And although I did that too, I also came away with a better understanding of what real-world engineering is all about.

The opportunity gave me the chance to see what concerns face the professional engineer in today's marketplace, and to see what great engineers do that makes them great. I learned things that cannot be taught in the classroom, but can only be learned through the experience: things like having a boss and projects that have impact on what direction products will take. Some of the people I worked with held more than one doctorate in various areas of engineering and have been working in those areas for years. This sometimes made them intimidating to approach, as sometimes it was a struggle just to understand what they were saying. However, working alongside them I benefited greatly from their wealth of knowledge and experience, and was able to come up with some good designs and ideas for the projects in which I was involved. The practical application, and implementation of engineering principles, was and will be of tremendous value to me. But of all the things I came away with from the experience, the most important was the appreciation I gained for the education I had thus far received.

What made the great engineers that I met great was their ability to take their knowledge and experience in a given area and realize its implications in whatever problems or tasks were around them. This and countless other lessons I have brought back to school with me, as they have given me a new perspective and appreciation for what goes on here in the world of Messiah College engineering.

"Of all the things I came away with from the experience, the most important was the appreciation I gained for the education I had thus far received."

Messiah College team reports progress in Mahadaga

January 2004
Solar Electrical System at the Handicap Center in Mahadaga

Dokimoi Ergatai Solar Team with workers and children from the Handicap Project in front of the new solar array.

"While the language was always a challenge, God's love was communicated to us in our interactions with the Burkinabe."

After more than a year and a half of planning, designing, and revising, the Messiah College team from Dokimoi Ergatai (Approved Workers, 2 Timothy 2:15) came to Burkina Faso to install a solar electrical system at the Handicap Center in Mahadaga. The 13-member team consisted of Dr. Ray Norman, dean of the School of Mathematics, Engineering, and Business; Brad Statnick, development office; Leif Uptegrove, alumnus; Dale Johnson, alumnus; Matt Walsh, electrical technician; Lee Sverduk, senior, engineer; Leah Reiff, senior, biology; Matt Rooke, junior, engineer; Steve Frank, junior, engineer; Peter Allen, junior, engineer; Brendon Earl, junior, engineer; Lindsay Reilly, sophomore, business; and Deane Uptegrove, future alumna.

The solar electrical system includes (16) 120W solar panels mounted on two arrays, (2) 50A charge controllers, (12) 395AH batteries, and a 2.4KW inverter. The DC side of the system is based around 24V and the AC side is 230V/50HZ. The system is designed to provide all the electrical needs for the 12 existing buildings and the four to six future buildings the project is planning to construct. The electricity will be used for lighting, power tools in the shops, sewing machines, computers, and other equipment. The battery pack is sized to store two extra days of energy for cloudy conditions, and the batteries can be charged by a generator if necessary. Provisions have been made to allow for system expansion by adding another eight-panel array in the future if necessary.

In addition to the solar electrical system, the Messiah team also completed the wiring of all the existing buildings. Each room has a light and an outlet that is currently in working order. Maintenance was completed on the clinic's electrical solar system, which appears to have been maintained in excellent condition. The existing solar DC pumps were replaced with a three-phase AC pump that can operate off either solar energy or a generator. This will provide the Mahadaga staff with a more flexible system for ensuring that there is water.

Apart from the technical work, Dr. Norman led the team in a Rapid Rural Appraisal (RRA). An RRA is a technique used to quickly learn a lot about a village or community in a way where the community members assist in providing key development information and analyzing their own needs. Dr. Norman and other

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team members met with several families, the village elders, government officials, local association leaders, missionaries, children, and many others in an attempt to get a broad view of life in Mahadaga. Information that was gathered was organized into the following formats: general information and social organizations of the community, institutional relationships, map of the community, community history, trend analysis, income and expenditures, holiday calendar, migration calendar, marketing matrix calendar, well-being ranking and analysis, community and farm transects, flow diagram of the production system, farm sketch, seasonal farm calendar, preference matrix, listing and ranking problems. While this information is not complete or comprehensive, it will provide a lot of useful insights for future teams and can be improved upon by future teams.

By far the team will remember most the party at the end of the trip with everyone from the Handicap Center and the trip with Francoise into villages to see the Handicap Center's ministry in remote villages. While the language was always a challenge, God's love was communicated to us in our interactions with the Burkinabe. Working and playing with people like Diada, Moussa, Etienne, Pierre, Diancema, Palamanga and many others was always an encouraging and growing experience. We were all partners working together to further Christ's kingdom.

