Staff

Engineers' Forum is Virginia Tech's student-run engineering magazine, published four times during the academic year. The editorial and business office is located at 223 Femoyer Hall Virginia Tech Blacksburg, VA 24061. Please feel free to stop by anytime, or phone us at 540.231.7738.

Letter from the Editor

Folks,
The cold weather shows no sign of letting up and just when the weather takes a turn for the good rain or snow occurs. We students try to find some personal time with a good read and a good beverage. So here is a good read for you-Engineers' Forum February issue.
When you browse through the magazine you will notice multiple articles that are related to science and technology. You will also notice two photo collages. One is about CES 2013 and the other is about the sustainable energy design fair that took place last semester in the college of engineering. The design fair was a showplace for the design projects of students taking ENGE 1024. For those with short memories and an interest in robots Charli performing the gangnam style is a must read. That awful microorganism called Virus, which could not be killed can now, be broken using proteins. Interesting right?? Well read it on.
Engineers are always looking to get involved in engineering organizations particularly those that work on engineering projects. VT BAJA is a great organization to get involved with. If you are interested read about their work in Robel's article.
Just a quick reminder about our rack locations- our racks remain in Norris, Randolph, Torgerson, Squires and Newman Library while new locations include Surge, Hahn and Turner Place. Whether you are waiting in line for a bagel or taking a much needed study break browse through the Forum.
Don't forget to check out our website. You are welcome to leave suggestions on how to improve the magazine. Also next time you are on Facebook or Twitter look us up. We are always looking for new members!!
Cheers,

Sumedha Mohan

Point of View:
Internet Ads

Last week, I used a friend's computer to look up a YouTube video and found myself wondering why I was stuck watching a thirty second ad before getting to a twenty second video on YouTube. It took me a bit, but then I realized that they didn't have ad blocking software on their web browser. For those of you who don't know, Adblock Plus is an add-on available on Firefox and Chrome browsers that effectively eliminates ads from most popular websites, including both images or preview video. I have been using Adblock Plus for about four years, so viewing the internet without ads feels natural to me now. Having long left the ad-ridden version of the internet behind, I began to think a little bit about how commercialized the internet is. In order to satisfy my curiosity, I decided to view the internet the way ad companies wanted me to. I disabled my ad blocker and went to check some of my most visited web sites.

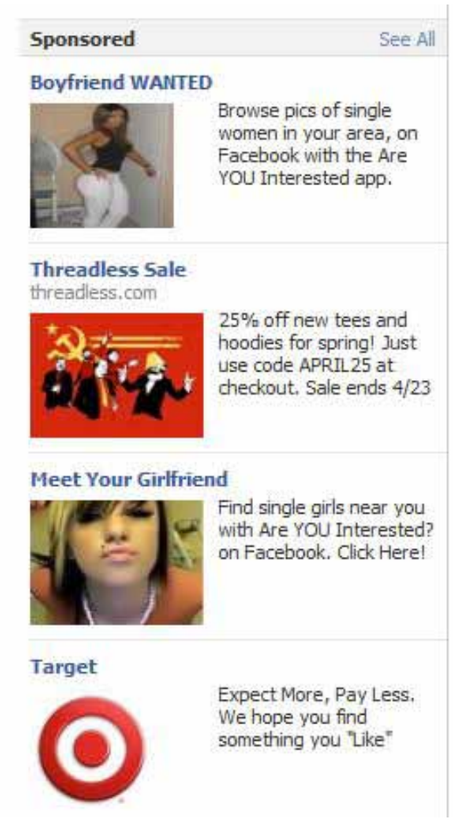
First was Cracked.com. Cracked is an American humor magazine that has been published since 1958. These days, they stick to web publishing. Without Adblock Plus, the usual default crimson backgrounds were replaced with banners promoting TurboTax. Aside from that, the only other change was the placement of a single ad at the bottom of each article's page. Thankfully there were no popups, but the additional ad at the bottom added a few extra inches of scrolling that personally annoyed me.

