Engineers' Forum

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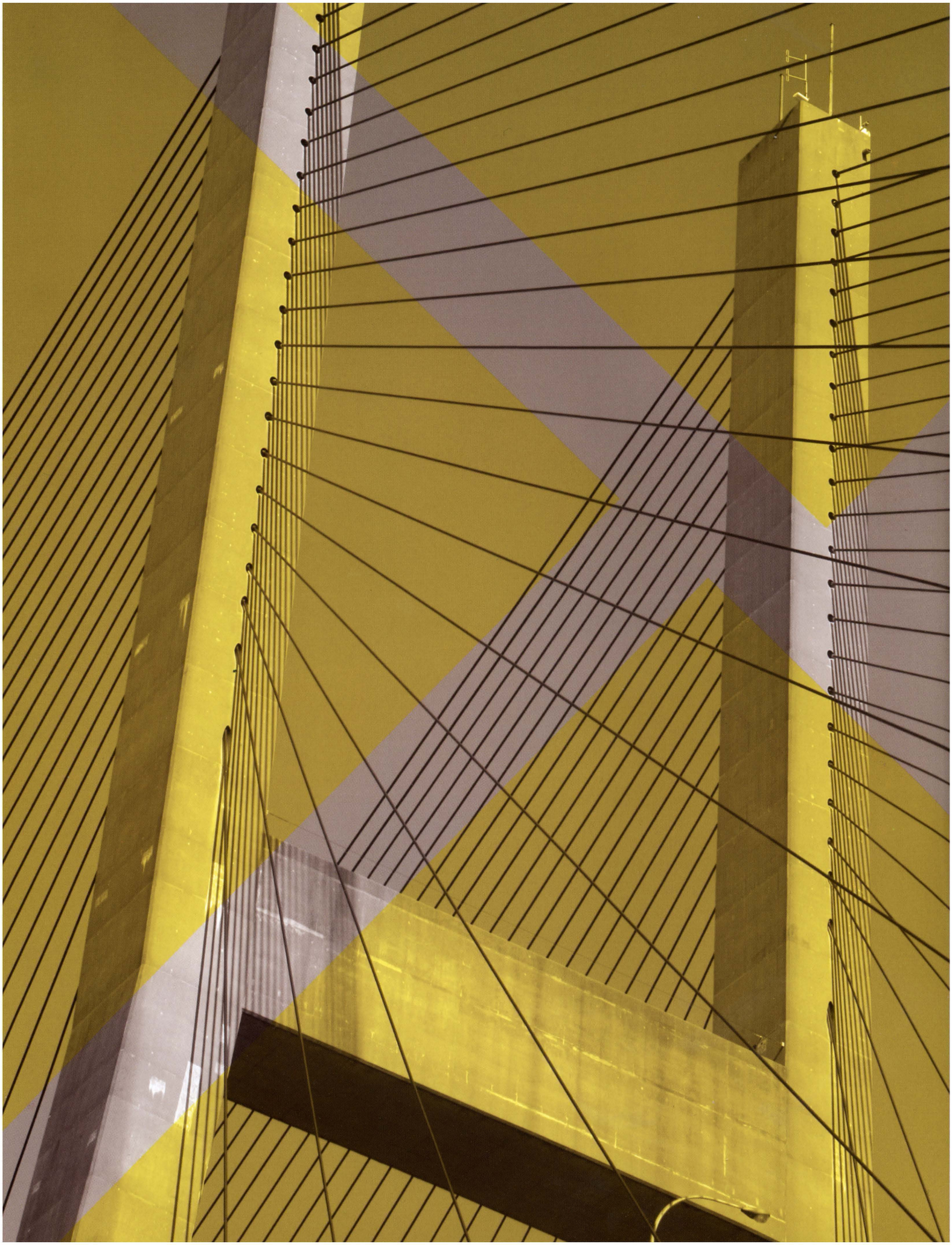

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LETTER FROM THE EDITOR

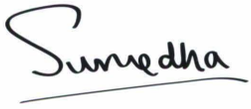
Folks,

It is that time of the year when pumpkin lattes and hot chocolate beckon us and 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 November issue.

