Congratulations Genesis Solar Racing Team

7th Place Finish in Sunrayce '99

Genesis '99 Solar Racing Team delivered an impressive 7th place finish out of 29 teams during Sunrayce '99, despite rainy weather and hilly terrain. The race ran from Washington, D.C., to Orlando, Florida, from June 20–29. Messiah College and Harco Corporation partnered throughout the year to provide resources for the Genesis solar car. The car weighed approximately 750 pounds, was powered by a 12-horsepower motor, and had overall dimensions of 6 meters x 2 meters x 0.84 meter. The solar array contained 759 solar cells, giving approximately 875 watts of power.

The top ten finishers were:

1st place  University of Missouri-Rolla
2nd place  Queen's University
3rd place  Rose-Hulman Institute of Technology
4th place  University of Minnesota
5th place  Iowa State University
6th place  University of Missouri-Columbia
7th place  Messiah College
8th place  Ecole de Technologie Superieure
9th place  Kansas State University
10th place  University of Waterloo

The Genesis Team — From left to right: (back row) Gerrit Padgham, Terry Earhart, Doug Bell, Don Pratt, Shane Kimley, George Sundin, Liz Messmer; (middle row) Dale Johnson, Matt Morrison, Erik Reutters, Rob Bagnall, Mike Bell, George Bubbas, Leo Nelson; (front row) Jessica Padgham, Tim Whitemeyer, Brad Field, Bill Sorg, Bethany Chambers, Dan Gomez, Rachel Vaughan, Rachel Money; (not pictured) Brian Longacre, Jessica Hester.
My name is Zelalem Estete. I obtained my B.S. in Agricultural Engineering from Addis Ababa University (Ethiopia) and my M.S. and Ph.D. in mechanical engineering from the University of Maryland. I am blessed with a wife Elisa, a son Nathan, and a daughter Salem. My teaching experiences include Alemaya High School, Addis Ababa University, University of Maryland, University of District of Columbia, Indiana Institute of Technology, and Indiana–Purdue University at Fort Wayne (IPFW).

It is an honor to join what I like to call the "Engineering Dream Team" at Messiah College for a higher calling that will bring glory and honor to our Beloved Lord and joy to us all. I love the Team's heart for Christ and His cause.

As I write this first article, I find it appropriate to talk about my feelings about the mission statement of the College because it is crucial to know if He is in it for real: Apart from me you can do nothing (John 15:5).

I came to believe for myself that, in fact, the College’s mission statement is a reflection of His heart’s desire. Simply put: He is the author. Let me share my thoughts as I meditated on this issue before the Lord.

"...I find it appropriate to talk about my feelings about the mission statement of the College because it is crucial to know if He is in it for real: Apart from me you can do nothing (John 15:5)."

Why? This heart of His. Relational-Love. Jesus approached this goal by assuming leadership in restoring the broken relationships (vertical and horizontal) using a medium of servanthood. There I have it: leadership, service, and reconciliation as my motivation.

What? In realizing his plan.
Discipleship-Mentoring. Jesus needed to use only 12 apparently weak people, in such a short time frame (3 years). There I see it: young students of God as my blessings.

How? His way of working. Inside-Out. The world stops at the intellectual level. The religion goes as far as the moral level. With Christ one can go even deeper to the well of life: Christ. Here is my how-to list: Once one is rooted in the Source of life (by Christian faith), the life within radiates His light to the world (character), while being able to solve practical problems of life with His superb wisdom (intellect).

That is what I got from Him. Thus, I take ownership in the mission statement. Now I have something to be excited about: Not by might nor by power, but by my spirit, says the Lord Almighty (Zech.4:6 NIV). I can do everything through Him who gives me strength (Phil 4:13 NIV).

Welcome Zelalem to the Engineering Department!
New Additions Make Labs More Convenient

By Earl D. Swope

Recent purchases by the Engineering Department have added some flexibility to the labs on the second floor of Frey Hall. The Electrical Engineering labs are now home to a digital camera and printed circuit board (PCB) fabrication equipment.

