EEVC NEWSLETTER

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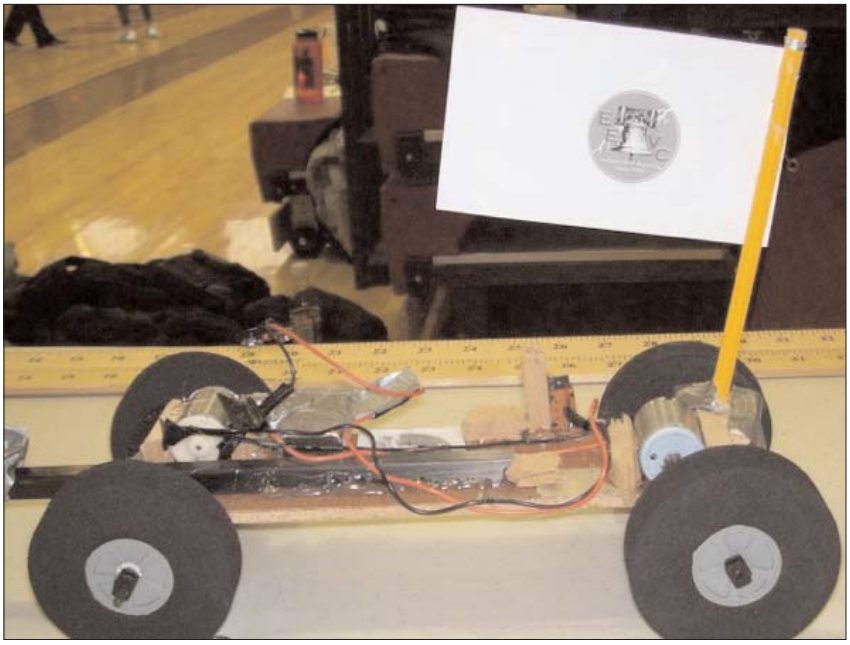
EEVC AWARDS RON GROENING AWARD AT ANNUAL PHYSICS OLYMPICS

Alan Arrison, Carl Grunwald and Jim Natale

The Physics Olympics were held at West Chester Henderson High School Saturday March 18, 2017. The cold, wet, and miserable weather did not dampen the enthusiasm of the students. The competition included the electric vehicle competition, a bridge building competition, a Physics trivia game, Physics Plinko, and a relay event that combines sports challenges with solving physics and engineering word problems.



The winner: Minimalist design but effective. One motor per axle for 4 wheel drive. The motors are mounted on opposite sides. One 9 V battery for power.

The EEVC sponsors the Ron Groening Excellence in Engineering award to recognize excellence in engineering design toward achieving the challenge goals.

The day started with our judges performing registration and tech inspection for the electric cars. Each of the eight schools were allowed to enter up to four cars each. Radnor submitted three, Penncrest & Cinnaminson submitted two, Phoenixville, Pennsbury, Harriton, and Henderson each entered one. Interboro was not represented.

Each vehicle could use either one or two Pitsco 280 motors and alkaline batteries with a combined voltage of up to 12 volts. Although the objective of the event was to cause damage, the car could not have any sharp metal edges, spikes, or anything deemed dangerous by the judges.

To be eligible for the Groening Award the car had to sport the EEVC logo. Of the eleven entries only four chose to display the logo. The other criterion is that the car finish in the

Alan Arrison presents the Ron Groening Award to David Debellis of Harriton High School. An engraved plaque was later delivered to the winner.

Alan Arrison gives a speech explaining the Ron Groening award.

top half of the field.

Bubble Wrap

The first challenge was to pop large blistered bubble wrap that was taped to a sheet of plywood. Several designers took the Pointy Sticks approach by building a removable bumper holding short sharpened pencils or sharpened dowel rods. The other effective approach was using a lid from a tin as the contact point.

Crush the Can

The can was positioned vertically against the side of a wooden back drop. Denting the side of an empty soda can appeared relatively easy.