When you browse through the magazine you will notice multiple articles that are related to science and technology. While one article talks about the life and success of Professor of Practice Dr. Dan Sable, another talks about the development of the landmark building, Squires Student Center. For a trip back to the high school chemistry classroom, look at the article that talks about the Heisenberg Uncertainty principle. Does this term ring any bells? Google lovers will be delighted to know the history behind this search engine giant.

We have changed our rack locations since the Fall semester began. 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. Next time you are on Facebook or Twitter, look us up. We are always looking for new members!

Cheers,



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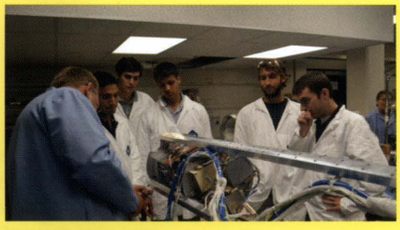
What's Happening at Virginia Tech

Traffic Light Timing: Avoiding Dilemma Zones

Professor Hesham Rakha of the Virginia Tech Transportation Institute (VTTI) has been conducting research on the timing of yellow lights, to calculate which duration of yellow lights is optimal to prevent accidents. Rakha and his team studies drivers' behaviors on Virginia Tech's Smart Road, on which VTTI can control the stoplights. Yellow light time for a 35 MPH road is normally around 4 seconds. 1 second is roughly how long it takes for a person to react to the yellow light, and it takes roughly 3 seconds to slow down comfortably. These results are not exact and vary with the age of the person, the weather, and a factor they call "the dilemma zone," that familiar feeling when you're unsure whether you should proceed or stop. Speeding ahead might potentially mean running a red light, but slowing down too suddenly could lead to a rear-end collision. While analyzing red lights, VTTI is also currently researching ways for cars to communicate, so we wouldn't need stoplights at all.



Launching Rockets with RockSat-X

The RockSat-X team was able to team up with other universities in a program called The Colorado Space Grant. The team built instruments for a rocket that was launched at NASA Wallops, located in Virginia's Eastern Shore. Two of the instruments they built included the nitric oxide sensor, which records the amount of nitric oxide at different altitudes, and a Piezo Dust Detector, which collects data about different dust particles. On September 21, the RockSat-X team was able to watch its experiments being launched and its instruments work successfully.

Water and Aircraft Devices

In the College of Agriculture and Life Sciences, David Schmale and Craig Woolsey are associate professors that helped lead the creation of the Kentland Experimental Aerial Systems Laboratory. This laboratory will be used to create devices for vehicles going in the sky or underwater. These devices will collect information about the land or sea in places where it would be hard or even impossible for humans to travel. Some possible upcoming uses of this include land management, search and rescue, border security, and disaster support, all of which could quickly advance the speed of research.

Impact-Sensing Football Helmets

Our beloved football team has also been getting some help from researchers at Virginia Tech, specifically through better helmets. The Hokies' helmets are designed to reduce the risk of injury to the players, with sensors to measure how much force hits the helmet, and where. The sensors alert the nearby athletic trainers if a player has suffered a hard hit, and if they should check the person for concussions. Although hard hits don't always mean concussions and vice versa, the alerts are an important extra step in the name of safety. Dr. Stefan Duma, department head of the Virginia Tech-Wake Forest School of Biomedical Engineering and Sciences, tested different helmets by putting each one through 120 hits at different forces and areas, the ones that lowered acceleration the best were the ones that Dr. Duma recommended for collegiate players.

More Energy for India

About two years ago, Virginia Tech agreed to open a campus in India. This campus will focus on research related to alternative powering options, like wind and solar, to help provide India's large impoverished population with accessible electricity. The ultimate goal is to have solar panels and small windmills mass produced and tested for the new location. Graduate students in India will be recruited to research this as soon as the India campus is completed and eventually, people from Tech's main campus will be recruited to help with the lack of electricity in India.

