# EEVC NEWSLETTER

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## EEVC PRESIDENT RECEIVES EAA LIFETIME ACHIEVEMENT AWARD

*EAA Awards chief Terry Wilson (l) and Chairman Ron Freund present Oliver Perry with the EAA Lifetime Achievement Award.*

On February 27 the Electric Auto Association presented EEVC president Oliver Perry with the organizations' Lifetime Achievement award in recognition of his 15 years as EEVC president, his numerous activities on behalf of electric vehicles and his outreach efforts though education.

The award was presented by EAA chairman Ron Freund and award chief Terry Wilson at the EAA General Membership meeting at Hewlett-Packard headquarters in Palo Alto, CA, in the heart of Silicon Valley.

Following the meeting Ron Freund took us

*(Continued on p. 6)*

## RON TYSON WINS 2010 RON GROENING ENGINEERING AWARD

**Historical Review**

In the month of February the EEVC annually attends the Southeastern Pennsylvania Physics Olympics League's end of season meet held at Penncrest High School in Media, Pennsylvania to select what is known as the "Over-all-best-electric-car" in the model electric car competition. The Physics Olympics competition brings together eight to ten high schools under one roof to compete against one another in physics problem solving and team (physics related) engineering projects. Some of the competitive events involve team projects conducted with on site materials while other events, like the bass-wood bridge competition and electric car event, involve

pre-meet preparation at home. The EEVC has been associated with the model electric car event since its inception in early 90s. We have been provided input in both the rules and supervision of the event and have presented our own award to the student (or team of students) who we feel have designed and constructed the over-all best of the group electric car. The Physics Olympic Committee provides medals to the winners of the event and utilizes their scores in determining overall team standings. The EEVC award is not involved with, nor related to, the team scoring. Our EEVC award goes to the vehicle that exemplifies high standards of engineering and craftsmanship as well as demonstrating competitive scores. In addition the winner has to display the EEVC logo on the vehicle and complete an entry form with questions. Our selected winner may or may not be a medal winner in the Olympic meet.

**2010 Challenge**

Fran Poodry *(above)*, a physics teacher from West Chester East High School, volunteered to head up and supervise the Electric Car Competition for 2010. In a 2009 spring joint meeting a group of physics teachers decided that the 2010 electric car competition should challenge the students to design a model vehicle that could push or tow a load across a gym floor; something along the order of a tractor pull. Under the direction of Fran Poodry, with input from others, the final rules resulted in the cars having to pull a small cardboard box (filled with 200 grams of mass) across a 4 meter long track (outlined on a gym floor) in as short a period of time as possible. The event became a pulling race with a 200 gram load. Each team was allowed 5 trials for scoring. The scoring averaged the top two speeds (out of a possible 5) with bonus points for each additional different car entered. Five separate cars run once each, one car run five times, or any combination could be utilized. The best scores counted for medals. The team cup award was awarded to the team successfully racing the greatest number of different cars. The greater number of different cars used, the better the chance of winning the PSE&G cup.

*Cars at the starting line*

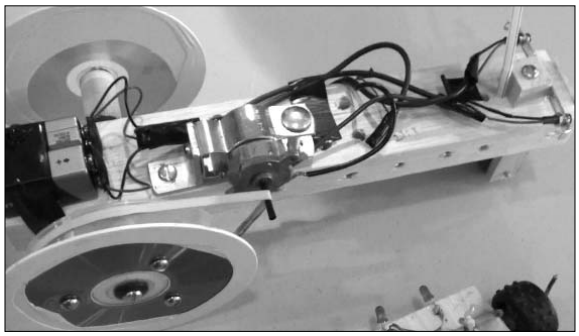
Fran selected a small permanent magnet DC motor from Electronics Goldmine for the official motor. (Part #G16580). All high school Olympic teams supplied that particular motor to their competing students. Two standard 9 volt batteries were allowed for power. The car had to have two axles with as many wheels on each axle as the student wanted but only one axle powered by the motor. Only two gears or pulleys were allowed for gear reduction. The car had to have two LED head lights operable when the switch was closed. A 3 x 5 index card flag with specific information written on it was needed to break the laser beam timer.

