SUMMER 2013

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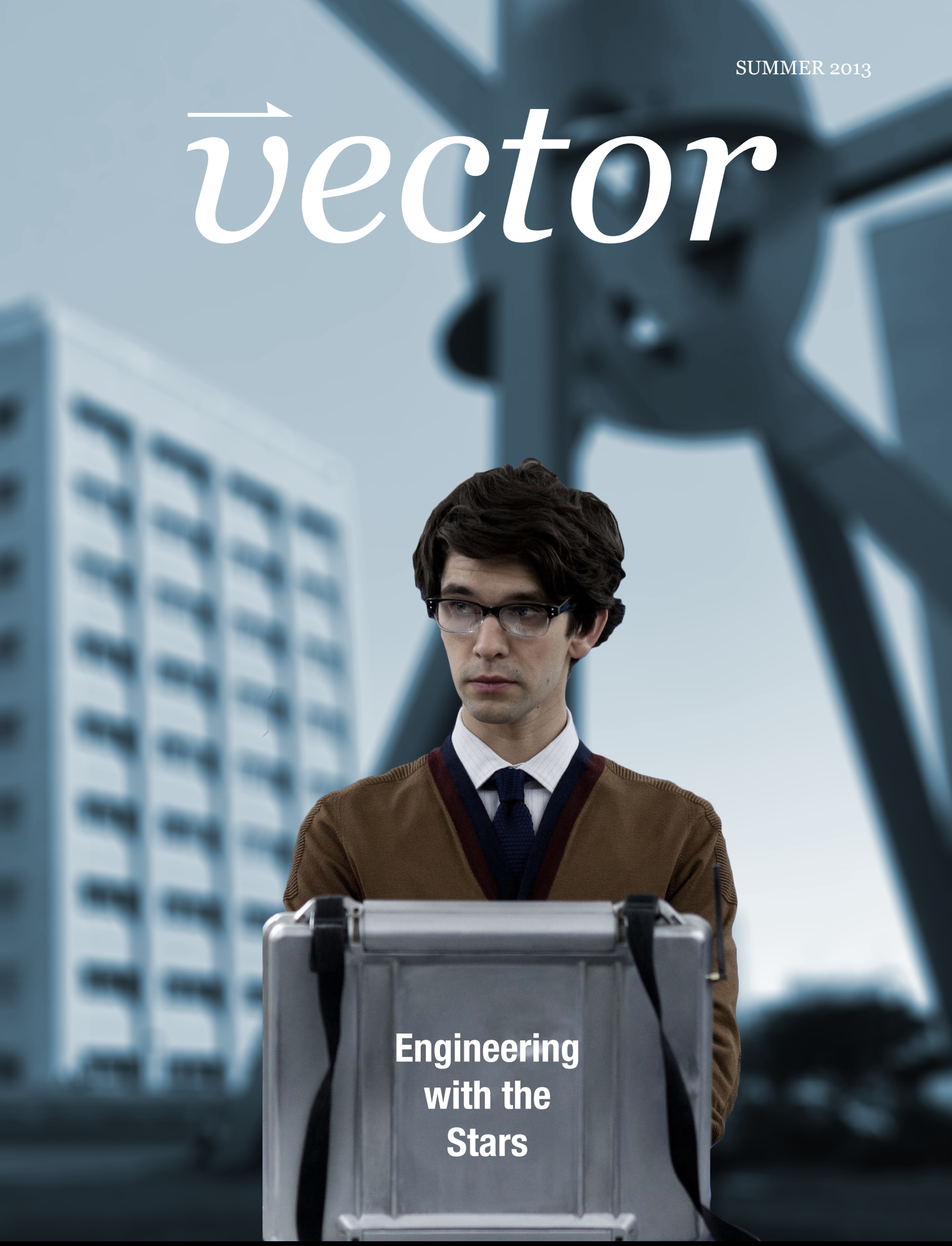

Engineering with the Stars

Cockrell School of Engineering

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Cover: Q from Skyfall

Reach for the stars... or just become one.

