MESSIAH COLLEGE

Engineering News

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In the waters, again: Solar Splash 2005

By Stephen Osborne '06

For the past year, the Genesis II Solar Racing Team has been very busy preparing their entry to the 2005 International Solar Splash Competition. After a full year of working to optimize the craft's performance in all three portions of the competition (sprint, slalom, and endurance), the team was looking forward to competing in Buffalo to win the title of 2005 Solar Boating World Champions.

The team had many weeks of testing under its belt before leaving for the race. These test days enabled us to fully optimize our variable pitch and tilt propeller system, to determine the most efficient configuration for each race section. There were also upgrades to the drive train, in order to make the boat glide more smoothly through the water. An improved system was conceived and built that narrowed the drive train's profile, and put the propeller farther down in the water. This upgrade would both reduce drag and prevent any turbulent water from interfering with the flow to the propeller, leading to a more efficient system.

The automatically tracking solar array was also tested and redesigned to provide a more precise alignment with the sun during the competition. This would keep the array panels pointed directly at the sun, even if it were as far as 45° from vertical. This adjustment, when compared to the 30° limitation of the previous system, resulted in a 10% power increase. A failure during testing of the telemetry system used to monitor the boat's performance prompted an upgrade to that system as well. The new telemetry system monitors data at a greatly increased rate, and can also monitor more data channels than the previous system.

Bryan Pilcher, solar array team leader, pilots the boat through the endurance race.

After these final preparations were made, the team felt confident that their boat was the best it could be, and quite possibly the best at the competition. Once at the competition in Buffalo, N.Y., we started out strong, receiving an award for the second best technical report in the competition. We also received two top technical awards. Our innovative automatic sun-tracking solar array, construct-

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Our innovative automatic sun-tracking solar array, constructed of space grade solar cells, won the Best Solar System Design award, and turned quite a few heads in the process.

Bryan Pilcher and Andrew Bryden monitor the automatically tracking solar array as it charges the battery pack.

Composites team leader and driver Kurt Stabler '05 competes in the slalom race.

Innovative techniques such as sand molding and vacuum infusion were used to lower the construction time to a very impressive four days from start to finish for a completely new set of custom-built propellers.

ed of space-grade solar cells, won the Best Solar System Design award, and turned quite a few heads in the process. Some teams had tried to build a tracking system that would automatically follow the sun, but our team was the first to make it work in the competition. The vectored thrust drive system, along with our custom-built variable pitch propeller system also won top honors by winning the Drive Train Design award. Other teams were also very impressed with the drive train system, especially the CNC milled lower unit and the many homebuilt propellers that we used to optimize the boat's performance during testing. Innovative techniques

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such as sand molding and vacuum infusion were used to lower the construction time to a very impressive four days from start to finish for a completely new set of custom-built propellers.

Once on the water and racing, our team was doing well after several qualifying rounds, when we were faced with an unusual problem. During one of the races, our propeller struck a concrete block in the lake where the competition was being held, which cracked the propeller shaft in the lower unit of the drive train. This component failed completely the next day while we competed in the endurance championship heat. The damage from this impact was so extensive that we could not use the drive unit at all to compete in the next day's sprint races. The backup unit we had brought was simply not strong enough to power us for the sprint races, and we were left with the unfortunate reality that we couldn't finish the competition. We could only watch as other teams passed us in the rankings the next day. We still managed to place in the top 10 (out of 19) despite missing an entire day of the competition. Despite this major disappointment, the team remained upbeat and supportive of one another, which was a real witness to the Christian character of each of the team members.

This coming year, the team is planning to repair the damage our drive system sustained and upgrade the solar array and motors in preparation for the 2006 Solar Splash. We are also very interested in recruiting new members to help us on this exciting journey. Anybody interested in developing cutting edge technology, applying classroom knowledge, and just plain having fun should consider joining our team.

For more information on joining our team, or more details about any of the changes we have planned, please visit our website (www.messiah.edu/genesis) or e-mail genesis@messiah.edu.

Electrical engineer's description of a Christian's week: part 2

By Carl A. Erikson Jr.

(This is the second of a two-part article. The first part can be found in the Spring 2005 Engineering News.*)*

Now I will look at the rest of the week, initially beginning with Monday and going through Wednesday. Because each day may contain similar circumstances, I will only mention the components once for each day.