Senior projects, as well as other projects, require the use of a digital camera to take pictures that will be used in a presentation. Without a digital camera in the department, students had to go elsewhere or scan regular photographs into a computer. Scanning photographs slowed students down by requiring a lot of extra steps. Going outside of the department required extra time to visit and coordinate with a number of other people. This problem of extra steps and additional time affected both mechanical and electrical engineering students.

The electrical engineering students had an additional burden when their senior projects required the fabrication of a printed circuit board (PCB). Up until last semester, all PCB's had to be fabricated by hand with simple tools. This process required an enormous amount of time because the board had to be etched by swirling it back and forth in a glass tray full of chemical. Extra caution was also needed because the chemical used stains very easy and can harm skin.

There are many things that work against senior projects. Time that can be better spent is one of these adversities, perhaps the biggest one. Therefore, when the department purchased the digital camera and the PCB fabrication equipment, the department aided senior projects, and other projects, in a big way.

Last April, three different senior project groups, as well as the solar racing team, made use of our PCB fabrication equipment. The equipment is also being used to upgrade the Manufacturing Lab in the basement of Frey Hall. Presently, the lab uses a circuit built on a prototyping board to interface between the computers and the motorized Lego™ building blocks. Loose wires can really be a headache in this situation. The PCB fabrication equipment will really make a difference in this case.

The digital camera was a big help to the Dokimos Ergatia team. During the summer, two team members went to West Africa to troubleshoot and inspect the solar power station. Two team members stayed at Messiah College to do research. Before shipping an important piece of equipment overseas, the two team members that were at the College could take a picture of the equipment in order to accurately show where connections were to be made.

Plans are in order to incorporate these new pieces of equipment into actual classwork in the coming semester. In the end, a lot of time will be well spent doing other activities and in further instruction and research. In addition to new and better equipment, the department is also drawing up plans to move furniture and equipment to use the lab space more effectively.

Electronics Laboratory Introduced to Surface Mount Technology

by Earl D. Swope

During the summer, the Engineering Department also purchased soldering equipment that is specifically designed to handle surface mount technology (SMT) electronic components. In today’s increasingly compacting world, electronic components are being made smaller and smaller. With smaller components, the standard soldering equipment can actually harm the components while they are being connected to the circuit board. Therefore, the Engineering Department purchased a special soldering iron to be used specifically with the SMT components.

With this new equipment, the engineering professors and students can learn more about SMT by experimenting with SMT components. Furthermore, since the laboratories have printed circuit board fabrication equipment, students and professors can use SMT components to make circuits for senior and special projects. Using these components will not only cause the circuit boards to be smaller, allowing for a more compact finished product, but will give students valuable real world experience as well.

Soldering equipment that is designed for SMT components have smaller soldering tips. The temperature of these tips is also more accurately controlled. With a larger, less accurate tip, smaller, more compact components, like SMT, can be easily destroyed. SMT components have tiny flat metal strips as contacts, as opposed to the longer, thicker metal leads of regular components. Since SMT components are mounted on the surface on the printed circuit board (as their name suggests), there is no drilling required during printed circuit board fabrication. Skipping the drilling step saves students or professors about a half an hour.

Engineering Newsletter • 3
Overseas Summer Adventures

In Burkina Faso
by David Adler

Four students spent the summer at Messiah College and in Mahadaga, Burkina Faso, working for Dokimoi Ergatia, Messiah’s "Approved Workers." Dokimoi Ergatia is an interdisciplinary service-learning opportunity sponsored by the Engineering Department. One of our goals is to discover new ways of integrating faith and work: to learn how God is using the gifts and talents of persons from various disciplines to build his Kingdom. Another goal is to witness the relevance of faith and practice to other persons in our disciplines.

A team of students and staff are designing human-powered pumps that will allow persons with disabilities to draw irrigation water for a microenterprise garden in Burkina Faso. The team is also designing a deep well and distribution system to provide drinking water for a new school for the disabled. The garden and school are a ministry of the Society for International Ministries (SIM). Our goal is to implement this work in Burkina Faso in August 2000.

