

by Mariah Quinn

A unique fervor has overtaken the Principia Solar Car shop in the last few weeks. One of our older cars, Ra 4, has been taken down from its lofty shelf. The dust has been removed, and parts have been cleaned for the

first time in roughly ten years. Ra 4 is going to Egypt!

Over spring break, faculty adviser John Broere was contacted by professor Tamer El-Raghy from Nile University, a new university that focuses on engineering and design. Tamer is interested in starting a solar car team at his university, and he wants to purchase Principia's Ra 4 to jump start the program.

Tamer first found our team while looking for possible names

for the new Nile University team. He wanted to call his team Ra after the Egyptian sun god, but a quick Internet an international race in Egypt.

Letter from the Editor

by Katie Farquhar

The team has had an excellent Spring Quarter, and we've stayed busy into the summer. The 2010 American Solar Challenge rolled through Alton on June 24th. Though not racing this time, we still wanted to be part of the action! Our advisers and the few students that were still on campus took Ra7 out to the checkpoint. They chatted with the media and onlookers, cheered on the teams, and were even interviewed by Fox News. The excitement continued the next night, when the documentary of our participation in the 2009 World Solar Challenge premiered at the Alumni Reunion! It was a big hit, and more



Lacey Crabill and Ross Vincent work on building the crate that will be used to ship Ra 4 to Egypt!

search proved that the name was already taken! Then Tamer contacted John to see if we could help support him.

After many emails and Skype conversations, it

was determined that we could best help the Egyptian team get started by selling them Ra 4. Tamer intends to purchase Ra 4 and all its spare parts from Principia's team, and then have his students reverse engineer Ra 4 essentially, modifying and remodeling it from the existing parts.

With Ra 4, Tamer hopes to gain support from sponsors to create an interest in solar cars in Egypt. The current plans are to have a preliminary race in Egypt to show the pos-

sibilities of solar vehicles and then eventually to start

information on a PBS airing and purchasing a copy will be available shortly.

On a different note, we're in a bit of a transition with our Business Manager position since I graduated in June. If you have donated within the last few months, someone will be contacting you in the fall. If you need anything before then, please feel free to contact me at katie.farquhar@gmail.com. I truly can't believe how quickly four years have flown by! I'm so grateful for my time on the team and for the opportunity to know many of you!

THE CONTRIBUTIONS OF CHRIS SNOW TO THE SOLAR CAR TEAM

by Mark Evans

Over the past few years, the *Solar Flare* has profiled the heroics of team members sprawled on the asphalt under Ra7 in Texan summers and wiring delicate electronics under the Australian moon. Now we would like to show our gratitude for the diligent work of another unsung teammate whose work often takes place hundreds of miles away from the team. Probably the only member of any solar car team to hold his title,

team practitioner Chris Snow helps us pursue our top goal - to glorify God.

Christian As а Science practitioner, Chris Snow offers spiritual treatment support and to anyone in need. The team first called on him before NASC 2008. Since then he has aided in race preparation, problems on the road, and more. He attends our quarterly metaphysical meetings.



Chris Snow, our team practitioner, came to visit us in Neosho, MO during NASC 2008!

During races he talks to our metaphysical head each day to share prayerful ideas. Always approaching solar car with energy and love, he focuses us on expressing good and keeping our motives pure and spirits high.

One evening before NASC 2008, I telephoned Chris. Crucial scrutineering deadlines approached, but Ra sat motionless on the pavement. The next few hours, it seemed, would determine whether or not the previous two years of engineering, construction, and labor would be for naught. Chris reassured us of God's presence and provision. He shared the following from *Miscellaneous Writings* (280: 30-7):

The doors of animal magnetism open wide for the entrance of error, sometimes just at the moment when you are ready to enter on the fruition of your labors, and with laudable ambition are about to chant hymns of victory for triumphs.

The doors that this animal element flings open are those of rivalry, jealousy, envy, revenge. It is the self-asserting mortal will-power that you must guard against.

This passage reassured us that any resistance we seemed to encounter was merely the final cry of animal magnetism. As past issues of the *Flare* have attested, we found exactly the people we needed to get our car running. Chris continued to support us along the race, and however frantic the situation seemed, he approached

it calmly and helped us to ground our thought on God.

For the next race, WSC 2009, Chris agreed to continue his support. When we received word that the crate carrying Ra and our tools to Australia was held in quarantine, the team - still in the US, half a world away from the problem - prayed. At the pre-race metaphysical meeting, Chris shared, "The 'still, small voice' of scientific thought reaches

over continent and ocean to the globe's remotest bound" (*S&H* 559: 8-10).