RESISTOR — Resistors are used to slow down the current, heat up filaments, and, simply, sap the energy of a circuit.

The analogy would be the Monday morning "blues," a confrontation with a fellow student that rubs you the wrong way and makes you "lose your cool," cheating on a test — namely, anything which saps your spiritual energy.

Some spiritual "resistors" are:

Colossians 3:5–9 *Mortify therefore your members which are upon the earth: fornication, uncleaness, inordinate affection, evil concupiscence, and covetousness, which is idolatry. For which things' sake the wrath of God cometh on the children of disobedience, in which ye also walked some time, when ye lived in them. But now ye also put off all these: anger, wrath, malice, blasphemy, filthy communication out of your mouth. Lie not one to another, seeing that ye have put off the old man with his deeds.*

Other "sappers" of our spiritual energy include pride, envy, jealousy, etc. The next two components can help us overcome the "resistors" of life.

INDUCTOR — one of the basic functions of the inductor in electrical engineering is to resist change in current.

The spiritual analogy of the inductor would be the Holy Spirit. He wants to help me resist the Devil and temptation into sin. It is the Holy Spirit that convicts me when I am tempted and begin to sin.

Scriptures include:

Romans 8:26 *Likewise the Spirit helps us in our weakness; for we do not know how to pray as we ought, but the Spirit himself intercedes for us with sighs too deep for words.*

John 16:13 *When the Spirit of Truth comes, he will guide you into all the truth, for he will not speak on his own authority, but whatever he hears he will speak and he will declare to you the things that are to come.*

CAPACITOR — The basic purpose of the capacitor is to store energy and release it when needed.

This function is analogous to our faith. Faith is what is put to the test when temptation arises. As a Christian, it is very important to utilize our faith. What is our faith based on? CHRIST! And what He has done for us and to us.

Scriptures include:

John 6:40 *For this is the will of the Father, that every one who sees the Son and believes in him should have eternal life.*

Romans 11:20 *They were broken off because of their unbelief, but you stand fast only through faith.*

Hebrews 11:6 *Without faith it is impossible to please God.*

Together an inductor and a capacitor form a "tank or tuning" circuit in electrical engineering. If we allow the Holy Spirit to show us the truth to "resist" sin and put our faith in God, we, too, will be tuned in or in harmony with God.

Tuesday and Wednesday are often like Monday, with spiritual "resistors" and tuned circuits occurring. On Wednesday night I can get another "spark" by going to midweek service to worship God and fellowship with other believers.

ANTENNA — This device has two functions: the first is to send out or propagate radio waves, and the second is to receive radio waves when properly tuned to specific frequencies.

I, too, must propagate the Good News of Jesus to others. This is our Great Commission. Mark 16:15 and Matthew 28:19 state *"Go into all the world. . . ."*

The spiritual analog for the receiver is that each Christian must be listening (specifically tuned) for God through the Holy Spirit and His word.

GROUNDED — In electrical engineering, grounding is essential for many things to work correctly. Grounding means to establish reference to a specific point in a circuit, which is "physically" connected to the earth ground through various ground wires in the line cords.

As Christians we must always remember to be referenced to, or grounded in, Christ and His Word.

Scriptures state:

Psalm 119:11 *Thy Word have I hid in my heart that I might not sin against thee.*

John 15:7 *If ye abide in me and my words abide in you, ye shall ask what ye will, and it shall be done.*

Colossians 3:16 *Let the word of Christ dwell in you richly.*

In other words, we must have a personal relationship with Christ and then really study His word to know answers not only to our own questions but to others' as well.

LIGHT BULB — This device, when powered, illumines its surroundings, getting

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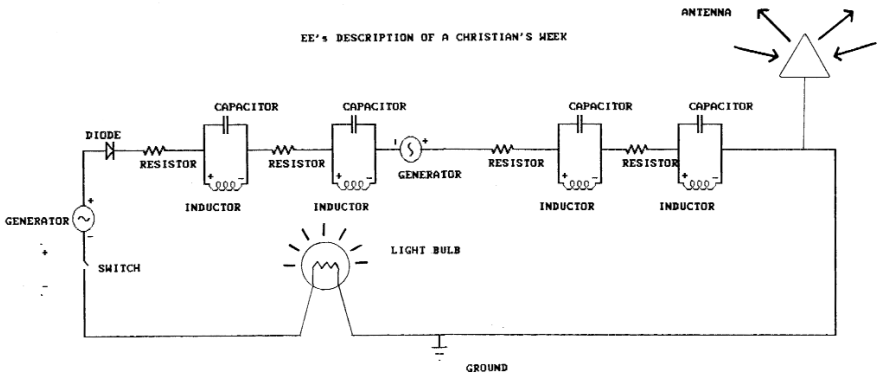
rid of darkness. The spiritual analogy is that we are to be spiritual lights to the world when powered by Christ.