Source Cracked

Next I went to YouTube to see what it was really like. Google has long been using ads to get revenue, and YouTube is no exception. I decided to try a variety of user videos in hopes that they decided to disable ads on their channel. Out of the ten videos I had to watch four commercials. It turns out, these past four years free of YouTube ads have made me impatient. I could forgive some commercials, but I am a fan of short clips, and the idea of watching a commercial longer than the video itself-drives me insane. Interestingly enough, YouTube employs a system of ads that allows ad blockers to block them. Sites like Hulu, however, use more advanced systems to prevent the blocking of commercials. It appears that Google is actively giving users an option, which I appreciate.

The last website I decided to visit was Facebook. Out of all sites that I visit, Facebook would have the most relevant ads as it draws on users' activity to find "relevant" ads. Usually I see only this.

Upon disabling my ad blocker I see this.



According to Facebook, I need to buy a new t-shirt in order to find a girlfriend, ideally while taking advantage of great deals at Target. Overall, though I found Facebook's ads to be discrete and fairly non-invasive; that said, the new occupied space really stood out to me, and I much preferred the ad free version.

My brief foray into the world of internet ads showed me that I am incredibly lucky to have found an ad blocker early on. The very idea of seeing ads on the internet to me is bizarre. If you too tire of this world I highly recommend seeking out Adblock Plus. It works with both Firefox and Chrome, it's free, and best of all, it gets rid of those pesky ads.

Jordan Sablan is a Sophomore in Computer Science

Freshman Engineers: *Inventing the Future* of Sustainable Energy

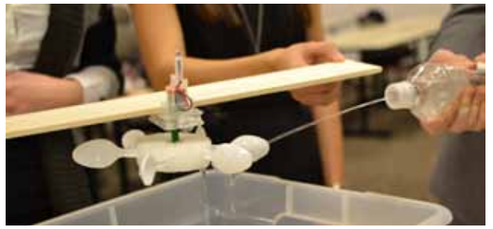
Every year, the department of engineering hosts the Freshman Sustainable Energy Design Showcase. This event offers students in Engineering Exploration, the freshman introductory engineering class, the opportunity to present their projects which are based on novelty, usefulness, and most importantly, efficiency of its power supply. Several judges are present to decide the top projects for the year. Students who are a part of this showcase should be very proud of their accomplishments. Their hard work could benefit the technological advancements of energy efficiency which will be vital in the near future. This is just another example of dedicated Virginia Tech students beginning early on their mission to Invent the Future.

Students of the Engineering Exploration freshman engineering class listen attentively as Dr. Vinod Lohani, a professor in the department of engineering at Virginia Tech, congratulates them for creating the top 6% of over 300 projects designed by the nearly 1200 students in this course. These designs were selected specifically by their instructors for having best met the requirements of being innovative and for efficient use of sustainable energy sources. He also introduces the six guest judges, of which few were proud alumni of Virginia Tech, at the Freshman Sustainable Energy Design Showcase. He started off the night by stating, “Let the competition begin!”

Dr Vinod Lohani listens attentively to an Engineering Exploration student who enthusiastically explains his hydroelectric power generator. This prototype creates electricity by using a water supply, used to power electronic devices.

Four Engineering Exploration students show off their biomass energy prototype that collects methane through the process of food waste decomposition. They collected organic waste from our local dining halls, and placed it in large jars. Their idea was to allow for the decomposition of these materials, which includes the process of the release of hexane. This innovative idea to create energy from hexane would mean more sustainable dining halls here at Virginia Tech.

An innovative Engineering student describes his team’s Pressure Activated Sound Emitting Plate to a Design Fair judge. This solar energy-powered prototype was created to assist the visually impaired. The design of this project has many of these plates set up in a row along a selected pathway. They are designed with the durability to withstand heavy and extreme forces as though as if a person is stepping on them. Upon compression, the plates emit a buzzing sensation to alert the person of obstacles approaching. The idea behind these plates is original and serves a good purpose in helping those who are visually impaired to be more independent.



Four Engineering Exploration students pictured here show off their hydropower energy waterwheel prototype design that produces energy from a simple water source. This small-scale prototype uses the kinetic energy of moving water to make electricity. The idea from this design can be used as a larger scale model and can be used in groundbreaking ways such as to power large buildings and facilities.

