EEVC NEWSLETTER

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PHILADELPHIA JUNIOR SOLAR SPRINT 2015

Oliver Perry

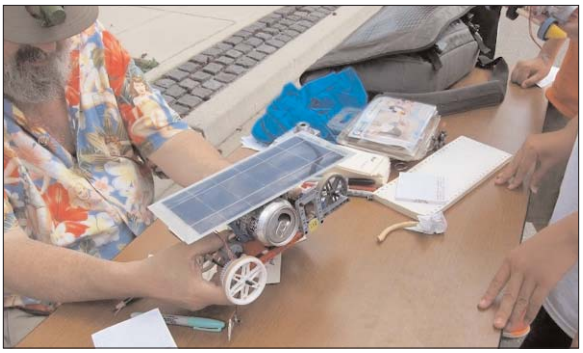
For more than twenty years now PSEA, the Philadelphia Solar Energy Association, has organized and operated an annual competition for the Jr. Solar Sprint. Joe Bruno has been working as the director for this event for a number of years, hosting workshops in the early spring to help teachers in the Delaware Valley teach their students how to construct solar paneled small race cars and prepare their students for the competition. The cars are constructed from kits containing the certified solar panel and DC electric motor. Some kits also contain wheels and gears. Several characteristics are required of all cars. The Sprint cars have to carry a 12 ounce soda can for the payload, have a hook under the body to keep the car attached to the lane string to keep them in their respective lanes, and the ability to switch over to battery packs in the event of inadequate sunshine. The competition is for middle school aged students, grades six through eight.

EEVC member Ken Barbour presents the 2015 "EEVC Over-all Best Sprint Car" plaque to the East Brook Middle School Junior Solar Sprint racing team at the Philadelphia Navy Yard, site of the PSEA Jr. Solar Sprint competition, Saturday May 30th. (left to right): Ken Barbour, students Christiana Stone, Ethan Kwok, Brian You and Ciyoon Kim.

About 300 hundred students gathered Saturday, May 30th at the Philadelphia Navy Yard, on a street next to the Grid Star Solar House operated by Penn State. There were over 100 cars registered for the competition. The Navy Yard location is new this year to the Jr. Solar Sprint. With the exception of one, all of the previous competitions have been held next to the Franklin Institute.

As usual EEVC members helped PSEA volunteers by judging the entries for technical merit awards. We selected the top three cars for technical merit and also picked our winner for the EEVC "Over-all Best Sprint Car Award." Alan Arrison, Ken Barbour, his wife

Contestants at the starting line.



Our winner being reviewed and inspected by the judge who looked for the recycling characteristics of the car body and parts. Since Legos are built out of recycled plastic the car's frame was considered to be recyclable.

Aimee, and I represented the EEVC.

Our choice for the EEVC Best Car Award went to a team of four students from East Brook Middle School in Paramus, New Jersey. Their teacher, Diane Verhasselt, made the following comments regarding her students' (Christiana Stone, Ethan Kwok, Brian You, and Ciyooon Kim) accomplishment.

"I am so proud of the accomplishments of my students especially taking into account the extremely high quality of the other competing teams and programs. The students worked with me as their club advisor one to two days a week after school, as compared to some of the students who have this as part of a class. The students learned about general engineering, how gears work, the importance of correct gear ratios, etc., and then applied their new knowledge and creativity to design and build their car. Using the engineering design theory, they brainstormed ideas, built designs, tested them, decided why some concepts worked better than others, and then redesigned their car. They worked cooperatively, with everyone putting their talents and abilities to their best use – some concentrated more on design, some on the actual building and others on the portfolio. When it came time for testing all the students participated. The Solar Car Competition is a wonderful avenue for students to learn how important solar energy is, and utilize engineering concepts in a fun, friendly, and creative manner."

EEVC members (left to right) Aimee Barbour, Ken Barbour, and Alan Arrison wait for students to bring their cars to the table for technical merit judging.

The students began research for their Jr. Solar Sprint project last February when they had a meeting explaining the fundamentals of how to construct such a car. Their original project began with cardboard and large flat surfaces. This gave way to lego beam construction. Their first local competitive meet did not end well. They eventually straightened out their bugs and produced a well running car that placed third in the Philadelphia speed competition.

The students produced a slide research report that briefly outlined their experiences in building the car, from investigating their solar panel's output of electricity, to their experiments with gears to find the best motor-to-wheels speed ratio.

