



Engineering News

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Fall 2004



Bryan Pilcher '06 begins the endurance race.

Genesis II makes a splash

by Nathan Bird '05

“Although this was the team’s rookie appearance they made quite an impression.”

After nearly a year of hard work by a dedicated team of students, the Genesis II Solar Racing Boat took to the water at Pinchot Park this past May. After final exams were finished, the team worked furiously to complete the finishing touches and perform last minute tests and adjustments before the race. There were lots of quizzical looks and questions from the fishermen and sailors at Pinchot about the odd-looking craft, but the students answered them patiently and enthusiastically. In the end, everything came together and the team left for Buffalo, New York the last week in June with 12 students and the team’s advisor, Dr. Don Pratt, for five days of racing in the annual Solar Splash Competition.

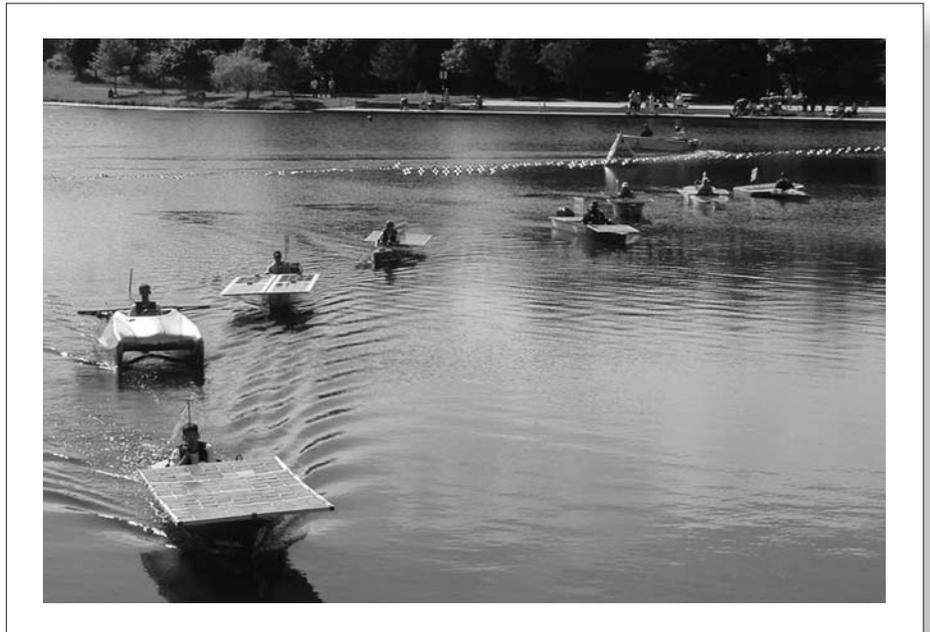
Although this was the team’s rookie appearance they made quite an impression. The competition did a double take when the modified sport catamaran design was rolled out of the trailer. No other teams had built anything quite like the Genesis II, and there were many “knowing” smiles and some laughter when they first saw “Miss Lucinda,” named after the wife of one of the major Genesis sponsors. However, the laughter turned to admiration as the highly efficient hull passed boat after boat in the efficiency competition, leaving only the razor thin hull built by the ETS team (Montreal, Canada) ahead of Genesis at the end of the race. Even the overall winners from Cedarville University, with their many years of

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experience, had to take a back seat to Genesis in the efficiency race. Overall, the Messiah team took 4th place out of 17 teams from colleges and universities across North America. The team also received the award for outstanding team- built hull and for a notable performance by a rookie team.

The team is fired up for another year of continued development as they prepare for the next race in June 2005. With the experience gained from the 2004 race, the students are dreaming up all sorts of wild ideas to improve the performance of the boat, and they are looking forward to the coming year for making modifications and testing their ideas. For more information and photographs, please check out our website at www.messiah.edu/genesis.



The Genesis solar beginning the endurance race.

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The Genesis II Solar Racing Team poses with “Miss Lucinda.”

Transition to a new chair

by Carl Erikson

As the new chair of the Department of Engineering, I have two items that I must share with you. First, I want to thank Dr. David Vader for chairing the department for seven years. His leadership skills and his desire for students to respond to God's calling have made Messiah's engineering program an innovative and exciting one to be involved in, either as a faculty member or student. Secondly, I want to take this opportunity not only to welcome back the continuing students in the engineering program but also welcome our new first-year and transfer students. Your desire to learn and apply engineering principles for God will make this another successful academic year.