This summer, Dale Johnson and Matt Walsh spent three weeks at Messiah College and six weeks in Burkina Faso upgrading the solar electric system that we installed in 1996 for the Mahadaga medical clinic. They also conducted on-site research in support of the new water resources projects. Sarah Highhouse and team leader Bryan Odentra spoke at the summer at Messiah College where they worked on actuation, transmission, and pump designs for the project.

We thank God for the many individuals and churches who are supporting us with prayer and funds for travel, summer work stipends, and material resources. Many companies have also donated materials to the project. If you want to learn more about Dokimoi Ergatia or receive an occasional newsletter, please contact Dr. David Adler (dvaider@messiah.edu).

In Honduras
by John Meyer

Thousands dead from an earthquake in Turkey, famine in the Sudan, floods in China and war in the Balkans. In this era of modern communications, reports of tragedies from around the world almost seem commonplace. We can become desensitized to the sufferings of others just by the sheer volume of need or by the fact that it is so distant from our doorstep. But I believe that most of us wish there was a way that we could personally share the love of Christ with those in need. This past June, I had one such opportunity as I joined a group of people from my church working to rebuild houses in the village of Swanah Bight on the island of Guanaha, Honduras.

In October of 1998, Hurricane Mitch stalled over Guanaha for thirty-six hours. The island was almost completely devastated. Totally exposed to the elements and left to live without food or shelter for days, people fled from the low coastal areas to the interior mountain. Seven months later, you could still hear the terror in peoples’ voices as they recounted the story. Some villages were reduced to rubble, while others were completely washed out by a thirteen-foot tidal wave. The mountains, once covered with thick forests of pine and palm trees, were scorched almost bare. A sharp contrast to an island that was once likened to "paradise" for its turquoise blue waters and lush vegetation.

The following is a small "snapshot" of what we encountered when we arrived in late June, almost seven months after Hurricane Mitch hit.

Tuesday Morning, June 22, 1999: another hot humid day in Savannah Bight. I’m on my way to look at our first construction project with Scott Floyd, the mission director in Guanaha. We past many houses in various states of repair but the one thing that is universal is the piles of garbage and debris. In combination with the open sewage system, it is easy to see why so many of the children are often sick. The house is only about a mile and a half from the church where we are staying, but the trip seems to take forever. Every hundred yards or so we are stopped by another person asking Scott when their house will be worked on or where they can find materials to rebuild. Scott seems to take it all in stride but you can see how dealing with the sheer volume of need, day after day, can wear a person down.

After a dozen or so conversations, we arrive at the house and are greeted warmly by a woman, Conchita, and two small children. The house is in pretty bad shape. It has an old billboard canvas for a roof, huge holes in the floor, and one side of the house is completely missing, while another is about two thirds gone. "Well, if I fall through the roof, at least I’ll land in the water," I told myself. Yet, I come to find out that construction will be the easy part. Scott tells me that the woman’s husband is an alcoholic. He has taken the relief money the family received from the Honduran government and started to fix up "his side" of the house. The rest he apparently drank away leaving his wife and kids to fend for themselves. Do we
Dreams Do Come True

by Darren Danielsen, '01

As children, we all had dreams. Some of those dreams were to be fire-fighters, some to be doctors, some to be super heroes, and some to be space travelers. Our imagination was our limit. Although we grew older, some of those dreams stayed close to our heart. Since I was young, I was always fascinated by flying. There seemed to be so much freedom in flying. I can remember closing my eyes and pretending that I was free like a bird. For those few moments, it almost seemed like reality. This past spring, that dream came true. Through the hard work of Dr. Pratt and Bryan Ondreak, the Messiah College Flying Club (MCFC) finalized its membership in the Mid-Atlantic Soaring Association (MASA).

Since its origin the MCFC had been looking for ways to include flight instruction as part of the club's activities. The club started the construction of the "airbike," the first ultra-light, in hopes that after "Tandem," the second ultra-light, was built, Dr. Pratt would be able to give flight instruction in the "Tandem." Those hopes were crushed because of insurance reasons and safety concerns, so Dr. Pratt considered the possibility of joining another flying club, specifically the MASA. After many meetings among the MASA, MCFC, board of trustees, and lawyers, an agreement was reached which allowed Messiah College students to become provisional members in the MASA.