**Winning the Prize**

The challenge turned out to be finding a way to tow a load with a low torque motor. The students quickly discovered that the motor selected for the competition needed to be radically geared down in order to pull any load slowly across the floor. A premature panic was created when early reports indicated the motor was not even able to pull a paper clip one centimeter across the floor in

two days of time. Fran quickly adjusted the parameters of the contest to appropriately adjust to the ability of the motor. The load was reduced from 1500 grams to 200 grams. The distance pulled was cut from 5 to 4 meters. As a result of the rule modifications we ended up with an excellent event, one that provided the students with a realistic engineering challenge and provided easily measured results for competitive scoring.

**Ron Tyson III from Penncrest: Vehicle number one**

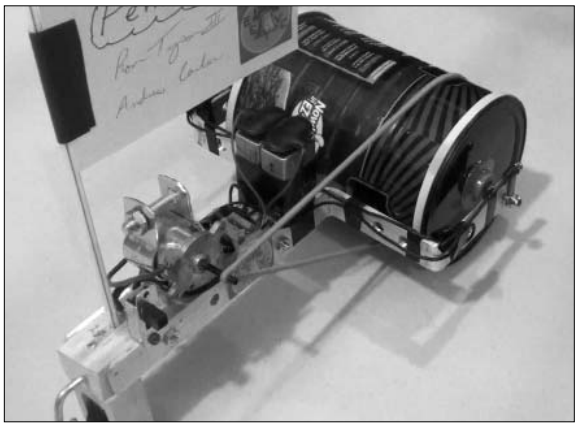


Ron Tyson, a junior taking Honors Physics I at Penncrest High School, taught by veteran Mr. Jim Ciccarelli, started to tinker with the motor approximately five weeks before the February 20th Olympic meet. Using his sister's mousetrap car as a platform, preserved from a previous Olympic project in 2002, Ron quickly discovered that he had to use a 40:1 gear reduction in order to pull a 500 gram mass. The challenge required a totally different car. Ron acquired balsa wood and various components and in about 15 hours created his first working vehicle. He used thick wooden dowels for his two axles and a cylindrical tape container for the main drive on the axle. He securely clamped his motor on the chassis with a hose clamp and ran a wide rubber band directly off the output shaft of the motor and on to the tape drum container which was centered on and connected to the drive axle. Making sure that everything was properly aligned and centered was vital to his success. Ron understood that the motor responded better to the higher voltage of two nine volt batteries connected in series than in parallel. The motor was overloaded voltage wise but performed without any overheating problem. The balsa wood vehicle set amazing times of under 8 seconds and worked flawlessly.

Unfortunately Ron (as highly motivated students sometimes do) experienced a conflict in his schedule and could not attend the Physics Olympic event. He left his car under the supervision of his teammates while he attended an event in Pittsburgh PA*. When placed on the track the car, for unexplained reasons, threw off its rubber band belt drive shortly after leaving the starting line. Ron had not experienced this difficulty in his previous successful trials. Therefore he had not anchored a raised bevel or belt stop at the end of the motor output shaft. When the belt was placed against the motor, and the vehicle rerun, the belt jumped off the large pulley on the drive axle which likewise didn't have a stopping edge on it. The students running the Penncrest cars couldn't figure out a solution for this problem. After using up three of their five trials, they turned to a second car that Ron had provided as a backup vehicle. It was a car that he put together in a six hour hectic time period two days before the meet.

*Ron was with the Penncrest High School orchestra playing for children at the Ronald McDonald House.

**Enter the Penncrest Steamroller!**



Ron felt that backup cars were needed to assure success in the electric towing car event so he developed what later turned out to be Penncrest's last defense against a disastrous score. Now and then a fortuitous flash of brilliance flashes through an observant mind. Such it was with the inspiration for the coffee can drive wheel on the Penncrest Steamroller. "What in my house was solid and perfectly circular?" Ron asked himself. "When I thought of the can idea I started looking in

my recycling bin."

Normally in designing a drive train one has to consider not only the pulley or gear ratio between the motor shaft and the drive axle, but also the size of the wheel attached to the axle. The ratio of the diameter of the wheel on the drive axle to the diameter of the gear or pulley on that axle also plays a factor in determining over-all torque and speed.