Sofia Davila is a freshman in General Engineering.

Faculty Spotlight: Dr. Christopher Moen

Dr. Cristopher Moen, an assistant professor in the Charles E. Via, Jr. Department of Civil and Environmental Engineering, is widely known for his research in thin-walled structures, but you may not know that he initially wanted to become a doctor. “I really loved those medical doctor shows,” recounts Dr. Moen. His interests took an unexpected turn, however, when he became involved in conducting undergraduate research in concrete and steel while studying at the University of Virginia. “It was kind of like being involved in medical research because you’re following an investigative path, but there’s no blood involved” he says. Through conducting research for the Virginia Transportation Research Council, Dr. Moen was also able to obtain a position as a Graduate Research Assistant at UVA and obtained his master’s degree, in which he concentrated on high performance concrete.

After receiving his master’s degree, Dr. Moen worked as a bridge engineer for J. Muller International in New York City. Although bridge engineer Jean Muller is not as well-known outside of France, he has created some incredible bridge designs, and Dr. Moen lists him as his favorite structural engineer. Also in New York City is where his favorite bridge, the Brooklyn Bridge, stands. “Because of the designers, John and Washington Roebling, that bridge is really well thought out: the shape of the towers, the inclination of the cables, vertical and diagonal hangers to provide extra stability to resist wind,” he indicates. Five years later, Dr. Moen continued his career as a bridge engineer at an engineering firm in Baltimore and later worked on the design and construction of the Woodrow Wilson Bridge—which many of us at Virginia Tech have driven over at one point or another.

After eight year of working as a bridge engineer, he decided to pursue a PhD at Johns Hopkins University in Baltimore, where he worked on developing new design methods for thin-walled members with holes. “I had seen all the design codes, and I was interested in digging below them,” replied Dr. Moen, when I asked him why he decided to change his path. “Now, I have the ability to actually improve them, which is a big motivation for me as a professor today,” he added.

Since arriving at Virginia Tech in 2008, Dr. Moen continues to conduct research in thin-walled structures and transportation infrastructure. He is also branching into other areas of research, including working on advancing ways to perform simulated experiments of structures on the computer and also developing new design methods to utilize the high-performance properties of modern concrete. “Concrete is almost as strong as steel now, and our design approaches and structural systems should change to fully utilize these beneficial properties,” points out Dr. Moen. “Also, new families of materials are being discovered using powerful optimization techniques that can be printed with additive manufacturing processes, a very exciting development for structural engineering.” Consisting of an active group of freshmen to PhD students, Dr. Moen’s research group is making a concerted effort to establish collaborative relationships in the field of multi-functional materials and structures.

Because Dr. Moen’s interest in structural engineering initiated while pursuing research, he strongly advises civil engineering students to find an internship, work with a professor, or join the ASCE Steel Bridge or Concrete Canoe team. By expanding your education beyond the classroom, you can take part in solving real-world engineering problems. “What fascinates me looking forward in the next 50 years for structural engineering are the new materials and tools we are going to be designing and building with. It’s going to be a really exciting time,” he says.

Zuhra Malik is a junior in Civil Engineering.

Club Spotlight: Virginia Tech Baja

Located at the Ware Lab on campus, Virginia Tech Baja designs single-seat, off-road vehicles to compete against other colleges for the Baja Series, hosted by the Society of Automotive Engineers (SAE). Schools compete from all over the world in hopes that their vehicle will be most favored by the judges based on a number of factors.

There are about twenty members of VT Baja, most of whom are mechanical engineers that put what they learn from their courses into use in making the vehicle. The people on the VT Baja team put many hours into working on the vehicles, and this is their senior design project for many of them. Each member is required to put in 15 hours of work every week and 80 hours of work during breaks, even if it requires staying at Blacksburg later than they usually would.

VT Baja competes twice a year in the Winter Baja competition and Spring Baja Competition. This February, they will be competing in Cookeville, Tennessee where they will see how their sweat and hard work measures up to the judges. The vehicles are ranked in areas such as suspension, acceleration, traction, safety, and presentation.