Robel Fasil is a sophomore in Industrial and Systems Engineering

Squires in a Timeline

1919-1936
The "Y" building was the center of student life and activities Under direction of Paul Derring

1936
April 1 Construction on the Student Activities Building (SAB) began

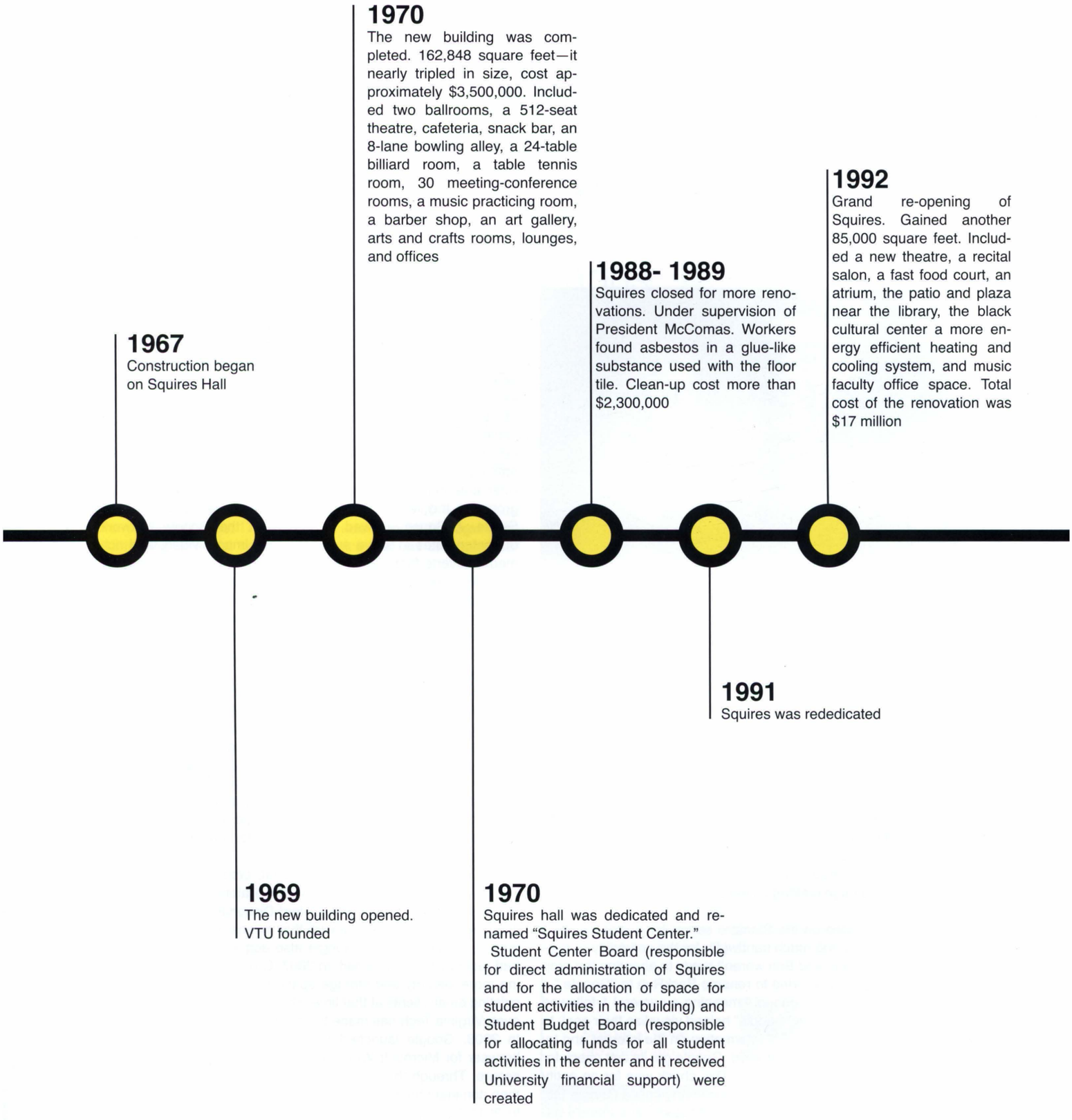
1937
May SAB construction completed.Contained 54,366 square feet "Y" Offices moved here, where the program continued to grow and expand