Crushing the Dixie Cup

The Dixie cup was taped to the wall with the bottom of the cup facing out toward the car. The paper cup proved very elusive to crush. As little as only four out of 28 attempts dented the cup. As it turns out, the cone shaped structure and symmetric bottom rim of a paper cup provide a surprisingly durable form such that if the cup is contacted squarely along all parts of the bottom rim, the force is evenly distributed and well absorbed by the cup. Consequently, teams that attempted to ram the cup with a large surface area battering ram fell into the cup's best defense by contacting the rim of the cup at all points along its surface. This allowed the cup to absorb and distribute the blow. Teams that chose small sharp battering rams, such as a series of pencil points, tended to puncture the bottom of the cup but left its overall structure intact. The best offense against the paper cup was a somewhat narrow battering ram that was just wide enough to hit a side of the cup bottom but small enough not to impact the full rim of the cup.

Crack the Egg

In this contest the target is a raw egg. Since this isn't Gallagher the egg was in a Ziplock bag and the floor was covered with a plastic sheet. Henderson and Harriton each cracked two eggs hard enough for liquid to enter the bag. Pennsbury got liquid three times and only cracked the shell on the fourth. The other participants caused no damage.

Observations

Four teams qualified for our award by displaying the EEVC logo: Harriton, Henderson, Pennsbury, and Phoenixville. All four cars

The official banner of the event.

were evaluated on their merits.

The Phoenixville car was built by Matt Tweedie and Josh Hayward out of Lego pieces. One motor was used and connected to the drive axle through an amazing matrix of gears. The elaborate gear design distributed the power to both the front and rear wheel axles. The large number of gears and gear ratios required to connect both axles may have absorbed some of the vehicle's power. But in total it was a very cool looking car showcasing a highly creative and intricate design.

Henderson's car was built by Miriam Saadeh and Abby Gaskill. It was a well proportioned, compact car, with similarly scaled miniature name card and logo. The car had a sturdy frame uniquely built of a perforated metal plate. It rolled true on stylish lime green monster truck tires. Interchangeable battering rams also provided additional functionality.

It placed third in the bubble wrap with the sharpened dowel rods. It placed second against the can with its removable battering ram and was second against the egg.

That leaves us with Pennsbury and Harriton. Sujit Hiremath from Pennsbury chose a dragster form factor. The rear wheels were direct drive and sported small tires. Playing

Carl Grunwald (l) and Alan Arrison examine an entry.

with it as part of the tech evaluation after the event demonstrated that it could really scoot. It would probably be faster over a long haul but its top flight speed could have been limited by the relatively short distances of the crushing stations.

This car was first against the bubble wrap and the egg. One cracked egg and three with liquid out of four runs compensated for the average performance against the bubble wrap.

And the winner is…

David Debellis of Harriton edged out Sujit on the points scale by crushing more can although he saved two eggs. The car exhibited several design features that suited it well for the challenge. The vehicle had a sturdy chassis and axle mount which gave the car a true line of passage, important in a competition needing to hit a target. It featured two motors, one on each axle, providing 9 Volt 4-wheel drive. An excellent gearing ratio with large tires delivered high speed and power, useful in the short distance traveled before ramming the target. The choice of battering ram was effective in crushing the Dixie cup, a feat in which only about four teams over 28 runs scored points. David and his teammates also showed ingenuity and collaboration in successfully lining up their vehicle to hit the Dixie cup target.

Following the Physics Olympics Closing Ceremonies and the awarding and presentation of the Ron Groening plaque, Carl Grunwald had an opportunity to chat with David. He asked what if anything had inspired him or if there was anything he would like to say. David shared his appreciation for his teammates at Harriton High School, among them Francis who helped with testing the vehicle, Thomas

who contributed design ideas and Robert who helped with building the car. David provided a sense of the dedication required in assembling a winning car. After mentioning to him that he had done pretty well in the sport aspects of the Physics Olympics Relay event, which combines sports challenges with solving physics word problems, he noted that the after school demands of Science Club left little time to also play an organized sport. An interesting twist, that, at least for this term, he had to give up sports for science.

Congratulations to David DeBellis from Harriton High School on winning the EEVC Ron Groening Best Electric Car Award for Excellence in Engineering

Comments by David DeBellis

My parents names are David Smith and Gia Ritchie. My father runs a banquet hall and catering business, and my mother works for a clothing consignment store. I have three sisters: Rene, Maddy, and Melita.

I am finishing my senior year of high school. In college I wish to study computer science or computer engineering. I want to pursue this as my career.

Some hobbies I enjoy are fixing and/or building things such as phones or computers. Another activity I participate in after school is Science Olympiad.