VT Baja is split into three groups: Chassis, Suspension and Drivetrain. The Chassis group designs the "skeleton" of the vehicle, the Suspension group designs the shocks and work with how impact is transferred through the vehicle, the Drivetrain group is responsible for designing the wheels and axles. The vehicle should be durable enough to withstand rough terrain, jumps, and other obstacles without cracking or breaking. VT Baja's main focus isn't speed—it's endurance.

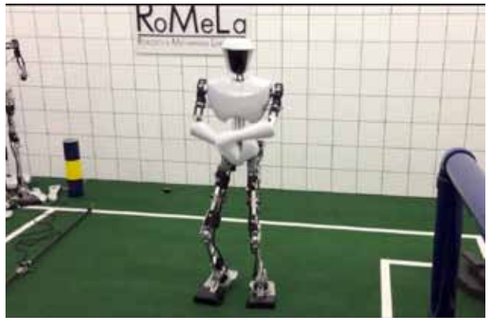
Presentation of the vehicle is a very important part of the judging process as well; the vehicle's non-physical section of the scoring is worth almost one third of its entire score. The team has to prove that the vehicle is marketable and that it can efficiently be reproduced. The final report submitted by the team also has to go in so much detail that it should be able to fully describe every part of the vehicle it to a person that knows nothing about the field.

VT Baja has been around for over 20 years, and in that time, Virginia Tech has worked its way to being a top competitor. Although most colleges that participate use similar vehicle design basics as previous years, Virginia Tech makes a point to change their design every year. Even with this disadvantage, Virginia Tech's team was required by the SAE to change other basic parts of their design to give the other teams a fair chance at winning.

VT Baja is always looking for volunteers. Although most of the members are mechanical engineers, anyone with a serious interest is invited to participate in this one of a kind learning experience. Contact information for VT Baja can be found at https://sites.google.com/site/vtbajasae/.

Robel Fasil is a sophomore in Industrial & Systems Engineering

CHARLI Dances Gangnam Style



As you may have heard, Virginia Tech's Robotics and Mechanisms Laboratory (RoMeLaVT) has recently contributed to the popularity of America's favorite Korean pop sensation. On October 19th last year, RoMeLaVT uploaded a video of CHARLI-2 dancing to Psy's "Gangnam Style."

In many ways, CHARLI-2 has more rhythm and coordination than some humans. Every movement is perfectly on beat, and although the dance is over before the song, the result is undeniably charming. For one, the two lasso-twirling and horse-riding signature moves from the original music video,are incorporated. Second, CHARLI-2 occasionally dances like a happy baby, bouncing up and down on its legs. The finale in particular is adorable: CHARLI-2 blows multiple kisses and takes a gracious bow.

While the dance may seem simple, the movements performed demonstrate CHARLI-2's outstanding coordination, balance, and versatility, as well as the programming skills of the RoMeLa students.

The video now has over one million views. Although this is not CHARLI-2's greatest accomplishment, nor RoMeLa's greatest technological feat, the video has led to greater publicity for the robot, the lab, and Virginia Tech.

CHARLI-2 was named the "2011 Best Invention of the Year" by Time magazine and won numerous awards at RoboCup 2011. He is currently being treated as a preliminary robot for the Navy's future Shipboard Autonomous Firefighting Robot project.

Avery Nelson is a sophomore in Materials Science & Engineering.

Outsmarting Viruses: Re-engineering Ourselves

Peter Burnham, a sophomore in Biochemistry. Last summer he worked to discover the proteins that viruses use to multiply.

On a summer night when most college students were hunting each other in the latest video game, Peter Burnham leaned over his computer and engaged in a hunt of an entirely different sort: the search of a protein that would break viruses.

During the summer of 2012, Dr. Murali of Virginia Tech's Computational Biology Department employed Peter Burnham as an intern to assist in unraveling the mysteries of how viruses propagate and infect hosts. Because they are exceedingly small and simplistic in structure, all viruses require the more sophisticated equipment of host cells around them. By "hijacking" those cells and telling the nucleus to act as a factory instead of a cell, a virus can multiply and ensure its survival. When a virus becomes particularly adept at that process, it spreads exponentially and becomes a lethal force to its host.