1937
Fall, SAB opened for students

1937-1939
Used as a civilian dining hall

1949
Renamed "Squires Hall" after John H. Squires, a scientist, financier, and philanthropist who donated $10,000 to the university

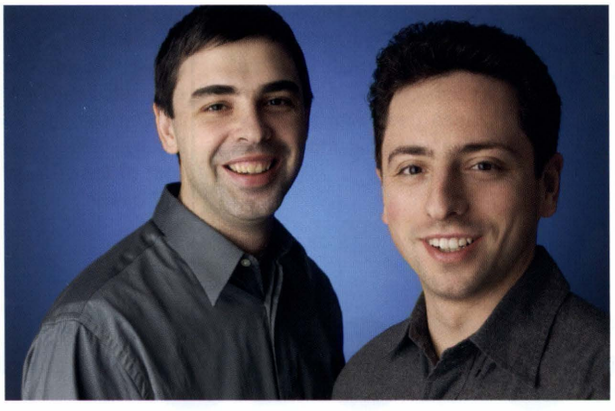
1966
Original Squires building closed for an addition and renovations. Renovated the core building and constructed a surrounding region



Amanda Karstetter is a junior in English & Humanities, Science, and Environment

When Larry Met Sergey:

A Brief History of Google



Larry Page and Sergey Brin

Who doesn't know about Google? Google has now become part of our daily life. On an average day, Google gets about 320 million hits on an average from US alone, and 2.4 billion hits worldwide. This year, Google celebrated its 14th birthday on September 27th. In recognition of this milestone, it's important to remember the progress this company has made from a research project at Stanford to a $200 Billion Company.

It all began in the year 1995 when Larry Page (22) and Sergey Brin (21) met at Stanford. Larry was considering PhD in Stanford and Sergey (enrolled as master's of science student) was assigned to show him around the campus. Upon first meeting each other, they disagreed about almost everything. Despite their differences, they were thrown together in 1996, both assigned to begin work on BackRub, a web crawler. A web crawler crawls through all the websites and web pages around the world and assigns them a page ranking based on things like content, words used, links, etc.

BackRub operated on the Stanford server for a year before it eventually took up too much bandwidth for the university to support. However, Page and Brin weren't ready to abandon the project. They eventually decided to rename BackRub to "Google," a misspelling of the word "googol," meaning a numeral 1 followed by 100 zeroes. The name "Google" helped visualize their goal: to take the enormous amount of information on the internet and try to organize it. In the August of 1998, Google got its first check for $100,000 from Sun Microsystems. This check was for an entity that didn't even exist at that time: a company called Google Inc. Shortly afterward, Brin and Page moved Google to a friend's garage and set up office there.

By the turn of the millennium, Google had won the international honor of a Webby Award for Best Practices, and crossed a milestone of over 1 billion indexed pages, making it the world's largest search engine. Google opened its first international office in Tokyo and hired its first CEO Dr. Eric Schmidt, a 48 year old veteran of Sun Microsystems and Novell in 2001. In that year, Google launched image search, and also became available in 26 different languages, growing to search over 3 billion web pages and attain an annual income of $7 million.

After entering a partnership with AOL, Google then broke new ground in the field of advertising through the wildly popular AdSense. AdSense allowed publishers in the Google Network of content sites to serve automatic text, image, video, and rich media adverts that were targeted to site content and audience, all while being administered, sorted, and maintained by Google. After AdSense revenues had skyrocketed, Google later launched Google Grants, a program that donated some of the money generated from ads to non-profit organizations and charity funds all over the world. By the end of 2003, Google's income had grown past the $105 million mark, and it had 1628 employees.