(Editors comment: For the last 20 years Harriton High School has participated in a highly competitive national Science Olympiad competition which begins at the local level and proceeds to the state and then national finals. Harriton has won the state of Pennsylvania Science Olympiad championship many times and the nation title several times. Truly an outstanding accomplishment.)

Designing the car

My friend Tom Delvin and I brainstormed some possible designs for this year's Physics Olympics electrically operated car crushing event. We asked ourselves how to get high torque with a good speed to build up enough momentum to crush the various objects in each differing trial. I used a small gear on both the front and back motor and a larger gear on both axles resulting in a great balance between torque and speed. I used ball bearings to keep a low friction and to secure the axle. I made two different heads that were able to be interchanged on the go to help crush the objects in each situation. I needed a spare pair of hand to help out and make the construction process go a bit faster. My teammate Robert Fleming helped me with that. Once the car was constructed I tested it to make sure the car could roll straight and crush the objects sufficiently for a high score. To help speed that process up my other teammate Francis assisted. We used a laser pointer to see the trajectory of the car to insure we hit the objects. This approach insured that we would have a successful "Car Crusher." (note: a vehicle that would crush the objects placed in front of it, not a device that would crush cars.) This whole building process took me two Physic Olympics practices, which is a total of 4.5 hours."

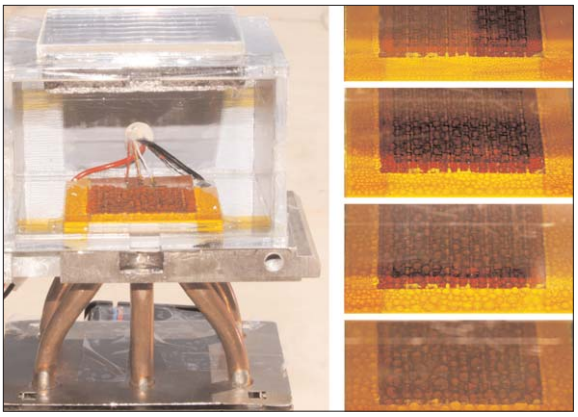
As for Harriton's Science Olympiad, we're looking strong this year. We have an outstanding team that I have great confidence in. States is April 29 at Juniata College where we will be going up against some of the most competitive teams. We then hopefully move onto nationals which is May 19 at Wright State University. This is where the top competitive teams will be opposing us with a huge challenge. Hopefully we can conquer. I believe our team is capable of doing so. In Science Olympiad I am a builder, so I take part in the following events: Electric Vehicle, Robot Arm, and Hover Craft. My team and I constantly are thinking of ways to improve and prefect our "builds" and testing them to the point where we can handle any situation.

WATER, WATER EVERYWHERE — EVEN IN THE AIR

David Chandler. MIT News Office

Editor's note: The following article, from MIT News*, has little to do with EVs, but discusses an important enough advance that I decided to include it.*

Severe water shortages already affect many regions around the world, and are expected to get much worse as the population grows and the climate heats up. But a new technology developed by scientists at MIT and the University of California at Berkeley could provide a novel way of obtaining clean, fresh water almost anywhere on Earth, by drawing water directly from moisture in the air even in the driest of locations.



This proof-of-concept device, built at MIT, demonstrates a new system for extracting drinking water from the air. The sequence of images at right shows how droplets of water accumulate over time as the inside temperature increases while exposed to the sun. Images: MIT

Technologies exist for extracting water from very moist air, such as "fog harvesting" systems that have been deployed in a number of coastal locations. And there are very expensive ways of removing moisture from drier air. But the new method is the first that has potential for widespread use in virtually any location, regardless of humidity levels, the researchers say. They have developed a completely passive system that is based on a foam-like material that draws moisture into its pores and is powered entirely by solar heat.

The findings are reported in the journal *Science* by a team including MIT associate prof of mechanical engineering Evelyn Wang, MIT postdoc Sameer Rao, graduate student Hyunho Kim, research scientists Sungwoo Yang and Shankar Narayanan (currently at Rensselaer Polytechnic Institute), and alumnus Ari Umans SM '15. The Berkeley co-authors include graduate student Eugene Kapustin, project scientist Hiroyasu Furukawa, and professor of chemistry Omar Yaghi.