It is that very hijacking system, therefore, that Dr. Murali and Peter Burnham have studied in hopes of one day predicting and impeding. Peter Burnham, a sophomore in biochemistry, has been tasked with using algorithms and a computer suite developed by the Murali lab called Biorithm to identify the special proteins inside human cells that a virus uses. These proteins, called host dependency factors (HDFs), are key components in every human proteome that a particular virus needs to interact with in order to complete its "hijack." The dependency factors for each virus are unique and, if successfully identified, can be shut down and stop a virus from replicating. This also means that the protein cannot be too essential to the human host, or silencing it could be lethal.

As an intern in Dr. Murali's predictive computational biology lab, Burnham's original mission was to use known information about the HDFs of the well-known virus, HIV, to predict information about the set of HDFs of another local virus. "Essentially," he said, "my goal would be to take methods we used to identify host dependency factors in HIV and use those same methods to identify HDFs in another virus, in this case influenza." The predictive analysis employed by computational biology labs is the first step in a two-part process. Once candidate proteins have been identified and catalogued, they are sent to scientists of higher technical expertise to be experimentally tested and eventually proved or disproved to be a successful means of halting the propagation of a virus. "To see if knocking out that human protein prevents the virus from replicating," says Burnham.

That summer, Burnham was not disappointed.

What began as a routine predictive test evolved into something much more exciting, as the young intern

Spreadsheet comparing codependency factor proteins for two unrelated viruses.

analyzed and completed predictive models for the dependency factors of not only Influenza, but also a host of other viruses, including the West Nile Virus, Hepatitis C, and additional aspects of HIV. Intrigued at some of the similarities between the predicted dependency factors for the different viruses, Burnham began comparing aspects of the models against each other. What he found was astonishing. Though viruses like Hepatitis C, Influenza A and HIV possessed "very different structures and natures," when compared analytically they revealed a set of dozens of common host dependency factors that encompassed a wide range of cellular functions.

The finding's implications were enormous. Burnham explains that even though the target viruses appear to have no common ancestry, the matching sets of proteins that each of these viruses use to invade a host's body "suggests that very different viruses exploit the same part of the human proteome, the vast network of proteins that makes up a human genome."

The common set of HDFs that diverse viruses use implies a consistency and a level of dependency on the part of the viruses that goes beyond mere coincidence. The similarities of these interactions suggest the existence of a fundamental set of rules for how viruses interact with the human genome. The computational lab has hypothesized that common dependency factors make up the oldest proteins in the human proteome. If this hypothesis could be proven correct, it would add mountains of data to the study of viral and human coevolution.

The finding of a common set of dependency factors for diverse viruses has immediately thrown Dr. Murali's and Burnham's work into greater importance than ever. Simply put, if one common dependency factor protein could be used to inhibit the growth of a virus, then it was now plausible to predict and test that same protein against other viruses, impeding them.

The ultimate goal of this research is that by inhibiting one virus using a common protein, scientists may be able to use that same dependency factor to knock out multiple other viruses. The predictive modeling used to compare dependency factors has the potential to save researchers countless hours and bring unprecedented efficiency to the search for cures for viruses around the world.

The key challenge, according to Burnham, is to find a protein within that common network of the human proteome that many viruses interact with that somehow stops the virus from replicating while still preserving the health and safety of the human host when removed. The balance of all these conditions is very slim, and requires a great deal of care on the part of the researchers and experimenters concerning this study. "We are hoping for this perfect condition," Burnham says, " that one of our couple hundred proteins identified will meet that perfect criteria: that knocking out the protein indeed inhibits the production of the target virus and that it does not significantly harm the host."

As of now, the combination of disabling a protein used by common viruses without killing the host human remains a slim but hopeful possibility. With about 30,000 proteins in the human genome, finding and testing a couple hundred only scratches the surface. Researchers like Dr. Murali and Peter Burnham continue to head the efforts for finding these common proteins, and with them come new possibilities for cures. And if I know anything about Peter, he won't stop until he has tried every last one.

Coleman Merenda is a sophomore in General Engineering.

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