The uniqueness of the car was the large steamroller drive wheel. The coffee can served as both the pulley and the drive wheel. How clever! It provided maximum torque for that sized wheel.** One of the grooves in the side of the can made a perfect track for the rubber band belt drive. The groove kept the belt in place. To center the axle in the middle of the can all Ron had to do was use the raised markings on the lid cover, which was perfectly centered. He cut out the bottom of the can and replaced it with a lid from another can in order to take advantage of the marked center. He cut out holes in the centers or the lids and epoxied hard plastic washer grommets over them to serve as bushings for a brass axle. He added graphite lubrication to reduce what little friction remained.

**(In the past some students have pressed the output shaft of the motor directly against the outside of the drive wheel and achieved essentially the same result.)

Of course the can was not like a pre-made wheel or a CD with a centered hole. Used in its entirety, the can had to have an axle perfectly positioned through its center and it had to be supported by a yoke. Although the result may have appeared simple to make it still required accurate tooling and some skill to produce. Since steering was not important the yoke was anchored firmly to the center support frame. The motor, as in the balsa wood car, was held to the chassis by a strong hose clamp. Simple? Yes, but nobody else thought of it. Ron's motor could be removed, exchanged, or replaced quickly and easily and yet it was firmly anchored. Finding and utilizing suitable existing off-the-shelf components in an elegant manner has merit.

The uniqueness of the coffee can steamroller as well as the craftsmanship, performance, and reliability of the car made it the EEVC choice for the Best Car Award. It was a fool proof design with a 31-1 drive pulley ratio. The speed was moderate but reliable.

*EEVC judges Dan Monroe, Ken Barbour and Alan Arrison.*

*Penncrest graduate Mindy Coleman, shown here with EEVC member Mike Manning, won the EEVC Award last year.*

Ken Barbour: one of the EEVC judges "I liked the idea of using the can as a really large rear pulley. It must have had more low end torque than any other competing car. It was also neat that the groove in the can lined up with the rubber band belt and the motor shaft."

Dan Monroe: one of the EEVC judges "Personally it was attention to detail that put it over for me. From using the groove in the coffee can to keep the drive belt in place, to making sure that all of the wires were tidied up and securely held in place. You could tell that this car wasn't thrown together at the last minute. It looks like a lot of care and testing went into making it."

Alan Arrison: one of the EEVC judges "I thought the big roller was very innovative. It allowed for a low gear ratio for power. It doubled as a drive pulley and it provided good traction and straight line stability."

Mike Manning: one of the EEVC judges "The coffee can electric vehicle demonstrated a three wheel geometry that could conceivably be built full scale and marketed as a motorcycle. Hence as a two seat full con-

veyance it could be licensed and insured as a motorcycle in most states, providing a considerable savings in cost of electric transportation and therefore enhancing its customer acceptance and increasing the number of potential purchases. In addition, a version of it could be sold as a grounds or street roller if the rear drum was filled with water."

**A bit of controversy regarding battery packs**

*l to r: Josh Kassner, teacher Robert Schwartz and Sean Keenan of the Harriton High School team. Their car revealed excellent aluminum-framed craftsmanship, strength, durability and precision in addition to providing the high torque needed to tow cardboard boxes filled with mass at a fast pace across the gym floor.*

The rules called for the use of standard nine volt batteries. The students from Harriton High School, we later discovered, had used the newer type lithium-ion 9 volt batteries to set their winning times of 5.94 and 5.45 seconds. Although in previous years the rules stipulated that only alkaline 9 volt batteries could be used, a check of the 2010 rules indicated that the alkaline rule had only been a verbal one between instructors, but not placed in writing.

Since it had been theorized that the lithium ion batteries had less internal resistance than alkaline batteries then they would provide more current to the motors than the alkaline batteries. Winning times produced with superior battery technology most felt was illegal. So, the Harriton Students were asked to switch their battery packs to the standard alkaline type and re-run their cars. Surprise! As a result their cars went even faster setting times of 4.86 and 4.96 seconds accordingly. The students conjectured that the nominal voltage of the alkaline batteries might actually be a little higher than the lithium ion batteries.

**Ron Tyson the student**

Ron comes from a family of four. His father is an electrician who is handy with tools and has a love for hands on construction projects. The Tyson home basement is a perfect place for projects of this nature. Ron had a good father to bounce ideas off of and get suggestions from. As a freshman Ron participated on the Science Olympiad team for Penncrest High School. He surprisingly won the windmill competition, a new trial event in the Science Olympiad. In the windmill event students had to use several provided materials and construct a windmill in a short period of time. The speed of the windmill per provided fan power determined the magnitude of the electrical power produced by an electric motor (gen) driven by the windmill blades.