Tim Skaar '99 and I became the first MCFC members to have "Flying Status." I began my training on March 27th with an introductory flight and spent the next seven weekends at the MASA glider-port in Fairfield, Pa. On May 8th I left for the glider-port for my first solo flight; it was my 23rd flight. It rained the entire way to the airport, but the sun finally peeked through the clouds as I approached the glider-port. There was turbulence in the morning so I decided to take a few extra flights before my solo. Soaring through the air with nothing but the wind for noise was so much better than I could have ever possibly dreamed.

Darren Danielsen on the ground in his glider.

Darren Danielsen in the air.
Excerpts from e-mail:

Chrisy Ficarra '99
I'm into my second week of classes, and so far I love it. I'm learning how to use ANSYS... it's a FEA software package... so of course I'm trying to memorize all the notes we got in Machine Design about FEA. Oh, and get this, I have to teach... statics... for two days. I figure that if I relate everything to soccer, they'll stay interested.
They just started a Bible study for grad students through InterVarsity. It's awesome. My biggest prayer before I left to come here was that I would find some real fellowship, and the Lord has blessed me a million times over. So far I am convinced that this is where I'm supposed to be.

Brian Winkler '92
I wanted to give you an update on what I am up to... God has called us back to Pa. I have enrolled for the fall semester at Lancaster Bible College where I will be studying Church Music and Bible. Fortunately, all of my Gen. Ed. classes transferred into the program so I will be starting as a junior. I will also be once again working part time as Music Director for Capital Baptist Church...
Some of my peers ask me about "wasting" my engineering degree. However, I feel that my years in the engineering profession have been anything but in vain. It is engineering that first brought us to Pa. In addition, as we have been financially blessed, we have been able to bless others. Also, I have made many great contacts and have been allowed to both minister to others in my field, as well as to be blessed by fellow Christians. ...
My engineering basic skills can be used within the church as well. The ability to organize and systematically solve a problem is needed in the church. Finally, as churches are getting more and more technical, they need staff members that can understand the various technologies in order to further the spreading of the Gospel.
I am excited about the opportunity that God has given me to use my various gifts and abilities in full-time ministry. It has been neat to see God working through events in our lives to bring us to this place.
We would really appreciate your prayers as we undertake this new "adventure."

Linda Bert '97
Admit the turmoil (at AMP), my career has been going smoothly.
The two-year training program that I was a part of was discontinued, but I did complete all of the requirements of the program and "graduated" this month [May]. I am very excited over this first promotion and am getting into the swing of a new position with the company. I am now working in the communications division as an electrical development engineer. I work with a small group of engineers to develop communications connectors that meet industry standards for cross talk, return loss, attenuation, etc.
My training in electromagnetics and communications has been of tremendous help in this specialized arena (thanks, Dr. Underwood) along with all of my other courses.

Best wishes to these alumni who begin graduate studies this fall:

Aaron Alexander '99 Purdue University
Christina Ficarra '99 North Carolina State University
Daniel Hallowell '99 Lehigh University
Douglas Pooler '95 Washington State University
Congratulations to Ben Claggett '99 and Phil Sorensen '99, winners of the 1999 Instrumentation Society of America (ISA) Outstanding Student Award for the use of instruments and controls. The winning design, selected by the Engineering faculty, was an Autonomous Instrumentation Package for recording solar, wind, and other data in remote locations. Each year, the Central Keystone Section of the ISA awards a plaque, a one-year membership in the ISA, and a cash prize of $500 to a winning design team selected by the engineering faculty. Mr. Dan Elliott of Distributed Systems, Inc., presented the award following the Claggett/Sorensen presentation at Messiah's 7th Annual Conference on Senior Engineering Design Projects.

Rebecca A. Snow won the James T. Scroggin Excellence in Engineering award for 1999. This award is given annually to an engineering senior who is selected by the Engineering Department faculty based on service, scholarship, and leadership in the department and at Messiah College. Beck graduated with a BSE in both mechanical and electrical concentrations. Congratulations Beck!