Fog harvesting, used in many countries including Chile and Morocco, requires very moist air, with a relative humidity of 100 percent, explains Wang, who is the Gail E. Kendall Professor at MIT. But such water-saturated air is only common in very limited regions. Another method of obtaining water in dry regions is called dew harvesting, in which a surface is chilled so that water will condense on it, as it does on the outside of a cold glass on a hot summer day, but it "is extremely energy intensive" to keep the surface cool, she says, and even then the method may not work at a relative humidity lower than about 50 percent. The new system does not have these limitations.

For drier air than that, which is commonplace in arid regions around the world, no previous technology provided a practical way of getting water. "There are desert areas around the world with around 20 percent humidity," where potable water is a pressing need, "but there really hasn't been a technology available that could fill" that need, Wang says. The new system, by contrast, is "completely passive — all you need is sunlight," with no need for an outside energy supply and no moving parts.

In fact, the system doesn't even require sunlight — all it needs is some source of heat, which could even be a wood fire. "There are a lot of places where there is biomass available to burn and where water is scarce," Rao says.

The key to the new system lies in the porous material itself, which is part of a family of compounds known as metal-organic frameworks (MOFs). Invented by Yaghi two decades ago, these compounds form a kind of sponge-like configuration with large internal surface areas. By tuning the exact chemical composition of the MOF these surfaces can be made hydrophilic, or water-attracting. The team found that when this material is placed between a top surface that is painted black to absorb solar heat, and a lower surface that is kept at the same temperature as the outside air, water is released from the pores as vapor and is naturally driven by the temperature and concentration difference to drip down as liquid and collect on the cooler lower surface.

Tests showed that one kilogram (just over two pounds) of the material could collect about three quarts of fresh water per day, about enough to supply drinking water for one person, from very dry air with a humidity of just 20 percent. Such systems would only require attention a few times a day to collect the water, open the device to let in fresh air, and begin the next cycle.

What's more, MOFs can be made by combining many different metals with any of hundreds of organic compounds, yielding a virtually limitless variety of different compo-

sitions, which can be "tuned" to meet a particular need. So far more than 20,000 varieties of MOFs have been made.

"By carefully designing this material, we can have surface properties that can absorb water very efficiently at 50 percent humidity, but with a different design, it can work at 30 percent," says Kim. "By selecting the right materials, we can make it suitable for different conditions. Eventually we can harvest water from the entire spectrum" of water concentrations, he says.

Yaghi, who is the founding director of the Berkeley Global Science Institute, says "One vision for the future is to have water off-grid, where you have a device at home running on ambient solar for delivering water that satisfies the needs of a household. … To me, that will be made possible because of this experiment. I call it personalized water."

While these initial experiments have proved that the concept can work, the team says there is more work to be done in refining the design and searching for even more effective varieties of MOFs. The present version can collect water up to about 25 percent of its own weight, but with further tuning they think that proportion could be at least doubled.

"Wow, that is an amazing technology," says Yang Yang, a professor of engineering at the University of California at Los Angeles, who was not involved in this work. "It will have a tremendous scientific and technical impact on renewable and sustainable resources, such as water and solar energy."

The work was supported in part by ARPA-E, a program of the U.S. Department of Energy.

NEWS UPDATE

Wyoming coming to its senses?

An article in *Mother Jones* by Maddie Oatman discusses the positive impact wind energy is having on farmers in the Midwest, giving as an example one Iowa farmer who would have been driven off his land by low prices for corn and high prices for pesticides and seed, but for the $20,000 he gets each year from leasing three acres of land to a local wind power producer. Overall, the article says, "Iowa now gets 36 percent of its electricity from wind, a higher percentage than any other state, even California," and landowners statewide receive $10 million a year from it.

But not all states out there are getting with the program, apparently. Wyoming, where there are a lot of open-pit coal mines as well as a lot of wind-swept prairie, tried in 2010 to help out the coal mines by levying a special tax on wind energy, and recently proposed to increase that tax from $1 per MWh to $5 per MWh.. That was defeated by the state legislature in January, but another bill, which would essentially forbid utilities in the state to use renewable energy, was introduced a bit later. That one died in committee at the end of February.

So perhaps there's some hope for them.

Better supercapacitors

Editor's note:Supercapacitors hold a key position in many alternate-energy systems, because they can sustain much faster charge and discharge than batteries, and have essentially infinite cycle life. One drawback has been that they have been limited in capacity. The following article discusses how researchers at RMIT University in Melbourne, Australia have found a way to greatly improve this capacity.