Ron still finds himself at home in the shop working on engineering projects. He will take A.P. physics next year as a senior at Penncrest High School and apply next fall to the Naval or Air Force Academy, as well as engineering schools like Cal Tech.

In addition to Science Olympiad and Physics Olympics Ron participates in orchestra, Penncrest Cross Country, Mu Alpha Theta (math tutoring program) and the World Language and National Honor Societies. Outside of school Ron plays violin in the praise band of his church and works on classic cars. He takes pride in his red 63 Ford Fairlane 500 that he purchased in eighth grade and finished up last April.

**Ron's answer to the EEVC Entry Form question #5**

Question prepared by Fran Poodry from West Chester East High School: Several companies are developing commercial electric cars or have already released them (The Chevy Volt, the Nissan Leaf, the BMW minie, the Tesla Roadster, to a name some.) What are the advantages of owning one of these cars, and what are the limitations?

"The main purpose of an electric car is to be more energy efficient. This most definitely is a reality, seeing that an electric car uses only $0.03 of gasoline per mile, while a gasoline powered car (getting 25 miles per gallon)

costs you about $0.12 per mile. On top of that the battery only needs to be replaced once every four years.

"Some problems with electric cars are its short driving range, usually only from 50-100 miles (gas powered cars get 300 miles and greater) and the fact that the performance lacks. With speeds of up to 90 mph, a drive on I-95 would drain power quickly."

**Editor's comment on Ron's statements above, by OHP**

Yes, at 90 mph, any car depletes its energy source quickly. Good point.

Ron's brief statements above regarding electric cars are his own, and do not necessarily reflect the views of all experts. It is important for us as an organization to listen intently to the views of non-members and to understand their perceptions of EVs in order to be better able to provide the public with up to date electric vehicle information.

Certainly some individuals reading Ron's responses would consider battery replacement every four years a defect rather than an asset. And those with advanced batteries might argue that replacement would more likely to occur at the end of 10 years than four. I am sure that Ken Barbour will make every effort to give Ron an opportunity to drive the BMW Mini-e in order to revise his understanding of the performance of the more expensive electric cars. But, then again, if Ken lets him drive his electrified Geo Metro perhaps Ron will still feel that electric cars are weak in terms of performance. Many people are still under the influence of NEV (Neighborhood Electric Vehicle) performance since NEVs have been more prolific than full sized electrics.

**Changing the World: by Ron Tyson**

I asked Ron what world problem he would like to solve if he were given the power to do it. "If I could solve a world problem, I would give every person on this earth a world-class education. As Albert Einstein once said, 'Great spirits have always encountered violent opposition from mediocre minds!' and I wish to change that."

*(Continued from p 1)*

on a tour of the area, including the headquarters of Tesla Motors, where we offered our condolences for the loss of three of their people in a plane crash, then got a chance to look over the facility.

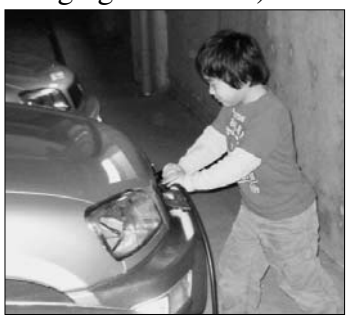
There were several vehicles on display, starting with a bright red one just outside the main door that helped to get the juices flowing *(above)*.

Inside were a couple of non-functional but historic Teslas: The flat-black Aero Buck, *(above)* which was computer-machined from solid fiberboard from the scans of the original clay model, and used for wind tunnel testing, and the hand-built "Drivetrain Mule," the second engineering vehicle built by the company and the first to resemble the Roadster's final design.

After our visit to Tesla Ron took us in his electric RAV-4 EV to lunch in downtown Palo Alto, which, as the home of Stanford University, has a distinctly college-town feel;

we then found ourselves in a municipal garage that offered both free parking and free charging for EVs (below); Ron drove his


RAV-4 in and pushed in the charger paddle (RAV-4s use inductive charging, although newer EVs are standardizing on conductive charging connectors).