Dear Reader,
No matter how deeply we bury ourselves in our Thermodynamics books, there's always that small part of us that fantasizes about the glamorous Hollywood lifestyle - no homework, no mundane errands, and best of all, no engineering exams. Wouldn't it be great to be a star?

Great news: even as an engineering student, you still can. In this Summer 2013 issue of Vector, our staff has investigated deep into Hollywood to discover how engineering plays a surprisingly large role in films. From creating special effects to simulating future technology, engineers have plenty of knowledge and skills to offer, particularly in films like Iron Man and Avatar. If behind-the-scenes engineering isn't appealing, you'll also read about present-day stars, like Bill Nye and Cindy Crawford, who studied engineering in college before getting their big break.

But being a "star" does not revolve around just Hollywood; there are plenty of engineers whose monumental work could easily earn them celebrity status (albeit without the tabloid covers and red-carpet poses). You'll learn about two particularly deserving engineers who have become stars in their field, as well as an award-winning architect whose most recent project in an astounding engineering feat. Of course, stardom isn't necessarily just about fame; the mentors of Student Engineers Educating Kids (SEEK) are also true stars in influencing young students to pursue and excel in engineering.

Since this is our final letter to you as Editors-in-Chief, we would like to thank all our readers for the constant support and feedback throughout the year. Vector has grown tremendously over the years and we will continue to strive for quality and readership as we enter the 2013-2014 school year. As always, please let us know your comments and questions at vector@sec.engr.utexas.edu. Best of luck to all the graduating seniors in the Cockrell School; we are proud to know that you all are already on the path to stardom!

Hook 'Em!

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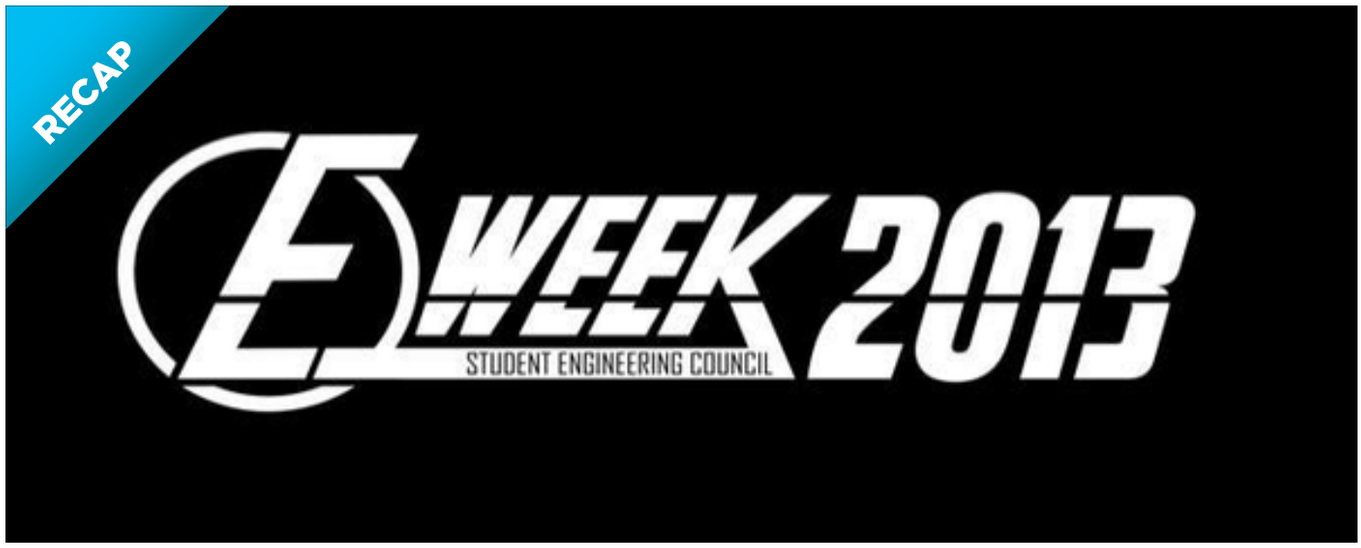
Vector is the student engineering magazine on campus. Published by the Student Engineering Council, Vector is completely written, managed, and designed by students for students. With issues dating back to 1971, the magazine has a long-standing tradition of serving as the voice for engineering students at The University of Texas at Austin. The Vector staff publishes two issues per semester.