For the most part, things will not change; our excellent faculty will continue to teach, mentor, and advise each engineering major, our facilities will continue to be updated and effectively used, our mission to include service-learning projects will continue to be enhanced through cocurricular projects and the

Collaboratory for Strategic Partnerships and Applied Research of which Dr. Vader is director. However, as in any change in leadership, some things will change over the next few months and years. There are several new initiatives started under Dr. Vader's leadership which will be implemented to include a new admission to the engineering major policy, a pilot program using the Integrated Projects Curriculum approach, and the consideration of reinstating the civil engineering concentration using the Philadelphia campus. Please feel free to visit me and share your opinions on any of these or any new items that come up.

Each year I will establish a theme for the department to think about. This year the theme is "Imagine . . ." It is based on Ephesians 3:20–21 which says, "Now to him who is able to do immeasurably more than all we ask or *imagine*, according to his power that is at work within us, to him be glory in the church and in Christ Jesus throughout all generations, for ever



Carl Erikson

and ever! Amen" (NIV). I believe God has already done great things through the students and faculty of this engineering program. People in Burkina Faso, Guatemala, and Harrisburg can testify to that. However, I also believe He has much more in store for us in the coming years. Do you dare to imagine what they can be and how God can use us? Stay tuned as God works through the students and faculty of this engineering program.

Newly revised admission into the Engineering Major Policy

Admission into the engineering major is a two-step process. First, a student must declare a pre-engineering major as a first-year student, transfer student, or change of major. Pre-engineering majors are eligible to enroll in the lower division engineering courses subject to the normal prerequisites. Second, to advance to upper division courses in the engineering curriculum, pre-engineering students are required to apply for admission into the engineering major by declaring a concentration* (computer, electrical, or mechanical) and by completing the following prerequisite courses (or the equivalents) with a grade of "C" or higher: MAT 111, MAT 112, MAT 211, PHY 211, PHY 212, ENGR 231, and ENGR 262. The student begins the application process by completing items one through three of the Application For Admission To Engineering Major (BSE) Program form

and submitting the form to his or her academic advisor. The academic advisor forwards the application to the chair of the engineering department. The department chair's† approval and signature on this document admit the student to the engineering major. The department chair† will notify the applicant and her or his academic advisor of the decision in writing by the specified deadlines. Pre-engineering students are strongly encouraged to apply for admission to the engineering major as soon as eligible. The typical student who begins first-year studies as a pre-engineering major will complete all prerequisite courses by the end of the third semester. **Students who have not been admitted into the engineering major will NOT be allowed to register for 300-level or higher classes offered by the engineering department.**

Deadlines for applications for continuing Messiah College students:

Spring semester: October 15, with notification by **November 1**.

Fall semester: March 15, with notification by **April 1**.

Deadlines for transfer students:

First day of classes, with notification by the **last day to add classes**.

* *Students can declare a dual concentration. If a student wants to change concentrations after being accepted into the engineering major, the student must submit a Change of Engineering Concentration Form to the academic advisor.*

† *Or department faculty member designated by the department chair.*

New developments in the electrical labs

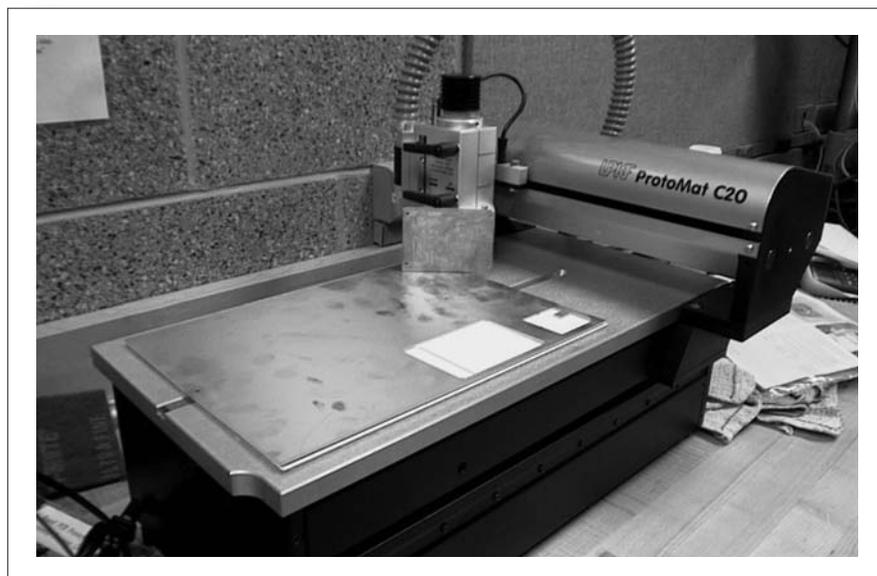
by Matt Walsh '00



Frey 254 lab



Frey 252



New milling machine to fabricate PCBs

Students may need a road map this year to see all the new changes that have taken place in the electronics labs over the summer. Students will benefit from new lab space in Frey 254, new equipment, new parts, and more room to create and test their project designs.