There's one thing to be said for inductive charging: it's easy to hook up. As we were leaving after lunch another RAV-4 EV belonging to a friend of Ron's drove into the garage and the driver sent his six-year-old son to plug in the paddle *(above)*.

## APPRECIATION FOR EAA 2010 LIFETIME ACHIEVEMENT AWARD
### Oliver Perry

My wife, Dorothy and I wish to officially thank the EAA for selecting me for the 2010 Lifetime Achievement Award. We are honored to receive such an award, especially when there are many others in our organization who have overshadowed my contributions to the EAA. I have thrown a few pebbles into the pond and created a few ripples while some have tossed boulders into the water producing rock smashing waves.

On behalf of those who nominated and supported me, I truly thank you. Thank you Tullio Falini, treasurer of the EEVC, for your kind and generous written nomination letter and thank you, Peter Cleaveland, EEVC newsletter editor, for reading Tullio's nomination letter and adding your comments at the annual EAA meeting Saturday, February 27th in Palo Alto, California. Thank you EEVC members on whose behalf I accepted the award. The award is a tribute to you and everything you have accomplished.

Thank you Terry Wilson, EAA awards chairman, for presenting me the award and thank you Ron Freund, chairman of the EAA board of directors, for your kind words during the presentation procedure. I would also like to thank all of the fine EAA officers and members that I met at the EAA annual meeting for their kind words and for their efforts to advance the causes of the EAA.

The lifetime achievement award could not have been realized without the combined efforts of many equally deserving lifetime achievement award individuals helping me. Without their assistance and sacrifices, I would never have been in a position to be considered for such a prestigious award. Beginning with my wife Dottie, I must give credit where credit is due.

Dottie has been a patient and long-suffering saint who has rescued me from many a disaster by coming along side me and picking me up (along with the pieces of the project) before the steamroller flattened me, She has solved computer problems, people problems, proof read my writings, taken care of pictures, run errands, transacted important business and frequently jumped into the van and slept on the road in order to help me meet the needs of the Tour de Sol, the EEVC, and other electric car related events. She has been a great host to the many EAA and EV people who have visited our home.

I would like to give credit to the Cinnaminson High School Board, administration, fellow teachers, many students and parents, who backed me and supported electric car projects in Cinnaminson High School for nearly 30 years. Without the students and their parents I would never have become as involved in electric vehicle projects as I did. I learned through their adventures.

Our projects would never have been successful without hundreds of contributors and supporters in corporate America, especially the local business folk in the Delaware Valley region. The long list of providers of goods and services from Campbell's Soup, RCA, GE, to the Philadelphia Navy Yard, and PSE&G power utility (Joe Barton), cannot be written on a single page. A retired engineer, fellow EEVC member Gus Ehrenberg, devot-

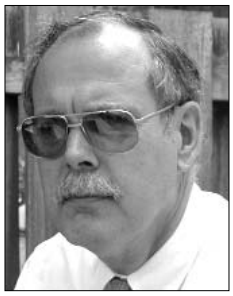
ed years of his life supervising and directing a 17-year Cinnaminson High School electric car project. He deserves special mention as well as fellow teacher and auto shop instructor Mr. Robert Deats who was a major partner for thirty years.

The EEVC and the Boyertown Museum were equally involved in supporting me as were the hard-working members in the EVA/DC (Washington DC) chapter of the EAA represented by Dave Goldstein, Jerry Asher, Charlie Garlow, and Chip Gribben, I must add to the long list of supporters NESEA, (Northeast Sustainable Energy Association), Tour de Sol volunteers with former director Nancy Hazard, the state of New Jersey governor Christy Whitman, the State of New Jersey Department of Transportation (Mike Strizki), and NJ Senator Diane Allen. I must also include the professors Tom Houck, Jack Braun and students from Burlington County College, the board, administration, staff members (Tom Molnar, Nancy Cunningham, Micah Wenkler, volunteer Dr. Paul Kydd) and students from the Burlington County Institute of Technology, both Westampton and Medford campuses. I would also like to include Dr. Joel Anstrom, director of the Hybrid and Hydrogen Vehicle Research Lab at Penn State, the director of the 21st Century Automotive Challenge.

Thank you everyone, as well as those of you who for brevity's sake could not be included, for this achievement award. On behalf of all of you I gratefully accept it.