The Engineering Department is pleased to announce the creation of a rotating scholarship chair, endowed by a gift from Mr. Clarence Hottel of Fidelity Engineering in Baltimore, Md. Mr. Hottel is a longtime friend of the department and member of the advisory board that began Messiah's BSE program. Thanks to his gift, members of the Engineering faculty may apply for release time in support of a scholarship project. The endowment provides each recipient of the Hottel Chair with release time equivalent to one semester, to be distributed over the course of a two-year appointment. The endowment also provides to each recipient a research grant.

Dr. David Vader has been appointed the first Hottel Chair of Engineering. For several years, the Engineering professors and staff have experimented with service learning as a means of influencing our graduates toward more responsible engineering. Creating and using technology may indeed, as Samuel Florman suggests, provide existential pleasures for the engineer. Technology, however, is what philosophers call an instrument value. It is not valuable itself, but is valuable because it enables one to achieve something else that is valuable. In his application for the Hottel Chair, Dr. Vader proposes that an engineer discovers the inherent value in her or his work when engineering is practiced as a kind of service.

His proposal asks: "Is service-learning effective in shaping the character and conduct of Messiah's engineering graduates? Can it help them make active connections between Christian faith commitments, learning, and professional life? The familiar process of gaining and learning to use new information achieves many of our goals for would-be engineers. In his book, The Divine Conspiracy, Dallas Willard laments that there is "no field of expertise in human affairs where interaction with God is a part of the subject matter or practice that must be mastered in order to be judged competent." "Observe how people are taught and certified or judged competent," Willard says, "and you will be staring the flight from God straight in the face." We live by our competencies in every context where we are supposed to be smart and informed. "Our souls are, accordingly, seared with secularism."

One goal of Dr. Vader's project is to further develop Dokimia Ergatia as a source of service-learning opportunities for Messiah College students and faculty. Other goals are to explore ways in which our faith should intersect with the study of engineering and to respond to Willard's challenge and enumerate abilities that must be mastered by those judged competent Christian engineers. A final goal is to devise ways of measuring the contribution of service-learning to the mission Messiah's Engineering Department, and to eventually share a proposal of best practices for service-learning with other colleges and universities.


Marconi Makes Way for Wireless Revolution
and Wonders of a Digital Age

by Harold Underwood

Messiah College meets the new millennium this year with the 20th-century retrospective: "People, Ideas and Machines." Such a retrospective reminds us that history often paves the way for opportunities of the present and future. Heinrich Hertz, a physics professor in Germany first generated and detected radio waves before the 20th century. However, Guglielmo Marconi of Italy first successfully transmitted radio waves across the Atlantic Ocean in 1901. In 1909, Marconi won a Nobel prize with Braun of Germany for "wireless" telegraphy. The electronic computer emerged near the middle of the 20th century. However, discovery of the transistor by Shockley, Brattain, and Bardeen in 1948 and introduction of the microprocessor as a chip by Intel in 1971 truly made the miniature and speedy personal computer a reality.

Today we stand at a crossroads when growth of wireless technologies continue to multiply and clock rates of electronic computers accelerate in the 100s of MHz. Lower cost hardware and software now enable applications in multiple fields to take advantage of DSP—algorithms specially devised for digital systems. Where does this leave us? More places where engineers can find opportunities with a background either in high frequency electromagnetics or DSP.

In the engineering curriculum at Messiah College, three courses help launch students in this direction: Linear Systems (ENGR 365), Electromagnetics (ENGR 367), and Communications Systems (ENGR 369). Thanks to the Pennsylvania State Equipment Grant and other generous donations, the Engineering Department has recently acquired six new radiofrequency (RF) signal generators (150 MHz max) and two new Spectrum Analyzers (1.5 GHz max). Also exciting is the addition of six new Texas Instruments TMS320C31 Floating-Point DSP boards for the Electronics lab. The TI C31 DSP board stands alone when powered by a simple adapter and is programmable by software on the Frey 254 PCs. For real-time DSP projects, linking software from the web now reduces programming of the TI boards from MATLAB SIMULINK to just a few mouse clicks. Both the new TI C31 DSP boards and the new RF equipment should help support student lab work in curriculum engineering courses. However, they will also enable more senior projects in the RF and DSP areas and prepare more Messiah engineers for opportunities in the 21st century.