With no way to physically fix the problem, the team took to the books to correct the situation by the consciousness of God's presence. When faculty advisors, Joe, Steve, and Karen, arrived in Australia to pick up the crate, there were no problems, and they were able to drive it right off the premises. Upon later inspection, our crate was filled with mold, and it seemed totally illogical that it was granted access to the country. It certainly seemed that our crate was cleared from quarantine by the hand of God. The race progressed harmoniously as we met each challenge with that calm trust in God's provision, speaking with Chris each night from the Outback via satellite phone.

The solar car team is immensely grateful for Chris Snow's metaphysical support and his example of calm confidence in Spirit.

AN UNDERWATER EXPERIMENT

by Justin Sinichko

This past winter quarter, the Biology department welcomed Dr. Scott Eckert as a visiting professor and college alumni back onto campus. Since graduating, Dr. Eckert has become the world's foremost authority on leatherback sea turtle biology. Needless to say, he is an invaluable resource to Principia. Incredibly, the department has managed to wean Dr. Eckert from his world travels; he will be settling at the college as a fulltime professor beginning next year.

Last quarter, I was a student in Dr. Eckert's Sea Turtles course - a class distinguished by the fact that two-hour lectures simply flew by due to meaningful tangents and other interesting asides. I am also a member of the Solar Car team, a project which provides students with tools to design and construct unique solutions to problems. Recently during Sea Turtles, we discussed conservation efforts surrounding leatherback bycatch on longlines – capturing sea turtles unintentionally on commercial fishing vessels. From this conversation, I imagined a new method to reduce this bycatch via re-engineering an aspect of longline fishing. Here was the idea:

The longtime fishing technique, used by fishermen to catch Swordfish & other high-value species, is based on a main line which is several kilometers long. Shorter lines with hooks dangle from this main line. Every hook is baited, and evenly spaced between these hooks are baskets of glow sticks used to attract the target species. The problem is that these glow sticks also attract leatherback sea turtles - which are not a target species. In our sea turtle class, we were asked to read a publication of Dr. Eckert's which studied the response of leatherbacks to light. It noted that, if designed properly, a light source could be made to appear 'invisible' to leatherbacks. Intrigued, I pursued this concept and discovered that many of Dr. Eckert's friends had researched various aspects of sea turtle light sensitivity. To my surprise, no one had capitalized on this scientific knowledge to supplement sea turtle conservation efforts.

I approached Project Centered Learning (PCL), a program which supports engineering projects (including Solar Car), with a proposal and budget for what it would take to produce four prototype devices

to function as a substitute

for the glow sticks and theoretically reduce leatherback bycatch. Science indicated that. technically, leatherbacks were unresponsive to certain light sources. Once I demonstrated that the concept was grounded, PCL approved my budget and allowed me to purchase the resources I would need to design and construct the device. My goal is to complete the prototypes this spring; perhaps in the future, contacts which Dr. Eckert has maintained over the years will help in testing these prototypes. An economical and effective design could have profound effects on helping reduce leatherback bycatch on longlines.

This project and others just like it are testament to the opportunities provided by PCL. Just like with Solar Car, I have enjoyed learning fundamentals in fields beyond those in the scope of my own major. This project, for instance, is teaching me EVERYTHING I have ever wanted to know about electronic circuits and the economics of longline fishing in northern waters. Stay tuned to hear how things work out.

Solution to Crossword on page 7



HITTING THE ROAD: RA7 REACHES OUT TO ST. LOUIS' FUTURE

by Mark Evans and Katie Farquhar

"The solar car!" and "It's here!" These excited shouts often float through the open truck windows whenever we take Ra7 on outreach adventures. This quarter, Ra7 traveled near and far – from Principia's own Wanamaker Hall all the way to Chicago. The team was engaged in a series of outreach events this spring, the first of which took place on Thursday, April 1 (we're not fooling!) at Parkway Northeast Middle School.

At the request of a recent Principia graduate who now teaches, the team agreed to bring the solar car to Parkway Northeast (a middle school in the St. Louis area) to show several classes of inquisitive sixth

graders. Students in a social studies class who were learning about alternative energies came out to see the car drive and learn a little about how it works.

Mark had the tremendous honor of driving the solar car around the parking lot for everyone to see (this was his first time driving the car!). As the blacktop pavement slid

beneath him and the posts of basketball hoops whizzed by, the first group of the day stepped out from the school and gathered to see Ra7 in all its glory. School sure has changed since we were there...the kids whipped out their camera phones to take pictures!