For more information regarding the Vector magazine, please contact us at vector@sec.engr.utexas.edu.



E-Week Effulgence

AIChE and SN&P shine bright for E-Week '13

Rachel Marches & James Conger

THE GREATEST WEEK of spring semester is E-week, when all the engineering organizations compete in hopes of coming out victorious. In the past, the competition consisted of two large dominating organizations; however, E-week 2013 caused these "stars of the past" to go from illumination to a mere glow. On the other hand, two organizations that have always had small twinkle in the sky went from a stellar nursery to a supernova seemingly overnight. These two organizations are AIChE and SN&P.

Two organizations that have always been a small twinkle in the sky went from a stellar nursery to a supernova seemingly overnight.

SN&P used their 2012 third place finish to springboard to the top of the competition, not only bringing numbers but also skill in a multitude of events. The American Institute of Chemical Engineers, otherwise known as AIChE, had little to do with previous E-Week competitions this year came out of the gate running. Throughout the week, SN&P appeared to maintain consistently strong in numbers, while AIChE exponentially increased in not only numbers but also in event placing.

After the first several competitions of AIChE domination, rumors of "watch out for AIChE, they're athletic" began to travel through the engineering realm. This did not faze SN&P and other organizations who continued with a strong presence throughout the first weekend of events. On Monday, it became clear who brought their A-game. AIChE earned points in every event that day, taking them into an unprecedented lead after the first full day of competition; in second, having won 5 events was SN&P. At this point, the competitive nature of every engineer increased and AIChE gained their first increase in momentum.

At the end of Tuesday night's competition, there became a snag in AIChE's dark horse run. By Wednesday morning, SN&P had pulled out its entire arsenal. Over the next two days, SN&P seemed to shine bright in every competition right above AIChE. SN&P's domination should have put AIChE in its past seat of passiveness and docility, but this year's chemical engineers showed dedication and determination for excellence. AIChE took first in four straight events, making it the largest winning streak among the large organizations. After Thursday, both organizations grew in numbers to cheer on their talented individuals in Lip Sync, So You Think You Can Dance, and Dr. Ramshorn.

Going into the last day of competition, SN&P had a lead of 2.1 points over AIChE. This small increment seemed irrelevant in terms of who was winning due to the confidentiality of the Scavenger Hunt List. As a result, this created a sense of excitement among the Cockrell School community to see two new frontrunners duke it out. SN&P was sure to have the advantage in terms of participation, as they had an excited and inspired group at each event, leaving AIChE in need of some sort of miracle in order to pull into the lead. This miracle came at the Dr. Ramshorn pageant. AIChE had struggled to find a contestant for the event, but Mark Goldman, a 3rd year chemical engineer, had the perfect talent: An interpretive dance to Ke$ha's "Tick-Tock" (YouTube AIChE E-Week 2013 Dr. Ramshorn). Marks shockingly amazing performance placed him 2nd in the event, virtually securing the victory for team AIChE. Some say: AIChE truly "shined bright like a diamond."

E-Week 2013 has gone down in the history books. Two organizations that had never succeeded before, did what every engineer should do: dominate. They "Dreamed the impossible dream / Fought the unbeatable IEEE and ASME / Strived with their last ounce of courage / To reach the unreachable star." #Winning

How Many Steps Does It Take an Engineer to Hammer a Nail?

Aftab Zindani, Vincent Ngo, & Samuel Houghton

WHEN PEOPLE THINK of things that engineers do, they typically imagine engineers trying to create something that works better, faster, and more efficiently to create simple solutions to complex problems. So when it comes to a competition that tasks engineers with hammering a nail, you would think that the engineers participating would try to do just that, right?