The process of going from a cardboard solar panel carrier on wheels to a shorter, sturdy, stripped down, lightweight racer took some time. But through persistence, trial and error, and a determined attitude, an excellent car eventually evolved. The students claimed that they had a number of disappointments en route to the Philadelphia competition, but they never threw in the towel. They continued to correct the problems and to refine their work.

The car we judged as the best over-all Jr. Solar Sprint car, was as previously indicated,

light, strong, durable, well constructed, reliable and technically well designed. It also finished in third place in the speed category. Other than the fact that it had a Lego beam construction, which is not typical among the better cars, there was not any particular feature that was remarkable or "off the charts" in terms of technical merit. My personal observation is as follows: I have judged hundreds of student built electric and mousetrap powered model cars over the years in both Jr. Solar Sprint and in Physics Olympics. My own students, during the twenty years that I had them construct all kinds of cars, seldom if ever did well with Lego construction. This is the first Lego constructed car that I have seen that merits commendation. Up until now the Lego build cars that I have seen have reflected hastily constructed projects that performed poorly, usually broke down, and eventually fell apart. Lego built cars most often were constructed by the students who wanted the easy way out and had little concern for quality. They could throw Lego parts together easily and quickly get them to move down a track. So this year I was very surprised when I saw the East Brook Middle School Lego car. My viewpoint has been shifted.

The team from East Brook Middle School made a great impression on everyone. Other judges remarked that were a super team. They were mature, enthusiastic, knowledgeable students, and exemplary of the spirit of the Junior Solar Sprint. Congratulations to each of the team members, their teacher, the school system, and the parents of the students involved.

IMPROMPTU JUNE MEETING A SUCCESS
Oliver Perry

Ken Barbour's converted Geo on the left and Al's converted pickup on the right.

Ken Barbour organized a successful last minute substitute meeting for the one canceled because of the Plymouth Whitemarsh High School graduation exercises. We lined the electric and hybrid cars up in the parking lot across from the small strip mall businesses. It was a great display. Members had fun hanging out with each other's cars. In all, 17 people attended the event which ended in Cugini Pizzeria. The meeting was so successful that the group assembled agreed to duplicate the same thing on the second Wednesday of both July and August. We will return to Plymouth Whitemarsh High School in September.

EEVC members and several guests enjoy a good meal inside Cugini Pizzeria across the street from the Deptford Mall. Jurgen Balitzky, seated on the left, showed everyone what the EEVC logo (that will be available to anyone wanting it to be stitched on an LL Bean jacket) will look like.

CAN RENEWABLES DO IT ALL?

The idea of powering the world entirely with renewable sources has been around for a while, and as of late seems to be garnering more enthusiasm in thinking circles.

Back in 2005 Nadine May, of the Faculty for Physics and Geological Sciences at the Technical University of Braunschweig (Germany), published a diploma thesis entitled *Eco-balance of a Solar Electricity Transmission from North Africa to Europe*. In it she put forward the idea that a surprisingly small area of the North African Desert, if equipped with solar thermal power plants, could provide all the energy needed by the world.

May's calculations show that an area of 45 x 45 km would provide enough electricity to power Germany, with the output of the solar plants being delivered by high-voltage direct current cables running beneath the Mediter-

ranean sea. An area of 110 x 110 km would power the entire European Union, while an area of 254 x 254 km would generate enough to power the entire world. This does not account for the fact that there would be no way to deliver it to the whole world, of course, but you get the idea.

A more recent effort

Since the beginning of the decade Mark Richardson, a professor of civil and environmental engineering at Stanford, has been putting forth a plan to eliminate the use of fossil fuels worldwide. A series of articles by Louis Bergeron of the Stanford News Service explains how Richardson backs up his claim that all the world's energy needs could be supplied with renewables — wind, water and solar — by 2030.

That claim seems to have changed a bit over the years, but a in new article in *Environmental Science* Richardson presents calculations showing that the U.S. could be powered entirely by renewables by 2050, and lays out state-by-state plans to do it.

The most recent Bergeron report can be found at http://news.stanford.edu/pr/2015/pr-50states-renewable-energy-060815.html?, and Richardson's paper can be found at http://web.stanford.edu/group/efmh/jacobson/Articles/I/USStatesWWS.pdf.

Ending coal?