PhD researcher Litty Thekkekara and Professor Min Gu

Inspired by an American fern, researchers have developed a groundbreaking prototype

that could be the answer to the storage challenge still holding solar back as a total energy solution.

The new type of electrode created by RMIT University researchers could boost the capacity of existing integrable storage technologies by 3000 per cent.

But the graphene-based prototype also opens a new path to the development of flexible thin film all-in-one solar capture and storage, bringing us one step closer to self-powering smart phones, laptops, cars and buildings.

The new electrode is designed to work with supercapacitors, which can charge and discharge much faster than conventional batteries. Supercapacitors have been combined with solar, but their wider use as a storage solution is restricted because of their limited capacity.

RMIT's Professor Min Gu said the new design drew on nature's own genius solution to the challenge of filling a space in the most efficient way possible — through intricate self-repeating patterns known as "fractals".

"The leaves of the western swordfern are densely crammed with veins, making them extremely efficient for storing energy and transporting water around the plant," said Gu, Leader of the Laboratory of Artificial Intelligence Nanophotonics and Associate Deputy Vice-Chancellor for Research Innovation and Entrepreneurship at RMIT.

"Our electrode is based on these fractal shapes — which are self-replicating, like the mini structures within snowflakes — and we've used this naturally-efficient design to improve solar energy storage at a nano level.

"The immediate application is combining this electrode with supercapacitors, as our experiments have shown our prototype can radically increase their storage capacity — 30 times more than current capacity limits.

"Capacity-boosted supercapacitors would offer both long-term reliability and quick-burst energy release — for when someone wants to use solar energy on a cloudy day for example — making them ideal alternatives for solar power storage."

Combined with supercapacitors, the fractal-enabled laser-reduced graphene electrodes can hold the stored charge for longer, with minimal leakage.

The fractal design reflected the self-repeating shape of the veins of the western swordfern, Polystichum munitum, native to western North America.

Lead author, PhD researcher Litty Thekkekara, said because the prototype was based on flexible thin film technology, its potential applications were countless.

"The most exciting possibility is using this electrode with a solar cell, to provide a total on-chip energy harvesting and storage solution," Thekkekara said.

PhD researcher Litty Thekkekara and Professor Min Gu.

"We can do that now with existing solar cells but these are bulky and rigid. The real future lies in integrating the prototype with flexible thin film solar — technology that is still in its infancy.

"Flexible thin film solar could be used almost anywhere you can imagine, from building windows to car panels, smart phones to smart watches. We would no longer need batteries to charge our phones or charging stations for our hybrid cars.

"With this flexible electrode prototype we've solved the storage part of the challenge, as well as shown how they can work with solar cells without affecting performance. Now the focus needs to be on flexible solar energy, so we can work towards achieving our vision of fully solar-reliant, self-powering electronics."

Renault introduces ZOE e-Sport concept

After launching the Renault ZOE, with its 400 km travel range, at the 2016 Paris Show, Renault showed its ZOE e-Sport concept car at this year's Geneva Motor Show. The vehicle uses technology and design ideas from the company's e.dams Formula-E racer, includ-

ing carbon fibre body, light weight (1400 kg including batteries), flat floor and air diffuser. It also has a tubular steel roll cage, making it suitable for the track.

Two motors, one at the front and one at the rear, deliver total power of 340 kW, or 460 bhp. As in Formula E, high-capacity permanent magnet technology maximizes energy efficiency. And there are two batteries (with a total storage capacity of 40 kWh), to make the most of this power.

The ZOE e-Sport Concept also benefits from Renault's Formula E experience in power-to-wheel optimization and delivery of full potential at all times.

Other features include a tubular steel chassis, low ride height, double wishbone suspension front and rear, 20-inch wheels, large brake disks and four-way adjustable dampers.

With torque of 640 Nm available almost immediately, the car gets to 100 km/h (62.5 mph) from standstill in 3.2 seconds.

Driving electric in the country

While EV charging stations are springing up everywhere, and Tesla Superchargers are strung like beads along major highways like I-5 between northern and southern California, things aren't quite so convenient for EV drivers in the Adirondacks and other places far from the coasts, according to an April 21 AP article by Michael Hill. Long trips in rural areas can require considerable planning, with time set aside for multi-hour recharging stops and a list of emergency contacts at the ready in case charge runs low with no regular EV outlet in sight.