One Scripture passage states this specifically:

Matthew 5:14 and 16 *You are the light of the world. . . . Let your light so shine before men, that they may see your good works and give glory to your Father who is in heaven.*

Thus, when one puts all these components into a drawing called a schematic, which is the electrical model, one can describe a Christian's typical week.



Remembering this electrical model has helped me in my walk with Christ. I trust it can help you in your walk with Christ.

NOTE: All Scriptures are from King James Version of the Bible.

Department Snippets

Introducing our new technician for the department

Steve Frank

Steve Frank is the new electrical and computer engineering technician for the Department of Engineering. Steve is replacing Matt Walsh who has become the manager of the Collaboratory for Strategic Partnerships and Applied Research. He is a 2005 graduate of the Messiah College engineering program, having earned a B.S. in engineering with a concentration in electrical engineering. Steve was active in Dokimoi Ergatai (DE) for all four of his years at Messiah. Steve worked with the DE energy team and traveled to Africa twice to work on DE projects.

Steve lived for 17 years as a missionary kid in Colombia, South America, before returning to the United States to attend college. Outside of work, his interests include renewable energy, computers, the Linux operating system, hiking, and camping. He lives with his wife, Krista, in Mechanicsburg, Pa.

ABET evaluation visit to occur October 2–4, 2005

The Accreditation Board for Engineering and Technology will be sending a team of three evaluators to review Messiah's engineering program October 2–4. This is a general review of our program which occurs every six years. Approximately 50 to 60 programs are reviewed every year by ABET representatives. A written self-study based on our program's mission, objectives, and assessment plan was completed in June and is the basis for the review. Courses and coursework will be looked at by the evaluators. Students, faculty, and administrators will be interviewed. Facilities and programs will be inspected. If the program passes the review, formal re-accreditation will be announced in August 2006 by ABET.

HOMECOMING COOKOUT — Saturday, October 15

Hello engineering alumni!

Hope you are planning to come to Homecoming this year on Saturday, October 15. The engineering department will be hosting a cookout from 11 a.m. to 1 p.m. in Frey 68. Come see the exciting things that have been happening in the department since you graduated. Visit the labs and project areas and talk with students and faculty who are now in the engineering program.

See you on October 15!

Engineering Professor Honored as Outstanding Teacher

Dr. Timothy J. Van Dyke, assistant professor of engineering, was honored at Commencement this year by receiving a Dr. Robert and Marilyn Smith Outstanding Teacher Award. Dr. Randall Basinger, provost, gave the following remarks concerning the award:

Smith Outstanding Teacher Award

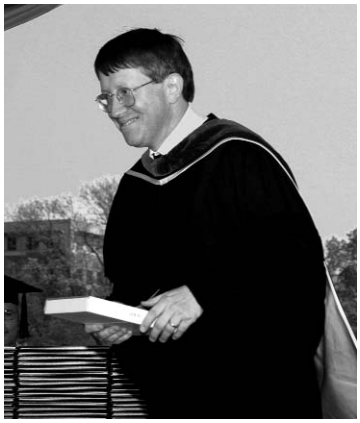
remarks by Randall Basinger, provost
Commencement 2005

Each year, senior students are invited to nominate faculty members to be considered for the Smith Outstanding Teacher Award. The award is made possible by the generosity of Marilyn Smith and her husband, the late Dr. Robert Smith. Bob and Marilyn have been wonderful supporters of the work of this college, and we are grateful for their faithful support.