Well, when it comes to the Rube Goldberg Competition, engineers are faced with the task of accomplishing a simple mundane activity in the most convoluted manner possible. The competition received its moniker from the late Rube Goldberg, who drew cartoons that depicted complex and wacky machines enhanced by his great sense of humor.

Following his example, the competition also requires participating groups to create machines that not only accomplish the task in a complicated way that takes at least 20 steps, but also do so in a creative, hilarious fashion. These requirements give engineers an interesting challenge as they try to combine their ingenuity with their engineering skills to accomplish their task in a unique way.

In this year's Regional Rube Goldberg Competition held at The University of Texas, teams competed in order to try and qualify for the National Rube Goldberg Competition to be held at the end of March. This year, the American Society of Mechanical Engineers (ASME) Rube Goldberg team, led by Captain Kevin Holmes entered the competition with a machine based on the nostalgic theme of Childhood Memories. ASME's machine hammered a nail in a grand total of 64 steps! When asked about his involvement in the Rube Goldberg Competition, Kevin saw it as "a creative outlet, social opportunity, and learning experience" through which "we come together to make the most ludicrous, yet consistent machine possible." To Kevin Holmes, the competition offers an excellent opportunity for him to "get together with engineers with a common interest in building something spectacular".

"We come together to make the most ludicrous, yet consistent machine possible."

Not only does the regional competition give students a chance to be creative and show off their engineering talents, it also gives them an opportunity for introducing young children to the field of engineering. Through the competition itself and events such as Introduce a Girl to Engineering Day and Explore UT, ASME has been able to showcase engineering to children in a fun and interesting way with their machine. At these outreach events, ASME's Rube Goldberg team demonstrated their machine to large numbers of children and hopefully inspired them to learn more about engineering. Asked about his thoughts on showing the machine to kids, Kevin said " I think it's a fun way to spark kids' interest without them even realizing that they're being entertained by science."

Dr. Ramshorn

Engineering stars (for a day)

William Gao

ON FEBRUARY 23, 2013, twelve ordinary engineering students became stars for a day. Just weeks before, no one could tell the difference between these select twelve and other typical students in the Cockrell School of Engineering. These normal community members had no idea that they were soon to become symbols of charisma and glamour amongst their peers.

ON FEBRUARY 23rd, 2013, 12 ordinary engineering students became stars for a day.

These twelve students were the contestants for the 2nd annual Dr. Ramshorn competition that took place at the end of E-Week. Each contestant represented and competed for a certain organization in the Cockrell School of Engineering. Every one of them was required to perform a talent in front of a panel of judges and an audience composed of on-looking engineering students ready to criticize. Whether it was serenading, rapping, or dancing, talents were unique and impressive. On top of that, contestants had to present themselves in a manner confident enough to win a beauty pageant. Each candidate had to be willing to put themselves in the spotlight and not be afraid to make fun of themselves. Though some were forced into the position, the contestants became role models of charisma and surrendered their dignities in the prospect of winning fame for their organizations.

Thus, at the precise moment they walked on stage, the contestants became stars. They showed the entire Cockrell School that the most ordinary of people can reach out of their comfort zone and become what they had no idea they could actually be.