What Hill is describing is the chicken-and-egg infrastructure problem EEVC members have been discussing since the 1980s, however, and one suspects it will gradually improve as EVs become more common.

Investments in renewable energy drop

An April 6 AP article by Frank Jordans reports that "[g]lobal investments in renewable energy fell by almost a quarter in 2016 amid a drop in prices and lower spending in some markets, according to a U.N.-backed report".

"Overall investments reached $241.6 billion last year, down from $312.2 billion in 2015, said the United Nations Environment Program."

At least some of the decrease can be attributed to lower prices for renewable;e capacity, however: "renewable energy capacity grew increased by 138.5 gigawatts, 8 percent more than the 127.5 gigawatts added the year before."

Toyota doubles down on hydrogen

On April 19 Toyota Motor North America announced Project Portal, a hydrogen fuel cell system designed for heavy duty truck use at the Port of Los Angeles. The zero-emission truck proof of concept will take part in a feasibility study examining the potential of fuel cell technology in heavy duty applications. The study will begin this summer and contribute to the Port's Clean Air Action Plan, which has dramatically reduced harmful emissions from operations at the Ports of Long Beach and Los Angeles since 2005.

Project Portal, says the company, is the next step in Toyota's effort to broaden the application of zero-emission fuel cell technology that can serve a range of industries. It is a fully functioning heavy duty truck with the power and torque capacity to conduct port drayage operations while emitting nothing but water vapor. Heavy duty vehicles make up a significant percentage of the annual emissions output at the Port of Los Angeles, and the Portal feasibility study may provide another path to further reduce emissions.

The Project Portal platform is designed to provide the target performance required to support port drayage operations. The truck generates more than 670 horsepower and 1325 pound feet of torque from two Mirai fuel cell stacks and a 12 kWh battery, a relatively small battery to support class 8 load operations. The concept's gross combined weight capacity is 80,000 lbs., and its estimated driving range is more than 200 miles per fill, under normal drayage operation.

Perhaps Toyota has found an application for which fuel cells are actually suitable. Like the electric delivery trucks used by many merchants at the turn of the 20th century, the hydrogen-fueled trucks will have no need for widespread infrastructure, as they can be fueled on site, and there is indeed a pollution problem (mainly having to do with particulates) at ports like Los Angeles, Oakland and others.

TOO MUCH SOLAR POWER
By California Pete

One of the well-known drawbacks of solar power is that it's available when it's available, and not necessarily when we want or need it. If solar power accounted for only a small percentage of what's flowing back and forth on the grid it would be somewhere between a curiosity and a way for some folks to feel good about themselves, but would not have much impact. But what about when it becomes a major factor? A March 22 article in the Riverside *Press-Enterprise* by David Danelski reports that, according to figures from the California Independent System Operator, the system last year experienced a "28 percent yearly increase in electricity produced from large-scale solar plants on the state's control grid, according to the data. The grid system, which excludes Los Angeles, Sacramento, and Imperial Valley area utilities, last year got 11.9 percent of its electricity from solar plants, up from 9 percent in 2015 and 6.3 percent in 2014."

When there is more solar power than the system can use the power plants are forced into what's call curtailment — basically shutting down — and last year, the article says, "[l]ast year 305,241 megawatt hours of solar and wind electricity were curtailed — a loss of enough carbon-free electricity that could have powered about 45,000 California homes for a year. This was almost double the amount of clean power that was lost through curtailment in 2015."

And more solar is coming on line. Hey, Elon, send us more batteries.

San Francisco, of course, always wants to in front of everyone else, and officially wants 100 percent of power used there to come from renewables by 2030, and is taking steps to get there: "Mayor Ed Lee on [April 14] set a new goal for San Francisco — that at least 50 percent of the city's electricity come from renewable sources by 2020. That's 10 years ahead of the target the state has set for itself."

There is, understandably, some resistance to that from PG&E.

Problems with BART

While the Philadelphia area has to contend with SEPTA, the Bay Area has its own problematic system: BART. It has been steadily falling into disrepair through lack of investment (no photo ops available for fixing worn tracks or replacing outdated wiring), but lately there have been a few new things.