After opening offices at many international locations including Australia, Ireland, India, and Mexico, Google then released two important developments: Google Maps and Google Earth. Google Maps would grow to become a wildly successful GPS-based map of the world. Google Earth was a satellite-based service that provided images of geographical areas. Nowadays, users can also see the images of earth from the surface of the Moon or even Mars. More recently, Google acquired Android, a Linux based operating system designed for touchscreen mobile devices such as smartphones.

In 2006,Google offered Google Chat, Google Docs, Google.org (a philanthropic organization) and Patent Search. In June of the same year, the English Oxford Dictionary added the word 'Google' to its volumes as a verb that means "to search for information on the Internet." Google also acquired YouTube, which had recently been launched. In 2007, Gmail was released, offering more security and storage space to its customers than any existing email clients at that time. Though it has taken some time, even Virginia Tech has made the switch to Gmail.

In 2008, Google launched Google Chrome, a freeware web browser for Microsoft Windows. It was faster, simple and more secure. Through this release they attempted to bring down the then dominant browsers Internet Explorer and Mozilla Firefox.

In 2011 Google launched Google art project for art lovers that

provided high-resolution images of more than 1000 works of art from the world's best 17 museums. It also launched Google Plus, a multilingual social networking service that, as of September 2012, contains 400 million registered users.

Google is not just about searching a word or looking for some information on the internet anymore. It is much more than that. As Ralph Waldo Emerson said, "Nothing great is achieved without enthusiasm." From the past 14 years, it has been a long journey for Google. It has gone through its various highs and lows and emerged as an extremely sought after website. So Hokies, what are we up to? If two college students in a garage could become the founders one of the world's most popular search engine, shouldn't we take inspiration and think of doing something big? You don't have to be Computer Scientists to dream big, either. There is an open avenue in every area.

Kanika Saini is a graduate student in Electrical Engineering

How Safe is Your Password?

Passwords have long ensured the security of information. For as long as there been a reason to limit access to information, there have been security measures to ensure it. Passwords serve as a way to grant and limit access to any number of sensitive data. In the digital age, passwords have become even more ingrained into society. From your email to your bank account, we are all familiar with the password blank and the familiar black dots it brings. Unfortunately, passwords are a necessity that is treated with little concern. Here are the top passwords of 2011 (in order); password, 123456, 12345678, qwerty, abc123, monkey, 1234567, letmein, trustno1, dragon, baseball, 111111, iloveyou, master, sunshine, Ashley, bailey, passw0rd, shado, 123123, 654321, superman, qazwsx, michael, Football. Oftentimes a user picks a weak password because they themselves cannot remember a more complex password. It would be fine if these habits did not go into the higher positions of power where serious damage could be done, but this is simply not true. In February of this year, the Syrian President Bashar al-Assad showed the world the importance of security when a group of hackers discovered his password was 12345. Not only that, but many of his staff members used the same password. 12345 is used by at least five other users. In the modern digital age, there is no room for weak passwords. Do not assume that you are safe if your password is not on this list, however. Weak password habits also incorporate practices such as using a mother's maiden name, a first pet, or your birthday. Sites like Facebook have made it easier than ever to gather information commonly used in passwords or password reset questions. There are ways to protect yourself from falling victim to common mistakes.

First and foremost, a good password begins with the user. While using something important to you may make it easier to remember the password, it also makes it easier to guess. Be random when choosing your passwords. Pick three words at random, for example car, water, and web. Combining all three of these words results in a password that would take about 169 days to brute force. Capitalizing each word results in a password that would take 952 years to crack. Adding "1" to the end would necessitate 408,000 years to crack the password. If you choose random words and combine them into a phrase it becomes easier to remember, but more difficult to guess.