Sincerely,
Oliver H. Perry
EEVC president

## TRAGEDY AT TESLA
### By California Pete



On February 17 a Cessna 310 belonging to Tesla senior electrical engineer Doug Bourn, 55 took off from the Palo Alto Airport bound for Hawthorne Municipal Airport in Southern California. With Bourn were senior interactive electronics manager Brian Finn, 42, and electrical engineer Andrew Ingram. For reasons as yet unknown the plane went out of control shortly after takeoff, clipped a power tower and crashed, killing all three and shutting off electric power to half of Palo Alto. Power was soon restored to the city, but the toll to Tesla, both personal and business-wise, must be considerable.

**Days of protest**

Remember the Free Speech movement and other events in Berkeley? In 1964-65 a group of students led by Mario Savio and others shut down the campus of UC Berkeley protesting a ban on on-campus political activities and demanding the right of free expression and their own version of academic freedom. The famous Summer of Love in the Haight took place in 1967, so this was a pretty feverish time, and it set a tone that can be noticed in the People's Republic today — despite the fact that Savio later went on to become a professor of taught mathematics, philosophy and logic at another California university. But the spirit of youthful rebellion has stirred once again.

California, which for decades spent lavishly as long as the economy was booming and real estate prices continued to march upward, is famously broke, and all parts of the state are feeling the effects, including the state university system. All students have been guaranteed free tuition, but that's not as good a deal as it seems: the schools cost just as much, but call the charges fees rather than tuition. And as state funds for education have dried up (think 35 to 40 kids in a first-grade classroom, and per-student expenditures ranking 49th in the nation) the money for university system was cur by $1 billion. In response the university "fees" have risen dramatically, and recently there were coordinated demonstrations on campuses all over the state.

But in Berkeley things got a little more enthusiastic. A group broke off from the main body of protesters and announced they were marching on Oakland. Later identified as "professional protesters," and apparently organized by Twitter and other means, the walked up an off-ramp and blocked the intersection of Interstates 880 and 980 during rush hour. Ah, the spirit lives...

**And other forms of madness**

San Francisco Board of Supervisors is well known for odd behavior, primarily because the districts that elect them have been carefully gerrymandered so less than 10,000 like-minded people can put anyone they like into office. One of the most notorious of these is named Chris Daly, who probably thinks that Che Guavera and Mao were members of a right-wing conspiracy. Day's latest eruption came on February 23, when, according to the *Chronicle*, he "cast the lone vote ... against a plan to place a $412 million earthquake-safety bond measure on the June ballot. His reason? There would be money to relocate Police Department brass, a police station and investigations bureaus from the seismically vulnerable Hall of Justice at 850 Bryant St. but no money to rebuild a couple of jails located there.

"'I care more about the people at the jail ... than I do about the rest of the people at 850 Bryant," said Daly."

**Historic EVs crash**

A feature of the touristy Embarcadero in San Francisco is the Muni F-Market line, which operates historic trolleys from all over the world. On February 18 a car on the adjacent J Church line rear-ended a 1928 trolley originally from Milan, Italy, injuring the F-Market car operator and two passengers. How long it will take to repair the car and get it back into service (if ever) is unknown, since Muni, along with all things public in the area, is suffering a severe deficit.

**Building British EVs in the Bay Area**

The *San Francisco Chronicle* reported on February 13 that British electric truck manufacturer Smith Electric Vehicles is "scouting locations in the Bay Area and Sacramento for a facility that would assemble, sell and service their plug-in trucks."

## NEWS UPDATE

**Better Li-ion batteries?**

Researchers at Boston College report that a tiny scaffold-like titanium structure of Nanonets coated with silicon particles could pave the way for faster, lighter and longer-lasting Lithium-ion batteries. The web-like Nanonets offer a unique structural strength, more surface area and greater conductivity, which produced a charge/re-charge rate five to 10 times greater than typical lithium-ion anode material. In addition, the Nanonets proved exceptionally durable, showing a negligible drop-off in capacity during charge and re-charge cycles. The researchers observed an average of 0.1% capacity fade per cycle between the 20th and the 100th cycles. The structure and conductivity of the Nanonets improved the ability to insert and extract lithium ions from the particulate silicon coating, the team reported. Running at a charge/discharge rate of 8400 milliamps per gram (mA/g) – approximately five to 10 times greater than similar devices – the specific capacity of the material was greater than 1,000 milliamps-hour per gram (mA-h/g).