Frey 252

Frey 252 has recently been converted from a classroom to an engineering department lab. The room has now been configured to house five work stations, each with a cart. These work stations will be assigned to senior project teams for one year, providing a place where equipment and prototypes can be constructed and tested without daily setup and take-down. Frey 252 also provides three network computers and three electronics test stations. The existing podium computer and video equipment will remain. All engineering project teams may use the room and video equipment for meetings, training, presentations, or conferences by making a reservation using the sign-up sheet on the door.

PCB lab

The method of producing etched printed circuit boards (PCBs) has been replaced this summer by a milling process. Now students will use the LPCF ProtoMat C20 milling machine for making PCBs. Students can take their electronic files from Ultiboard and import them into the C20's software. The C20 first drills all holes for the board, then mills out around all the traces, removing the excess copper, and finally routing out the board to any desired shape. Not only can traces be made much smaller by milling than by the chemical etching method, but also the whole milling process works more reliably. We have also added a surface mount technology (SMT) solder paste dispensing station that uses an air compressor to provide the precise amount of paste for various SMT components.

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Students can now use most SMT components easily by using the paste dispenser along with vacuum pen pick and place tools and a reflow oven.

Other changes

The old component bins have been replaced with a new components cabinet, improving organization and offering a wider selection for projects. The new cabinet holds all the components previously available, but now also includes components previously unorganized or unavailable as well as a new batch of components that were purchased this summer to fill out our inventory and provide equipment in other areas.

Modifications and improvements that have occurred over the summer represent a continued effort to provide high quality tools and resources to students in the department.



New component cabinet.

Hello from a recent graduate

Hello! It is a strange feeling to not be preparing to go to school this fall, so to keep busy, I decided to accept an offer for full time employment. (I'm joking! I diligently looked for a job over the summer, but knew this was the right one as soon as I found it). The job description perfectly suited what I feel my engineering strengths are. I am working for Metso Minerals, a division of Metso Corporation, <http://www.metso.com/>. My title is Pyro Process Engineer, which sounds like I play with fireworks, but I am learning to design kilns for heat treating minerals, <http://www.metsominerals.com/>. Metso is based out of Finland with over 26,000 employees worldwide. The Danville, Pa., location I am at has around 100 employees, including mechanical, electrical, and civil engineers. My job is a hybrid of mechanical and chemical engineering focusing on thermodynamics and heat transfer. My job does have domestic and international travel involved, around three weeks a year. I should be in Missouri within the month (exciting!) and China and Australia are also possible destinations (much more exciting!). Metso has divisions all over the world, but the Pyro Processing is only handled in Danville (and Australia, to a much lesser degree). The kilns are usually 6–20+ feet in diameter, a few hundred feet long, and cost around \$10 million. I am told there are two Messiah grads here, but I have not met them yet. The engineer who I replaced is

still in the office and graduated from Grove City and Purdue, and was one of a few people who told me they knew the authors of the engineering textbooks I just can't escape from.

I hope all is well at Messiah and in the engineering department. I will miss being there and being with the people I spent so much time with during the last four years, but I am excited to be a full-time engineer.

Wishing you a wonderful fall semester,

Becky Gast '03

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Burkina Faso summer 2004: engineering solutions to transformational development



Dan Dourte '04 stays close by as Yempabou learns to maneuver his electric bicycle.

“Working with DE for the past two years, I consider myself truly blessed to have had the opportunity to participate in this ministry of transformational development, development that aims to unleash the potential of the human soul by meeting the physical and spiritual needs of people.”

The Dokimoi Ergatai (DE) Summer 2004 trip to Burkina Faso was an adventure of learning, hard work, sweat, tears, growth, friendship, and discipleship. A team of 10 students, one faculty member, and one staff member traveled to Burkina Faso to continue DE's commitment to support and further the ministry of Handicapes En Avant, a center for the rehabilitation, education, and employment of disabled children and adults. Located in the remote, rural village of Mahadaga, the center works to improve the lives, spiritually and physically, of people with disabilities who are often not well cared for in underdeveloped areas. Working with DE for the past two years, I consider myself truly blessed to have had the opportunity to participate in this ministry of transformational development, that aims to unleash the potential of the human soul by meeting the physical and spiritual needs of people.