Passwords are not the only means of access; however, choosing stronger security question is just as important. For example a common question used "What is your favorite sports team." If you list this team on your favorite social network you have just given the keys to your account away. One password reset later and a hacker has complete control. If they manage gain access to your email this way, they then have the ability to reset access to every account associated with those emails. In 2008, a hacker used the password reset function in Yahoo mail to gain access to then vice-presidential candidate Sarah Palin's email account. Her security question was "where did you meet your husband?" By doing a simple online search the hacker was able to find the answer and then reset her password. This could have been easily avoided, instead Mrs. Palin suffered embarrassment and a serious potential breach of security.

The last security tip I have to offer deals largely with your behavior on the internet. Your social behavior on the internet is the biggest risk to your own personal security. Posting a page that gives out where you went to school, who you are dating, and your birthday leads to nothing but trouble. Keeping that in mind, the best way to insure your own security is very simple. Limit how much you put on the internet. As often as this is said, it seems that the majority of people still ignore this simple habit. The more information you place online the easier it is to find you, and learn your computer habits. If you want to see an example of information overload, you can visit a site like Pipl, which lets you easily look up a surprising amount of information simply by entering their name and location.We will use Associate Dean Watford for this example. Dean Watford is a semi public figure and as such there will be a little more data available on her than usual. Using Pipl let's see what we can find on Dean Watford.

Already we can see a possibility for the Dean's age, home addresses and some old photographs. Further down we find a very likely home address listed in Blacksburg. The Dean is not a special case; however, take the time to look yourself up and being protecting yourself from discovery. The information may not even come from you, but government census data, the important thing is learning to protect yourself whether it be passwords or just personal data in general.

Jordan Sablen is a sophomore in Math and Computer Science

Knocking Down the Heisenberg Uncertainty Principle

Since its establishment, the field of quantum physics has set down the rules of the universe of the very small using a shaky foundation of probability. Because of the addition of probability, even the path that light takes in empty space was convoluted from a wave of energy, to a stream of particles, and finally to a wave of photons that could interact via a fundamental force to split into a matter/anti-matter pair of electrons that later recombines into a photon. Nothing could ever be asserted with complete assurance or left in its simplest form because of one theory: Werner Heisenberg's uncertainty principle. In its purest form, the theory states that one cannot assign exact simultaneous values to two properties of a system because the measurement of either quantity alters the state of the unmeasured quantity. Simply put, the uncertainty in measurement (since the magnitude of disturbance caused by measurement cannot be reduced to an infinitesimal quantity, at least with current technology) prevents an observer from knowing more than one characteristic of a system (or in most cases regarding this theory, a particle). The frustration was so great in the scientific community because of Heisenberg's theory that even Einstein once stated in complete opposition that, "The Old One (God) doesn't play dice." Heisenberg's "quantum egg," as it was known, served the role of a limiting factor in all of quantum physics; no scientist could ever escape the physical and metaphysical implications of the tried and tested theory.
But the defiant nature that exists in all greedy knowledge seekers tends to overpower such 'brick wall' theories in the long run. The roots of Heisenberg's limiting theory have begun to dry up much like Newton's law of gravitation did as it was replaced by Einstein's much more accurate theory of general relativity.

At the University of Toronto, a team of researchers led by Professor Aephraim Steinberg developed a variation of the 'weak measurement' technique that has been used to attempt to measure the polarity and the effect of measuring the polarity of a photon. 'Weak measurement' has been employed by various researching teams in different institutions around the world. Professor Steinberg's team built their experiment and variation of 'weak measurement' around Austin Lund and Howard Wiseman's 2010 experiments at Griffith University. In the past, similar 'weak measurement' techniques were employed by a group led by Yuji Hasegawa from Vienna University of Technology. All experiments prior to those conducted by Professor Steinberg's group hinted at proving Nagoya University physicist Masanao Ozawa's hypothesis that Heisenberg's theory did not apply to measurement, but only suggested an indirect way of acquiring information from a system. Unfortunately, no experiments were able to confirm the hypothesis with enough evidence. Professor Steinberg's team built upon previous research and collected data using 'cluster state quantum computing' to overcome the hurdles that the previous teams encountered in trying to acquire significant amounts of meaningful data.