For more information go to www.bc.edu/offices/pubaf/news/Nanonets2010_0215_.html

**Daimler and BYD in EV partnership**

An AP story dated March 1 reports that Daimler AG has signed a memorandum of understanding with Chinese company BYD C to develop electric vehicles for the Chinese market. The plan is for the car to be marketed under a new brand jointly created and owned by Daimler and BYD and for the companies to set up a common technology center in China to develop, design and test the vehicle.

**Nissan to take Leaf orders in April**

A February 12 story by AP writer Dan Strumpf reports that Nissan Motor Co. will start signing up customers for the new Leaf EV in April, "with shipments starting by the end of the year." "Nissan Americas Chairman Carlos Tavares said he expects about 20,000 people to sign up to purchase the vehicle."

"Nissan will build the Leaf in Japan until 2012. Then production of the vehicle and its lithium-ion battery packs are scheduled to start at Nissan's plant in Smyrna, Tenn., outside Nashville."

**Charging your EV at home may get easier**

KB Homes has announced that it will make a built-in high-voltage EV charger available as an option on custom-built homes.

**The body is the battery**

Imperial College London reported on February 5 that Researchers working with European partners including Volvo Car Corporation, are developing a prototype material which can store and discharge electrical energy and which is also strong and lightweight enough to be used for car parts. In addition, the researchers believe the material, which has been patented by Imperial, could potentially be used for the casings of many everyday objects such as mobile phones and computers, so that they would not need a separate battery. This would make such devices smaller, more lightweight and more portable.

The description from the university makes the material sound more like a supercapacitor than a battery: "The researchers say that the composite material that they are developing, which is made of carbon fibers and a polymer resin, will store and discharge large amounts of energy much more quickly than conventional batteries. In addition, the material does not use chemical processes, making it quicker to recharge than conventional batteries. Furthermore, this recharging process causes little degradation in the composite material, because it does not involve a chemical reaction, whereas conventional batteries degrade over time."

## COMING EVENTS

**SAE 2010 World Congress**
April 13-15, 2010, Detroit, MI. Go to www.sae.org/ congress

**NHA Hydrogen Conference & Expo**
May 3-6, Long Beach, CA. Go to www.hydrogenconference.org.

**International Conference Chassis Electrification**
April 21-23, Wiesbaden, Germany. Go to www.chassis-electrification.com/Event.aspx?id=254670

**Alternative Fuels & Vehicles National Conference + Expo 2010**
May 9-12, Las Vegas. Go to www.afv2010.com/

**Energy Efficiency Global Forum & Exposition (EE Global)**
May 10-12, Washington DC, www.calstart.org/events/calstart-events/09-07-29/Energy_Efficiency_Global_Forum_Exposition.aspx?Events=EventItem.

**The Time Trial eXtreme Grand Prix electric motorcycle race**
May 14-16, Sonoma, CA. Go to www.infineonraceway.com

**SOLAR 2010**
May 17-22, Phoenix. Go to http://ases.org/index.php?option=com_content&view=article&id=18&Itemid=147

**Advanced Automotive Battery Conference**
May 19-21, Orlando, FL. Go to www.advancedautobat.com/AABC/index.html

**10th Challenge Bibendum**
May 30- 2 June 2, Rio de Janeiro. Go to www.challengebibendum.com/challengeBib/AfficheServlet?Rubrique=20070807132926&Langue=EN

**Transports Publics 2010,**
June 8-10, Paris. Go to www.transportspublics-expo.com/en/2010/accueil/index.php

**Formula Sun Grand Prix**
June 16-18, Cresson, TX. Go to http://americansolarchallenge.org/events/asc2010/formula-sun-grand-prix-2010-2/

**American Solar Challenge**
June 19-27, Tulsa, OK to Chicago. Go to http://americansolarchallenge.org/events/asc2010/american-solar-challenge/

**Southern ElectricVehicle Expo**
Oct 29031, Asheville, NC. Go to http://sev-expo.com/e107_plugins/calendar_menu/event.php?1288378800.event.1

**EVS25**
Nov 5-9, Shenzhen, China. Go to www.evs25.org/event/2009ddc-en/index.html

## 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 that here are no June or August meetings.

April 14

May 12

June 9

Sept 8