Perot Museum of Nature and Science in Dallas, TX

An Architect Among Us

Perot Museum of Nature and Sciences

Nathan Simmons

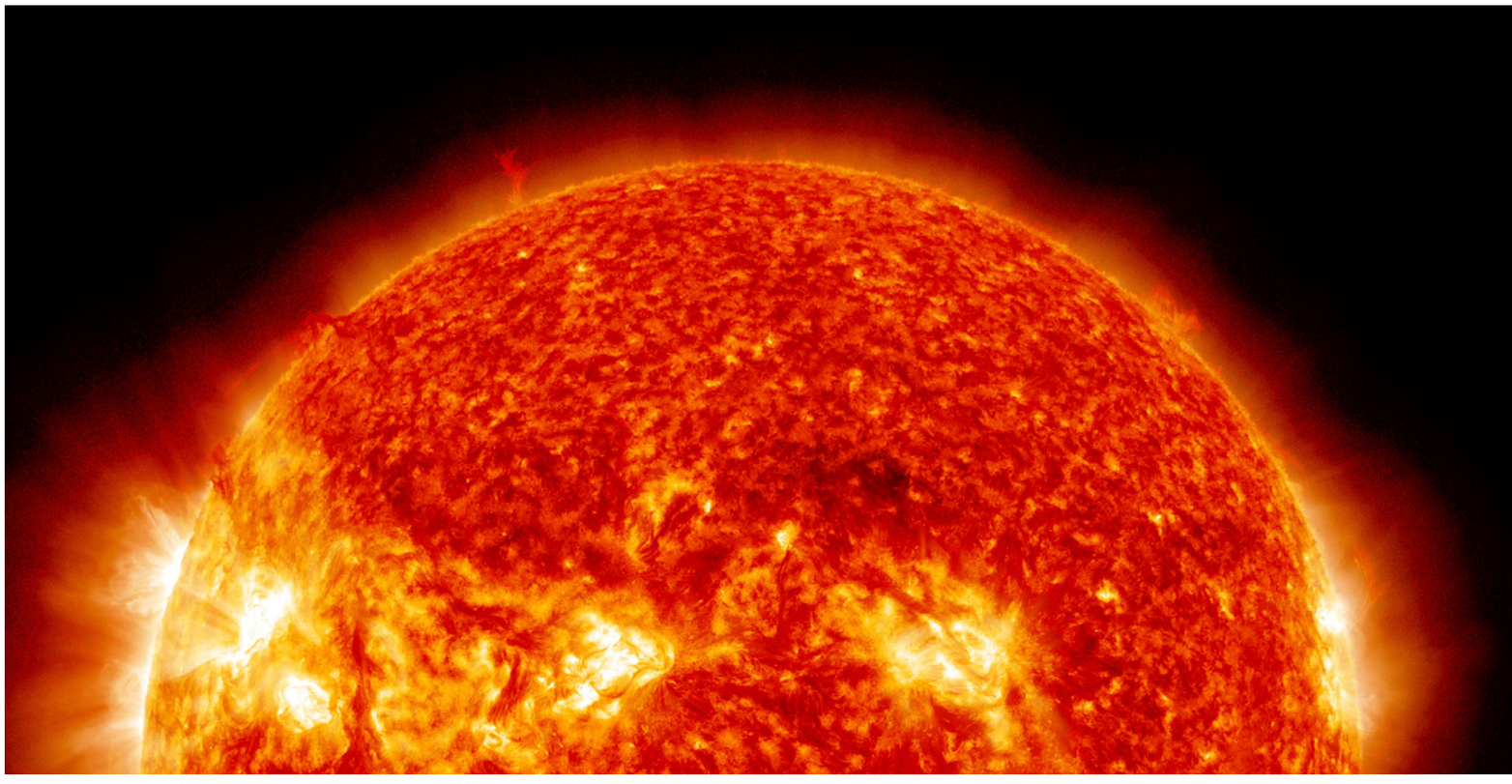
FOLLOWING ON THE HEELS of the Winspear Opera House, Wyly Theatre, and the Margaret Hunt Hill Bridge, the Perot Museum of Nature and Sciences is the latest multi-million-dollar project finished in Dallas' campaign to give a modern facelift to the city. The impressive $185-milion structure designed by Pritzker-Prize winning architect Thom Mayne seeks as its main goal to inspire wonder in children for science and nature.

The exterior of the building certainly expresses this sentiment. The structure bursts at the seams with life, refusing to be denied and confined in a box. Unseen forces seem to be at equal parts trying to escape the building and holding it together. It unsettles by being unconventional while trying to be conventional. Three corners of the building are solid, resembling the majority of the outer walls.

It is the fourth corner, the most visible and memorable, which both metaphorically and literally sticks out. Resembling a sample of quarts, windows and light protrude out from the rock-like covering. An escalator encased in glass is oddly attached to the outside of the building, showing the inner workings of the mechanical system that runs the contraption.