Dr. Ray Norman, Dean of the School of Mathematics, Engineering, and Business, helps Leah Reiff '04, prepare for the donkey races.

Matt Rooke '05 wiring the pump.

Engineering seniors pass FE exam

Eighteen engineering seniors passed the national Fundamentals of Engineering (FE) Examination last year on their first attempt. This is a 95 percent pass rate for those who took the exam, 10 percent higher than typical national averages. In addition, we have learned recently that the two December graduates who took the exam in October both passed. The exam is administered by the National Council of Examiners for Engineering and Surveying (NCEES), and is the first step toward professional licensure in Engineering. The Engineering program at Messiah College is accredited by the Engineering Accreditation Council (EAC) of the Accreditation Board for Engineering and Technology (ABET), and this accreditation permits our students to sit for this examination. The engineering department pays half of the cost for any of our majors who wish to take the FE exam.

Early evangelist explores electricity for healing

By Dr. Harold Underwood

Those familiar with John Wesley's contributions to Methodism or British evangelicalism may be less familiar with his enthusiastic exploration of electricity to help heal a host of human ailments. During his education at Oxford, scientific questions about extraordinary natural phenomena began to captivate him.[1] In 1747, Wesley saw a popular public show of electricity common during his day.[2] His journal entry reflects excitement mixed with confusion over the as yet undistinguished difference between fire and electric shock:

> *Who can comprehend how fire lives in water, and passes through it more freely than through air? How flame issues out of my finger, real flame, such as sets fire to spirits in wine? How these, and many more strange phenomena, arise from the turning round in a glass globe? It is all a mystery: If haply by any means God may hide pride from man!*[3]

His interest climaxed during the next several years especially when he read published letters by Ben Franklin to Peter Collinson (of London's Royal Society) and summarized what he learned from Franklin's reports in his journal.[4] On his travels, his attitude changed from intellectual curiosity to a determined effort to help the hurting people he met by offering low-cost, convenient treatments. By 1756, he grew committed to safe healing with electricity.

> *I [Wesley] ordered several persons to be electrified, who were ill of various disorders; some of whom found an immediate, some gradual cure. From this time I appointed, first some hours in every week, and afterward an hour in every day, wherein any that desired it might try the virtue of this surprising medicine. Two or three years after, our patients were so numerous that we were obliged to divide them; . . . and to this day, while hundreds, perhaps thousands, have received unspeakable good, I have not known one man, woman, or child, who had received hurt thereby.*[5]

The value of his human service not withstanding, Wesley's work has sometimes been criticized for not consistently contributing to the field or suggesting academic work to others. J.W. Haas Jr. remarks, "Wesley never had the interest (or time) to devote to serious experimental study . . ."[6] Moreover, his technique was less than systematic. H. Newton Malony describes Wesley's empirical approach with electric shock therapy to alleviate illness and pain as "probably more an artifact of trial-and-error than of reasoned judgment."[7] Yet his book *Desideratum* (Electricity Made Plain and Simple by a Lover of Mankind and Common Sense) seriously reflects on electricity's nature and offers his rationale for it as an "*elixir of life* which God provided to make creation function."[8]

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Wesley cared not only for the spiritual salvation of people to whom he ministered on his journeys but also their physical health and found electricity offered a low-cost treatment accessible to many. Wesley used electrification to help cramps, epilepsy, headaches, back pain, palsy, shingles, sore throat and toothaches, among many other disorders.[9] Whether Wesley found the "greatest medicine yet known . . . to a great variety of maladies"[10] is arguable, but electrical stimulation is now a well-established procedure in modern medicine.

Wesley may be one of the earliest examples of using electricity, and its associated equipment, in a service-learning mode. His application of electricity became dictated by the physical needs of people. Certainly Wesley's example of caring for peoples' physical along with their spiritual needs serves as a healthy guideline. Yet, engineers often go beyond direct usage to shape and design the technology itself. Today we have specialists who design and produce modern medical defibrillators that restart human hearts by shock treatment, saving the lives of patients. Even Wesley, in his day, relied on the resources of those who made the electrostatic machines[11] he applied for healing.

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[1] J. W. Haas Jr., "John Wesley's Vision of Science in the Service of Christ," Perspectives on Science and Christian Faith , 47, no. 4 (1995): 234.

[2] H. Newton Malony, "John Wesley and the Eighteenth Century Therapeutic Uses of Electricity," Perspectives on Science and Christian Faith 47, no. 4 (1995): 244.

[3] quoted in Malony, p. 244.