Professor Steinberg's team began each experiment by measuring a photon 'weakly' before sending it to the measuring device. According to Heisenberg's theory, this sequence of actions would cause the observer to truly measure only one aspect of the photon at a time. Professor Steinberg's team realized this, so each true measurement on the photon post 'weak measurement' gathered data on the polarity, and the magnitude of disturbance that 'weak measurement' caused. After a large number of experiments, with each experiment showing only a fraction of the sought-after information, the data was compiled to reveal not only the magnitude of disturbance from 'weak measurement', but also the photon's polarity. Though far more accurate than any data collected using prior 'weak measurement' techniques, the data was still very crude and had noticeable error bounds. That said, the experiments conducted at the University of Toronto certainly lessened the Uncertainty Principle's credibility. Scientists now have error bounds to work with while measuring at least two states of a system, a concept that was previously considered impossible due to the uncertainty principle.

The impact of the research conducted by Professor Steinberg's group has far reaching applications in Quantum Cryptography. Quantum Cryptography itself relies heavily on the nullification of the uncertainty principle, as the aim of the field is to one day be able to detect an "eavesdropper" on secure networks by measuring the amount of disturbance that the "eavesdropper" creates in the network at the quantum level. As a result of this groundbreaking research, physicists can begin to study how much uncertainty there is in the quantum world, and what limits quantum physics places on measurement, rather than consider the measurement of more than one aspect of a system impossible.

Carlos Magana is a freshman in General Engineering

A Hokie's 20 Year Sidetrack: Dr. Dan Sable

As an eleven-year-old boy, he watched Neil Armstrong step onto the moon. Plenty of kids were in awe of astronauts that day after watching those monumental steps, and Dan Sable was among them. He was inspired to become involved in the space industry, and his inspiration led him to major in Electrical Engineering at the Massachusetts Institute of Technology. He worked for RCA Astro-Electronics during a 1978 co-op and full-time after his graduation in 1980. While at RCA, he began teaching night classes and realized that he would need more than a bachelor's degree if he wanted to make teaching a career.

Sable chose Virginia Tech for its high quality education and the fact that it was a mere day and half ride from New Jersey on his motorcycle. While earning his master's, Sable had come to really enjoy Virginia Tech. "Even though I was only here for a year for my coursework, I always had the suspicion that I might go back at some point for my PhD." This suspicion proved to be true; after working part-time at RCA and as an assistant professor at the then-named Trenton State College, he came back to work on his doctorate.

By 1991, Dr. Dan Sable had earned his PhD in Virginia Tech's Power Electronic Program under the guidance of Dr. Fred Lee. At this point, Dr. Sable intended to become a professor, but one day Dr. Lee stopped Dr. Sable in the hall and asked, "Have you ever thought of starting a company?" Then Sable went ahead and did it, creating a successful company, VPT, Inc., that would sidetrack his career for the next two decades.

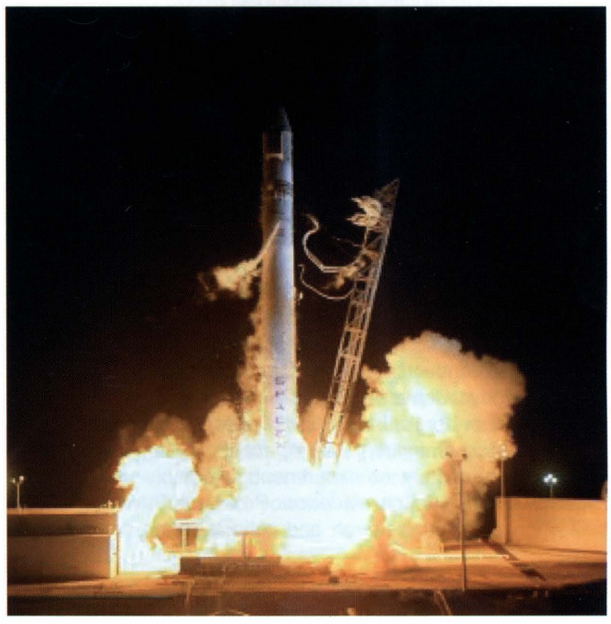
What does VPT stand for? Nothing, actually. "Not Virginia Power Technologies," jokes Dr. Sable, referring to the company's originally planned name, which it was forced to change when sued by Dominion Virginia Power.