Inside it is all about interaction, between exhibits and guests, exhibits and building, and even exhibits and other exhibits. The order of displays is determined by curriculum, not by era. That's why one finds the taxidermy body of a moose next to the skeleton of a triceratops when explaining animals developing natural defense mechanisms in their physiology: seemingly disparate examples come together to comment and make a larger point. Elsewhere, walls light up when people walk by, stairs sound like chimes when stepped on, visitors can attempt to outrun a 3D video projection of a cheetah, kids can construct integrated circuits, and of course there are places to build trusses for all the future architectural engineers. At almost every part of the building there is a chance to play, and by actively participating guests learn while also having fun, making learning fun.

The Perot Museum is now open to the public, and it costs $15 for adults. Obviously, the intended audience is that of a younger generation, but there is no denying the excitement generated for science by this museum.



The Quest for Clean Energy

Power from our very own star

Jan-Michael Yatar

NOWADAYS, renewable energy is hyped as the end-all, be-all solution to the energy 'crisis', although it is far from being 100% viable. The financial and human resources needed for start-up, maintenance, and disposal adds up exponentially, especially when it comes to solar power. It can be intimidating to think about, let alone implement. Thankfully, the scientists at the National Renewable Energy Laboratory, NREL, in Colorado are looking for ways to overcome this challenge.

Funded by the United States Department of Energy, NREL focuses on the research and development of energy efficiency. One of their projects that serves to analyze the country's energy generation, the Solar Vision Study, features the 20% solar energy scenario: 10% from photovoltaics (PVs), 10% from concentrated solar power plants, and an additional 12% from wind energy. Various modeling applications are being used for this study. The first one is the Renewable Energy Development Systems (ReEDS), which models the geographic area of the U.S. and its electric generation/deployment regions. It optimizes all of the electric system's costs due to limitations imposed by seasons (summer vs. spring), regional resources and policies, as well as the best locations for generators and storage technologies. Another model used is the Solar Deployment Systems (SolarDS) which simulates rooftop PV market scenarios. It considers several factors like regional solar sources, capital costs, and financing options.

These models demonstrated the capability of 20% solar + 12% wind to balance the US region's electric supply and demand. Ultimately, the success depends on the flexibility of the renewable technology used, especially, during summer and spring. Summer's need for additional cooling requires 150 GW of natural gas combustion but the 20% solar scenario reduces that demand to 50-70 GW. In spring, when the weather is temperate, there's high renewable energy supply, but low demand which necessitates a decrease in electrical generation.

As we go farther into the 21st century, modernization will increase, along with our energy needs. As the new generation of engineers, it is our responsibility to handle the intricate issues of balancing the population's supply and demand, sufficiency of required reserves, practicality of clean, renewable energy, and many more. The only question is, are we up to the challenge?