One is crime: while BART is the scene of a great deal of petty theft — most of it involving snatching smart phones out of people's hands and running away, at about 9:30 p.m. on April 21 a swarm of under-age kids estimated to number between 40 and 60 jumped over the fare gates and attacked a BART train stopped at the Coliseum station, some holding car doors open and others rushing inside to steal whatever they could from passengers. Seven people were robbed on the train and one more on the platform. At least two people were injured, mostly in the face and head. Before the police could respond the kids had scattered into the surrounding East Oakland neighborhood.

One thing they may not have counted on was that since the *San Francisco Chronicle* reported a year or so ago that most of the surveillance cameras in BART cars were actually dummies, BART had moved rapidly to install real cameras; these turned out to be pretty high-resolution, and the faces of many of the kids were captured. BART refused to publicize the pictures because of the perpetrators' ages, but police have been able to make a number of arrests. And BART has beefed up patrols police patrols.

Perhaps less frightening, but still nasty, is the fact that homeless people have been using the handicapped elevators at BART stations in San Francisco as rest rooms, and users have to contend with piles of feces and pools of urine. The escalators are also used for the same purpose, and are often broken down as a result.

Something may finally be done about it, because two disability rights groups and a couple of individuals have lawsuits in federal court claiming civil rights violations. This may be sufficiently embarrassing that something may actually get done. We'll see.

An April 21 *Chronicle* piece by Heather Knight suggests a new name for San Francisco: Needle City. "In March, the Department

of Public Works collected 13,333 syringes left on the streets — an average of 430 every day," says the article. "That's 10,465 more needles than the crews collected in March 2016, a shocking rise that could be attributed to better collection efforts but also probably to simply more drug use in a country facing a growing opioid epidemic.

"The figures come only from the department's hot spot crews, which mostly clean homeless tent camps. Even more needles were found by regular cleaning crews, though those aren't tracked. And the totals don't count all the syringes discarded on port property and in parks."

Now, the article continues, there is finally some serious talk about establishing a safe injection site; how much will come of it is anybody's guess, as San Francisco could also be called NIMBY City, but we'll see.

You can be poor here and rich elsewhere

By the way, if you live in some parts of the Bay Area and have an income of $100,000 you're considered low income by the Department of Housing and Urban Development. According to *CBSSF Bay Area*, "HUD says a family of four in San Francisco or San Mateo County [home to Silicon Valley] with an income of $105,350 is now considered 'low income.' For Alameda and Contra Costa County, $80,400 is considered low income."

Out-migration doesn't hurt home prices

Despite the fact that more people are now being pushed out of the area by insane housing costs (among other things) than are moving in, the real estate market remains incandescent. According to a March 23 *Chronicle* article by Kathleen Pender, "The median price paid for all new and existing homes and condos in the Bay Area rose to $662,000 in February, up 5.4 percent from January and 7.6 percent higher than February 2016, according to a CoreLogic report released Thursday. The year-over-year jump is the highest for any month since October 2016, when it rose 8.5 percent."

Silicon Valley is even worse: "A two-bedroom, one-bathroom, 908-square-foot home on Stanford Avenue in Palo Alto — advertised as a teardown — was listed in mid-February at $1,927,000. It got 17 offers and sold for $2,550,000 cash on March 1, said listing agent Dawn Thomas of Dreyfus Sotheby's International Realty in Palo Alto." Granted, the number of houses sold has decreased significantly in the past few months, but the prices remain insane.

COMING EVENTS

ACT Expo 2017 - Alternative Clean Transportation
May 1-5, Long Beach, CA. For info go to www.actexpo.com/

Electric Vehicles: Everything is Changing
May 10-11, Berlin. www.idtechex.com/electric-vehicles-europe/show/en/

National Drive Electric Week
Sept 9-17, nationwide. At press time no events were listed for the eastern PA-NJ area; for more information go to https://driveelectricweek.org/

National Drive Electric Week Event
Sept. 16, Vincentown, NJ. For info go to https://driveelectricweek.org/event.php?eventid=936

2017 Bridgestone World Solar Challenge
Oct 8-15, Darwin to Adelaide, Australia. Go to www.worldsolarchallenge.org

NOTICE ON DUES

Annual dues are $20 with electronic delivery of the Newsletter, or $25 for a printed copy. Make checks payable to EEVC and mail to James Natale, 3307 Concord Dr, Cinnaminson NJ, 08077, or pay via PayPal to www.paypal.me/EEVC.

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 the school is closed in July and August, so no meetings are scheduled, although most years we find somewhere else to meet in those months.

May 10

June 14

Sept. 13