After a few laps, we opened up the car so they could see inside. Then we showed off everything we could: how Ra7 can drive in reverse, the turn signals, how it has a rear view camera with a screen for the driver in the steering wheel, how the steering wheel detaches, and even how the car can drive without the solar cells attached. The kids were filled with good questions, especially a few budding young engineers—one bright young girl diligently took notes (3 pages worth!) on everything she heard. "How fast does it go?" "How does it make the sunlight into power?" "How does the driver get out if there's an emergency?" "Are they going to make solar cars that are more like regular cars people drive?" Soon, they learned how the batteries store the energy from the solar cells and how the motor uses that energy to spin the back wheel to push the car up to 85 mph, how the driver can jump out a hatch in the upper body, and how some teams have made special passenger solar cars but how solar energy may be best used mounted in a stable location so the fragile solar cells don't break.

Though we were sad to leave Parkway Northeast, we had to hit the road. We were due in Chicago in a few weeks! The team travelled north and spent a wonderful day at Fox River Country Day School. The next day,

we put Ra7 on display at Chicago's Elgin Eco Expo for the general public to see. Coming back home, we then had the privilege of talking to some of Principia's own parents! Parents' Weekend was a lot of fun, as we got to show off photos from Australia and answer lots of great questions.

After that, we headed to Jacksonville, IL for the

Going Green Expo where we gave a presentation to three hundred 3rd graders! Let me just say that there was a lot of enthusiasm in that room! We finished off the quarter by heading down to St. Louis campus. We gave a Chapel talk in the morning, sharing our experiences on the team and how we've relied on Christian Science. Later in the day, we were able to talk about more technical aspects of the car with interested students.

Though we could talk about solar car forever, the sun inevitably sinks low in the sky and we realize it's time to head back home. We rest assured, though, that we're leaving the kids with some knowledge of solar cars, hopefully inspiration as to what's possible, and certainly a lot of memories preserved on their camera phones. We're excited to host a lot more of these types of outreach events in the future. If you're in the St. Louis area, keep your eyes peeled for a glimpse of Ra7!

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all about Ra7 during one of our many outreach

events.

Never a Moment's Rest

by Brian Kamusinga and Lukas Dauterman

After the race across Australia, Ra7 required much repair work. Most was completed over spring break, but some preparation occurred winter quarter. During the winter, the team disassembled the battery pack to recycle cells damaged by shipping or wear and tear. In turn, we replaced damaged parts on the chassis. The goal for spring break was to bring the car back to driving mode.

First Week – Brian's Perspective

The first week Lukas and I examined the pack to consider how to improve conductivity. While racing in Australia, parts of the pack experienced areas of high resistance. Through research and examination, we procured new, thicker, copper shims for the battery pack which would correct the problem. In order to test it, the pack was reassembled.

The pack has five bricks plus another sixth of a brick (one additional module). Each brick has six modules, and each module has five cells, totaling 155 cells. While assembling the pack, we tested every cell to assure that it was on par with the rest. After assembling the bricks, we left each in quarantine for 24 hours to ensure that all the cells would function correctly; cells that leaked were replaced. Ra7 also has a supplementary battery pack (separate from the main pack) that powers the car's safety features. This too, was reassembled and tested to make sure it worked optimally.

Second Week – Lukas's Perspective

During the second week Brian and I reassembled the car. To begin, we separated the lower body from the chassis, fitted the tow straps, and made sure the harness - a five point seatbelt - was properly fastened. At this stage we replaced some of the aluminum brackets that attach the lower body to the chassis. They normally wear out due to driving fatigue, so they only need replacing every so often. Usually, we stagger replacing each individual piece. This reduces the likelihood for them to fail all at once. By the middle of the second week, Ra7 was fully reassembled.

Recently, the team considered restoring past cars, so Brian and I cleaned the older vehicles during the second half of the week. We also prepared a storage space closer to the shop for working on the vehicles. We spent most of our time cleaning Ra4, the chassis of which will be sold to a fledgling solar car team from Egypt. The team decided to sell the chassis and other components to them due to our desire to get as many people involved in solar car as possible. We also wish to share the knowledge we have gained from building solar cars. Also, we will have made yet another invaluable connection with another team.

The last weekend of break, we finally tested the motor, and it worked! Marking spring break a success, we looked forward to the tasks of the coming quarter - continuing work on a second upper body, improving Ra7, hosting outreach events and more.