Also generating considerable buzz these days is a May, 2015 article by Michael Grunwald in *Politico.com* entitled "Inside the War on Coal." The article describes the methods used by the Sierra Club in its Beyond Coal campaign, which is strongly backed by billionaire ex-NYC mayor Michael Bloomberg. The article shows that, by using economic arguments rather than appeals to environmental correctness, the group has been able to stop essentially all new coal-fire power plant construction in the U.S., frightening the swiftly-declining coal industry and enraging coal-state politicians. The primary argument is that the expense of increasingly-strict controls on emissions of sulfur, mercury, airborne haze and, increasingly, carbon, have made the long-term cost of coal-generated electricity equal to that from gas, wind and solar, and that the cost curves for coal all go up, while those for the alternatives go down. As mentioned, there has been considerable political pushback, but the Club's grass roots efforts seem to be difficult to counter.

Now the Sierra Club also has a Beyond Gas program, but its goals are further in the future.

It's a fascinating article, and can be seen at www.politico.com/agenda/story/2015/05/inside-war-on-coal-000002.

NEWS UPDATE

Musk sets date for Model X SUV

Tesla CEO Elon Musk has announced on June 9 that deliveries of the Model X crossover SUV, according to a June 10 AP story. "Tesla originally planned to put the Model X into production in 2013," says the article, "but has delayed it several times to work on technical issues. Musk said he's test-driving the Model X now and is pleased with its progress. He said the company is focused on making sure key features, like the Model X's wing-like doors and its sliding rear seats, are working properly."

"Tesla began 2015 with 20,000 reservations for the Model X. The company plans to deliver 55,000 Model S sedans and Model X SUVs this year."

The new car is also expected to feature an autopilot function, which "lets the car drive itself at highway speeds. It also is expected to let owners summon their vehicles autonomously from a parking spot as long as they are on private property. Autopilot will eventually be available through a free software update to customers with recent versions of the Model S sedan. The Model X would likely have the system as well."

Electric truck maker presses on

In the August, 2013 issue we discussed Wrightspeed, a San Jose-based company founded by Ex-Tesla engineer Ian Wright. The company specializes in hybrid electric powertrains that can be dropped in as replacements for the diesel systems in existing trucks.

Wrightspeed "is installing its powertrains on 25 FedEx delivery trucks and 17 garbage trucks for the Ratto Group, a Santa Rosa-based waste management company," according to a June 2 AP story. The company's

Route system in some ways resembles a Chevy Volt, in that it can travel about 30 miles on batteries; at that point a gas turbine generator kicks in to increase range.

A wind turbine without blades

Spanish startup Vortex Bladeless claims to have developed a way to capture wind energy at a fraction of the capital cost of conventional turbines. The system consists of a simple lightweight tower in the shape of a slender cone, with the big end a at the top. As wind goes past it creates eddies — vortices — that cause the tower to vibrate. In conventional structures this vibration can be a problem, and if the frequency of the vortices matches the natural frequency of the structure the resultant oscillations can build up to damaging or destructive levels. In a wind turbine, they also siphon off energy that might otherwise be captured.

In the Vortex Bladeless design the oscillations are captured and turned into electric power; the absence of rotating blades makes for a simple and cheap unit.

The company is crowdfunding in a effort to build a demonstration installation. Let's wish them luck.

Inductive charging without the paddle

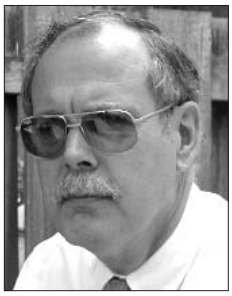
Some years ago there was a contest between the conductive (plug-in) and inductive charging technologies for EVs. Conductive eventually won out, but inductive never really went away.

The original inductive system was embodied in the paddle system used in the GM EV1 (GM called it Magne Charge) and the Toyota RAV4 Electric. While it eliminated the danger of exposed electrical contacts, it increased complexity and required the same effort — plugging in — on the part of the user as conductive systems.

The pendulum may be swinging the other way, a little, as several companies have come up with systems that consist of a floor-mounted pad that transmits the energy and a vehicle-mounted one that receives it. The vehicle simply parks above the charging pad, and no plugging in is required.

A number of companies offer the technology. Closest to home is Momentum Dynamics Corp. (www.momentumdynamics.com), based in Malvern and headed by EEVC member Andrew Daga. Farther away is WiTricity (witricity.com), in Watertown, MA. We'll try to keep an eye on these, and keep you apprised of developments as they come up. Andrew informs us that there are a number of other companies active in the field, and has agreed to write an article on the topic for an upcoming Newsletter.