[4] Malony, p. 246.

[5] quoted in Malony, pp. 244, 245.

[6] Haas, 234.

[7] Malony, 249.

[8] Malony, 249.

[9] Malonly, 250.

[10] Malony, 250.

[11] Malony, 247.

Genesis II solar boat update

Zach Eakin '05, Nathan Bird '05, Kurt Stabler '05, Chris Slaybaugh '05, and Daniel Yoder '07 seal up vacuum bag before the boat goes in the oven.

"We have really grown as a team over the past few months and look forward to the challenges that await us this spring."

The Genesis team has grown rapidly in the fall to a crew of over 20 students. The team has been hard at work through the cold winter months making the finishing touches to the plug and creating the molds. We will use the molds in the next few weeks to make the actual boat. Our goal is still to have the boat out on the water by the first of April. Our final design is a catamaran, 14 feet long and about five feet wide. The entire body will be made of carbon fiber and will hopefully weigh less than 350 lbs with all the systems in it. Add to that light weight our twin 15 HP German motors and the boat should fly along the water.

With only a few months until the race in June we still have a lot to accomplish. We are doing everything possible to predict on paper what will happen, but getting out onto the water will be the real check. Our main goal now is to get all the systems into the boat so we can begin testing at a local state park. The team is anxious to get out on the water and see the results of the many hours spent at the garage working on the boat. We have really grown as a team over the past few months and look forward to the challenges that await us this spring. We have more motivation than ever to finish the project since we found out that we will be racing our rival school, Elizabethtown College. Look for us out on the water very soon. If you are interested in our progress or to learn more about the project please check out our new web page at www.messiah.edu/genesis.

COMMUNITY MEMBER ASSISTS WITH BOAT PROJECT

When the Genesis II team decided to make their boat out of pre-impregnated carbon fiber, the lightest material for this application, they knew they needed to find some help. Kerry Hitt is the owner of Advanced Composites Products, which specializes in Corvette racing bodies. He has been interested in the Genesis project from the early cars with their composite suspension systems. The Genesis II team worked with Kerry in his shop to put the finishing touches on the top and bottom of the boat, using his giant oven to "bake" the carbon fiber.

Ross Billings '06 checks out the driver's seat in the "plug" (full-sized model of the boat).

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DEPARTMENT OF ENGINEERING

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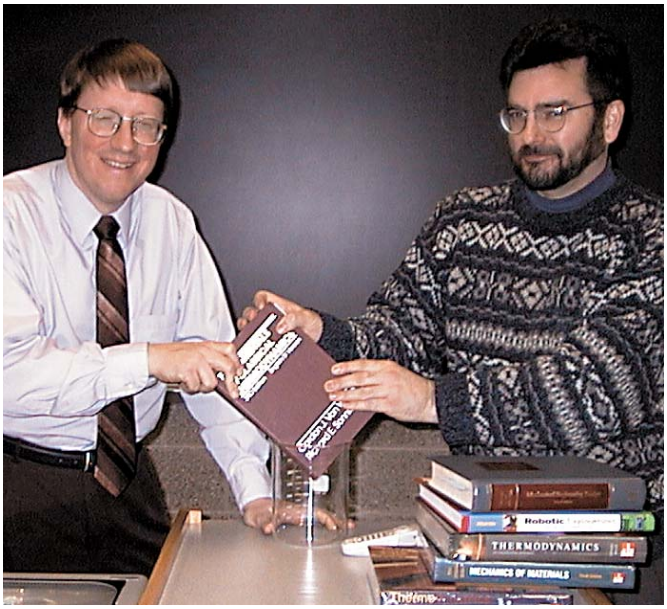

Dr. Timothy Van Dyke and Dr. Timothy Whitmoyer.

Two professors causing a reaction in the Department of Engineering

Last summer, Dr. Timothy Van Dyke and Dr. Timothy Whitmoyer attended a workshop entitled "How to Engineer Engineering Education" at Bucknell University. This workshop was sponsored in part by the National Science Foundation and Project Catalyst at Bucknell University. The goal of the workshop was to help engineering faculty be more deliberate in the design of their courses, and to introduce them to results in education research applicable to undergraduate engineering. Tim and Tim (or Tim^2 as they were referred to) enjoyed the workshop, won some chocolate, and got many ideas on how to improve their teaching, and the engineering program as a whole. During the fall semester, they used knowledge gained at the workshop to lead the department through a series of brief tutorials and exercises on setting measurable learning objectives and techniques for cooperative learning.

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.