The project

SIM missionary and Handicapes En Avant visionary and director Françoise Pedau made a request to DE in 2002 for

a simple electric wheelchair. She asked that an electric power kit be added to the existing hand-powered tricycles, which are used as mobility devices by many of the local disabled people. For some people without the strength or coordination to use the hand-powered tricycles, an electric tricycle could provide a much improved level of mobility. A 2003–2004 senior project team of which I was a member responded to this request from Françoise by partnering with DE to design and implement a new mobility solution: the electric tricycle.

In Mahadaga this summer, John Meyer and I introduced the electric tricycle. We worked with a local craftsman named Moussa, a Handicapes En Avant employee who makes hand-powered tricycles, leg braces, and other physical therapy devices, to teach him how to maintain and manufacture much of the new design. Starting with the familiar design of the hand-powered tricycle we added a chain-drive system that drives a rear wheel from a small 24 VDC motor. A single axis joystick provides throttle and braking, and directional control is provided by a tiller-type steering bar. The electric tricycle was designed to be as appropriate as possible, which meant using mostly locally available materials and manufacturing processes so local maintenance and replication could be achieved.

While some readers may be on the edge of their seats, eager for detailed design specifications, probably more people would rather hear what Yempabou thought about the project. Yempabou is a 13-year-old boy who lives in Mahadaga, Burkina Faso. He has cerebral palsy that severely limits his level of mobility, and he was the first recipient of an electric tricycle. As a crowd gathered in anticipation of Yempabou's first ride on the electric tricycle, it seemed that he didn't share my anxiety about the possibility of failure. He seemed to not even notice all

the people; he appeared to be simply eager for the chance to use this tricycle that had the potential to help him be more mobile. However, after Yempabou spent a few minutes operating the electric tricycle, we did share feelings of joy and thankfulness. If smile frequency is a valid way to assess project success, then I would judge this initial phase of the electric tricycle project to be quite successful. For me the highlight of this whole journey, from the sometimes tedious design work to the often exciting implementation, was the uninhibited joy shown by Yempabou's father upon seeing his son moving about in his new electric tricycle. It was truly a great gift, and we have a great, great God who deserves the praise and thanks for such a gift.

The people

To give an accurate portrayal of the time that our team spent in Burkina Faso, more must be said about the people we worked with and learned from. Over the years, Francoise has gathered an incredibly effective and capable staff at the center. Anyone who has served together with this staff comes away thoroughly inspired by their courageous service.

It takes a certain amount of courage to travel long distances by motorcycle in areas where there is danger of bandits and where problems with the motorcycles are not easily repaired. Several times a week, Joel, Pierre, Palamanga, and Francoise travel to visit disabled people and their families in remote villages. The goal of these visits is to extend the reach of the rehabilitation that the center can provide by teaching simple physical therapy methods to the family members of a person with a disability. Sadly, there are some people who neglect disabled members of their family, and sometimes increase their suffering by not showing them the love they deserve. Working tirelessly and faithfully to meet the needs of the disabled, the staff communicates to the families of people with disabilities that the disabled



Local children, DE team members, and Handicapes En Avant staff gather around as Yempabou concludes his first ride on the electric tricycle.

person really is valuable and really does deserve to be loved.

Ultimately, the goal of the home visits and the goal of Handicapes En Avant as a whole is to help bring about spiritual development in people with great needs. It is good news for those with disabilities when the staff comes to visit and administers physical therapy or provides some mobility device, but the home visits always included some Bible reading or song to focus the attention on the ultimate source of the Good News. The work of the handicap center is a model for transformational development that aims to free the human soul to know, love, and commit to the God of abundant life.

What a gift it has been to have the opportunity to participate with Dokimoi Ergatai in partnering with Handicapes En Avant and engaging in transformational development. My involvement with DE will continue as I assume the role of an alumni advisor for the Tricycle Group this year. It is my challenge now, and the challenge of all the members of our team, to maintain and apply all we have learned in our work preparing to go to Burkina Faso and in sharing in the work of Handicapes En Avant.

—Dan Dourte '04



N'Dansima, Yempabou, and Dan Dourte '04 plant a Mango tree as a symbol of the partnership between Dokimoi Ergatai and Handicapes En Avant.

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Genesis II Solar Racing Team receives one of its four awards. (Pictured left to right) front row: Nathan Bird '05, Fred Yutzy '05, Dan Yoder '06, race official, Kurt Stabler '05, Zack Eakin '05; Back row: Nate Swanger '07, Steve Osborn '06, Bryan Pilcher '06, Dr. Don Pratt, Drew Bryden '06, Ross Billings '06, RC Hartman '05, Jeff Delcamp '06

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.