FINANCIAL SUPPORT APPRECIATED

We greatly appreciate all our generous donors for this project over many years. Solar Car will continue into new projects, but we must still cover our expenses from the Australia race. In addition, we intend to underwrite the documentary detailing the World Solar Challenge 2009. The documentary, a project by Nick Molle Productions in Estes Park, CO, will air on PBS. Currently, they have two documentaries on PBS; each has aired over 2,000 times, covering all major US markets. Robert Duvall has agreed to narrate the introduction of the documentary. We have room for four fifteen-second slots for companies, foundations, or individuals to advertise. For details, please contact Steve Shedd at (618) 581-4004 or steve.shedd@principia.edu. Thank you for your assistance.

Welcome to the team, Mariah

by James Koval



Boating is one of Mariah's many hobbies.

Looking for a strong new member on the solar car team? Look no farther than Mariah. Born in Connecticut, Mariah is a junior with a focus on marine biology. She recently has found a family in solar car members and a home in the shop. The team is happy to have her energy, diligence, and friendliness.

Through solar car she hopes to raise awareness of alternative energies and by doing so, indirectly help endangered marine habitats. With only a few weeks on the team so far, she has already accomplished a lot! During our Saturday shop meetings, Mariah has worked on the front suspension of the car and tinkered with the old and new batteries. She says, "I am really intrigued by the mechanical aspects [but] after working on the batteries I can see myself enjoying just about anything." Like any member, Mariah is finding there is no limit as to what you can do for the team.

When asked why she joined the team, she points out the success of the Australia race and mentions her conversations with classmates who were on the race. She also mentioned how inspiring it is to have the chance to race with one of the best solar car teams without much technical knowledge initially. Mariah has found that technical skill really isn't what the team is looking for. Thankfully, she's felt included right from the start: "The camaraderie and support for one another is amazing. Everyone is helpful and encouraging both in the shop and in my daily life." We're so happy to have Mariah on the team - she's always engaged, and her smile and fun-loving attitude brighten up any shop day.

Kudos to our veteran, James

by Julianna Hensey

Hailing from Charleston, West Virginia, is junior James Koval, computer science major. An extremely talented individual, he can cooperate with anyone and get a job done. He is loved by everyone, and his excitement, joy and intellect just can't be replaced on our team.

More than willing to help, James has worked on most everything involving the solar car and is eager to learn anything new. He enjoys getting messy hands from working on the car body and getting to know everyone. Thought he has not yet participated in a race, he hopes to do so. Whatever that race may be, he trusts it will be "a superb growing and building experience." He looks forward to "building even stronger relationships with others and with God, and growing spiritually along many avenues."

When he is not working on the solar car, plowing away at his studies, or improvising jazz piano, he loves

fiddling with Linux - an open-source computer operating system - and, of course, helping everyone he can. If you don't find him tinkering with computers, you will surely find him outside climbing trees and communing with nature, looking at what the world has to offer. Ever genial, James is truly valued member of our team.



When not writing code for the telemetry system, James just likes to have fun!

Solar Car Crossword Puzzle



Crossword clues

Across

3. A part of the car that allows for steering; connects the wheels to the frame of the car (two words)

5. The type of energy solar cars use (one word)

6. An old member who came back during winter quarter as an "adult" presence on the solar car team; has contributed a lot to our website

9. A component of the car that came back from Australia severely damaged

12. The abbreviation for the race the Principia College team participated in during the summer of 2008

14. A device that controls the motor; we recently returned one to another team after borrowing it in Australia (two words)

15. One of the recently updated solar car systems resulting in far more car data; improves strategic calculations; derived from Greek roots tele (remote), and metron (measure) 16. One of the planned stops on the North American Solar Challenge (NASC) race this summer; a town near the Principia College campus

Down

1. The smell our batteries make when they're broken; it's also a fruit!

2. The number of centimeters needed between the driver's head and the roll cage of the car

4. The team's biggest supporter

5. The type of braking available on the back wheel of the solar car, produced by the motor; a circuit in electronics that allows a signal to be amplified many times

7. The city where WSC 2009 began; the name of a famous naturalist who presented the concept of natural selection and evolution

8. A position on the team that requires at least 20 hours of training

10. Principia College's team number (two words)

11. The number of cars Principia has built; number of spots on a common ladybug; number of daughters of Atlas in the Pleiades; current Microsoft operating system 13. The name of the astronomical object that provides energy to the solar car

14. A new member of the team who is majoring in Biology



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You receive:

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You receive:

Subscription to *The Solar Flare* 1 Race T-shirt

Please address contributions to:

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