Earlier this spring, dozens of seniors took the time to prepare and submit nominations and over 46 talented faculty were nominated. Messiah students are fortunate to sit under the tutelage of gifted educators — professors who teach with confidence and hope, professors who demonstrate academic and scholarly excellence, professors who model societal and civic engagement, professors who practice intellectual and spiritual hospitality. Today we have the privilege of honoring two excellent teachers at Messiah College.

The recipient of this year's Smith Outstanding Teacher Award in the category for instructors, assistant professors, and associate professors was described by one student as "the most superb teacher I have encountered while at Messiah. He has a unique gift for taking extremely complex course material and explaining it thoroughly and clearly. He demands excellence and skill and is willing to put in as much effort as required to help his students attain and exhibit that excellence and skill. Few professors grade harder. . . . However, none of them grade as fairly."

And another student adds, "Not only do we believe he 'knows everything,' his imaginative and innovative teaching style promotes learning. He is devoted to his teaching. We often see him in here at 1:00 a.m., still working hard to be able to instruct us well. We respect him, his knowledge, his teaching, and his character."



Dr. Timothy J. Van Dyke receives his award at Commencement.

I am pleased to present the 2004 Smith Outstanding Teacher Award to Dr. Timothy J. Van Dyke, assistant professor of engineering.

Congratulations, Dr. Van Dyke!

Pennsylvania Department of Education engineering school equipment grant

Almost every year, the budget of the Commonwealth of Pennsylvania contains an amount of $1,000,000 to purchase equipment for the engineering schools in the state that apply for the money. There is a two-to-one dollar match requirement (i.e., for each dollar the state awards a school, the school must contribute two dollars to the purchase of equipment). The amount allocated to each successful applicant school is based on the number of students in that specific school as compared to the total number of students in the applicant pool. For example, if a school has 100 engineering students and the total number of all schools' engineering students in the pool was 1000, the school would receive $100,000 from the state if they could match the amount with $200,000. Several forms and documentation are required to fulfill the state's requirements.

Last year Messiah's engineering department had allocated $5,726. However, because we could not match the two for one requirement, we were only allowed to spend $4,087.50 from the state, plus the two-for-one match, on equipment. Equipment purchased included oscilloscopes, power supplies, digital voltmeters, a sheet metal notcher, slip rolls, and a carbide grinder.

Gifts from industry and faithful alumni and friends of Messiah's engineering program are the main contributors to the matching funds. We are encouraging our alumni and friends to consider sending in a small gift to help the engineering program purchase its equipment.

If you would like to contribute to this fund, please specify in the memo line of your check PA Equipment Grant, made out to Messiah College, and send it to my attention (Carl Erikson, Chair, Dept. of Engineering). It is estimated that we will again need between $11,000 and $13,000 this year to match the grant amount. Thank you for all that you can do.

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DEPARTMENT OF ENGINEERING

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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.

CHAIR'S CORNER

Changes

By Carl A. Erikson Jr.
Chair, Department of Engineering

As I enter my 17th year of teaching at Messiah and second year as chair of the department, I may feel comfortable with the status quo, but I realize that changes are inevitable and often bring positive experiences and people into our lives. For example, this year:

1. The department has a new electrical/computer technician, Steve Frank, who has already and will implement new lab policies and procedures, buy new equipment, etc. *(see the Department Snippets concerning Steve's background)*.
2. A Faculty Search Committee has been formed to find a replacement for Dr. Job Ebenezer who is retiring. Whoever takes his place will bring new interests, new styles of interacting with students and colleagues, etc.
3. A new class of first-year engineering students will bring new energy, new ideas, and new expectations for the engineering faculty to channel in productive learning and project experiences.

Indeed, change is the one certainty in our lives and world. However, Henry Lyte's hymn, "Abide With Me," expresses one important fact about God: He doesn't change!

> Swift to its close ebbs out life's little day,
> Earth's joys grow dim, its glories pass away;
> Change and decay in all around I see—
> O Thou who changest not, abide with me!

Malachi 3:6 says, "I am the Lord, I do not change." Hebrews 13:8 says, "Jesus Christ is the same yesterday, today, and forever." As Christians, we can face all of life's changes if we look to, and put our trust in, the unchanging God.

This year "change" is my designated theme for the Department of Engineering. Throughout this academic year, please pray for Messiah College; the School of Mathematics, Engineering, and Business; and, specifically, the Department of Engineering, as each experiences change. May God be glorified in all we "change" for Him!