VPT, Inc., started off in a one-room office at the Corporate Research Center in Blacksburg, and after selling a number of successful products, eventually moved to an office, lab, and manufacturing space in Blacksburg's Industrial Park. The company currently plans to expand into a fifteen thousand square foot space right across the street from its first office.

Its primary products are DC-DC power converters for high-end applications requiring top-notch reliability. They are "like a subcontractor to a subcontractor," creating parts needed for systems built by companies hired by Boeing, NASA, the European Space Agency, the government, and other entities. Gradually, VPT, Inc., power supplies made their way into dozens of airborne machines.

"All your GPS satellites have our power supplies in them." VPT, Inc., has been involved in the GPS program for about 10 years; their first GPS satellite launched with VPT power converters in 2005. Their products have also gone in Predator drone UAVs, a NASA probe to Mercury, a European Space Agency probe sent to Venus, a probe going to Pluto, and the satellite that found water on the moon. "I tell people that our power supplies found water on the moon," Dr. Sable jokes.

Over the years, VPT has slowly but surely grown in size, profit, and reputability. About four years ago, Dr. Sable started looking for someone to buy VPT, Inc. After a much consideration, Sable decided on Heico, a supplier that regularly buys aerospace companies and then allows them to run very independently. While Dr. Sable is still the president of VPT, Inc., he is gradually transferring more responsibility for running the company to his employees, a careful process of placing the right people in the right positions. "My baby is now 20 years old, and like any parent, you slowly let it go. I'll never leave it, but I consider it my adult child," he explains. The company has about 45 employees in Blacksburg, 9 on a marketing and sales team in Seattle, and about 140 at a joint venture facility in Taiwan. Dr. Sable appreciates each and every one.



VPT develops products for exciting programs, such as the recent SpaceX launch of the Falcon 9 rocket and Dragon capsule

Throughout this all, Dr. Sable has remained actively involved with the university. He plays handball with several Virginia Tech faculty and, for the past eight years, served on the advisory board for the Electrical Engineering Department. At the beginning of the fall semester of 2012, he started teaching Electronic Circuit Design as an adjunct "Professor of Practice" (a professor with experience in industry), and he has begun to serve on the Engineering School's advisory board. He says that he loves teaching and interacting with students. Teaching comes relatively naturally, as he is very familiar with the subject and has extensive experience getting a point across in front of an audience. He also says that his students enjoy hearing "war stories" of industry.

For example, say you build one hundred units and run qualification tests on ten of them. You subject these units to a wide array of demanding tests, including centrifugal G-force, high vibrations, shock, and extreme temperature cycles. If any of the units fail one test, all one hundred must be disposed of. This is exactly what happened with VPT, Inc.'s first batch of expensive GPS satellite power supplies. "This business is not for the faint of heart," explains Dr. Stable.

Next semester Dr. Sable will continue to teach but he does not intend to become a tenured professor. Nonetheless, he will most likely stick around for a while. To the engineering students of Tech, he advises, "By hook or crook, get a co-op or internship, [and] pay close attention to your capstone project." When hiring an entry-level engineer, those are the first two things he examines. If anything else, his story proves that it pays to have good connections at an excellent university.

Avery Nelson is a sophomore in Materials Science & Engineering. Thank you to Dr. Dan Sable for the interview and use of VPT, Inc. photos.

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