STEALING PRIUS BATTERIES
By California Pete



The Bay Area has the country's highest density of Prii, so it seems only reasonable that local thieves have begun to specialize in them. They don't steal the whole car, but just the battery pack, which takes considerable expertise, apparently, considering that the battery weighs about 120 lb. and has cables with dangerous voltages. Yet they do it in about 20 minutes. A quick check showed quite a few batteries on Craigslist, so victims can buy theirs back — after repairing the damage inflicted during the theft.

Free EV charging while you shop

A startup company in San Francisco aims to make charging your EV free — if you shop in the right place. The company, Volta, installs charging stations in the parking lots and garages of businesses that pay for the equipment and electricity in a bid to gain customer loyalty.

So far, according to the *San Francisco Chronicle*, the company has installed "110 chargers in Honolulu, the Bay Area, Los Angeles, San Diego and Phoenix."

Fun movie, bad seismology

The reviews for the recent movie "San Andreas" report that, while the science is bad (lots of inaccuracies, including a quake that destroys the Hoover dam — in an area with few earthquake faults, according to the *Chronicle*), it's great fun if you like disaster movies.

Don't light up that soda

San Francisco, having failed at the polls to

enact a law taxing sugar-laden beverages (unlike nearby and more "progressive" Berkeley), is moving to require that all advertisements for such drinks devote 20 percent of their space to a warning, much like the ones on tobacco ads, that says "WARNING: Drinking beverages with added sugar(s) contributes to obesity, diabetes, and tooth decay. This is a message from the City and County of San Francisco."

The beverage industry is not amused, and vows to fight it.

State cuts farm water — again

The old saying in the West, that whiskey is for drinking and water is for fighting over, applies even more now, and recently the state of California "ordered farmers and others who hold some of the strongest water rights in the state to stop all pumping from three major waterways in one of country's prime farm regions," according to a June 15 AP story. In an effort to survive, farmers have been responding to the drought by pumping groundwater, and now will do it even more. Of course, why some in the Sacramento area decided to grow rice and cotton in the first place is beyond me. But the rest of the country can expect to see rising food prices as other farmers fallow their fields and let their orchards die.

Another Santa Barbara oil spill

In 1961 a blowout on an oil platform off Santa Barbara fouled miles of shoreline, killed thousands of birds and other creatures, and spawned the modern environmental movement. Now a broken pipeline has spilled 21,000 gallons of crude in the same spot. Bad memories resurface.

COMING EVENTS

EVs and the Grid Summit
July 8-9, Los Angeles. Go to www.infocastinc.com/events/ev-grid/agenda
Formula Sun Grand Prix
July 26-31, Austin, TX. http://americansolarchallenge.org/the-competition/fsgp-2015
SAE 2015 New Energy Vehicle Forum
Sept 3-4, Shanghai, China. Go to http://www.sae.org/events/nev/
Mushroom Festival and Antique and Classic Car Show
Sept. 12-13 (Cars on Sept 12), Kennett Square, PA. EEVC is planning to participate; for information go to http://mushroomfestival.org/2014-antique-classic-car-show/
2015 Electric & Hybrid Vehicle Technology Expo
Sept 15-17, Novi, MI. www.evtechexpo.com/
The Battery Show (colocated with the event above).
Go to www.thebatteryshow.com/exhibition/about-the-battery-show
ALTCAR Expo
Sept 18-19, Santa Monica, CA. Go to www.altcarexpo.com
2015 World Solar Challenge
October 6-13, Australia. Go to www.worldsolarchallenge.org
Engine Expo 2015 (with an electric and hybrid pavilion).
Oct. 20-22, Novi, MI. Go to www.engineexpo.com/usa/pavilion.php
SAE 2015 Electric Powertrain Technologies Symposium
Nov 17, Stuttgart, Germany. Go to http://www.sae.org/events/epts/
SAE International Vehicle Electric Powertrain Forum
Dec 3-4, Shanghai, China. Go to https://www.sae.org/events/vept/

NOTICE ON DUES

Annual EEVC dues are $20 with electronic delivery of the Newsletter, or $25 for a printed copy. Mail checks payable to EEVC to James Natale, 3307 Concord Dr, Cinnaminson NJ 08077, or pay via PayPal to jnatalemicro@comcast.net.

MEETING SCHEDULE

Meetings are held in Room 49, Plymouth-Whitemarsh High School, 201 East Germantown Pike in Plymouth Meeting, PA, and begin at 7:00 p.m. Note there are no official meetings in July or August, although members often arrange informal ones.

Sept 9

Oct 14

Nov11

Dec 9