Engineering as Entertainment

Engineerng in popular culture and media

Richard Fang

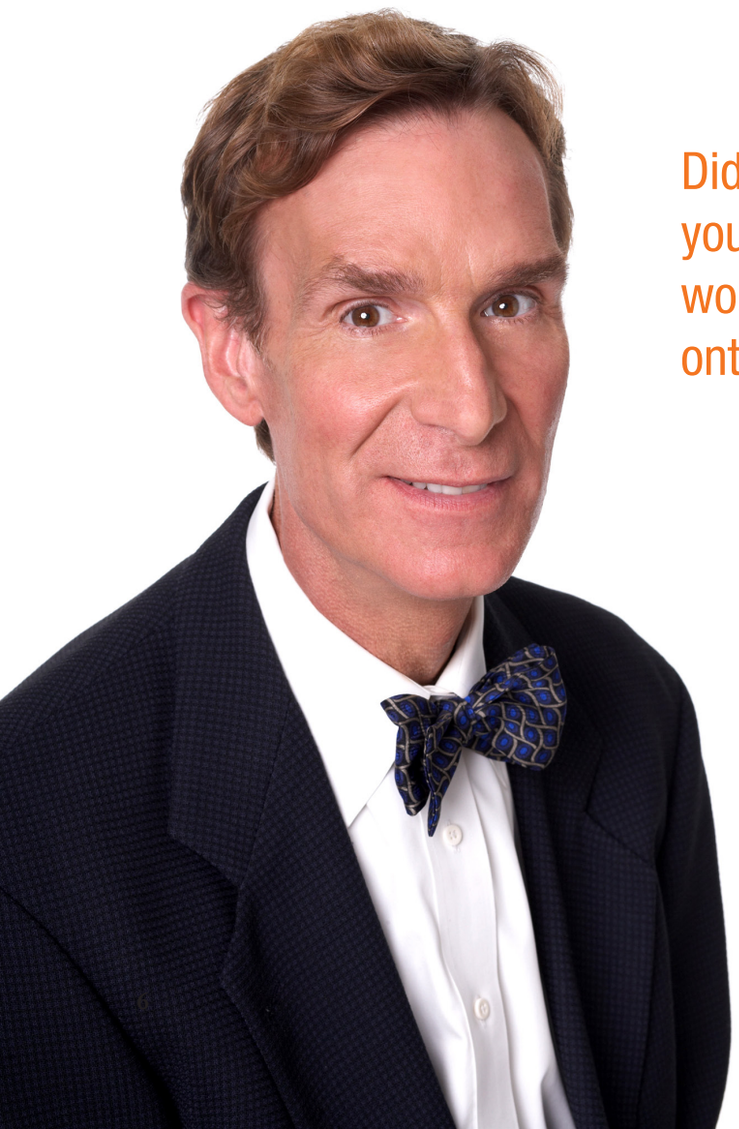
MORE OFTEN THAN NOT, when engineering or science is displayed on television or the big screen, it is behind the scenes and not the main point of attention. However, there are notable examples where engineering and/or science is the focus of a television program.

The series that sticks out the most in my mind is Mythbusters. For those that don't indulge in this magnificent program (which I am a huge fan of), the premise of the show is to test common myths and decide if they are confirmed, plausible, or busted. Notable examples include "driving at high speeds with square wheels can actually be smooth", "you can stop a shark attack if you poke the shark's eyes", and "a loose driveshaft can flip a car". The sheer amount of engineering and manpower put into each of these myths is mind-boggling: building a fully functional mechanical shark, remote controlling an actual car while rigging it to fail at just the right time, and countless more. Almost all of the 200+ episodes utilize some form of engineering, whether it is mechanical, electrical, or chemical. And if that doesn't intrigue you, there are also tons of explosions and destruction to keep you hooked.

Another outstanding example of engineering and science in popular culture is none other than Bill Nye the Science Guy. It is a little known fact that William Sanford "Bill" Nye began his career as a mechanical engineer for Boeing. Look at him now - an icon, inspiration, and mentor for thousands (if not millions) of children worldwide who are interested in science and technology. On top of this, he has appeared countless times on television shows even after his own show ended. Always interested in science, he remains active in his field and has even been awarded two honorary doctorates by John Hopkins University and Willamette University.

Another notable contributor to science in popular culture is Neil deGrasse Tyson. While not strictly an engineer, he is another individual who manages to interest the general public in science and technology. Possibly the "hippest" scientist of the era, he makes frequent appearances on popular programs such as The Daily Show, makes pop culture references, and has even become a meme. His popularity with the younger generation makes him an important spokesperson for science.

While there are still not neon signs advertising engineering and science in television shows or popular culture, there are some programs out there that expose the public to the world that we here take for granted. These instances of engineering and science charging headlong into popular culture and media may well be the inspiration that develops the future engineers and scientists of our world.



Did you know that without your skin's fingerprints, it would be very hard to hold onto anything?

Bill Nye, "The Science Guy"

The Art of Special Effects

Engineering's role in Hollywood

Anvita Jain

REMEMBER the mysterious world of Pandora in *Avatar,* Arthur's gravity-defying fight sequence in *Inception*, or the automaton from *Hugo*? While these special effects seem impressive on the big screen, the engineering techniques used to create these effects are even more impressive.

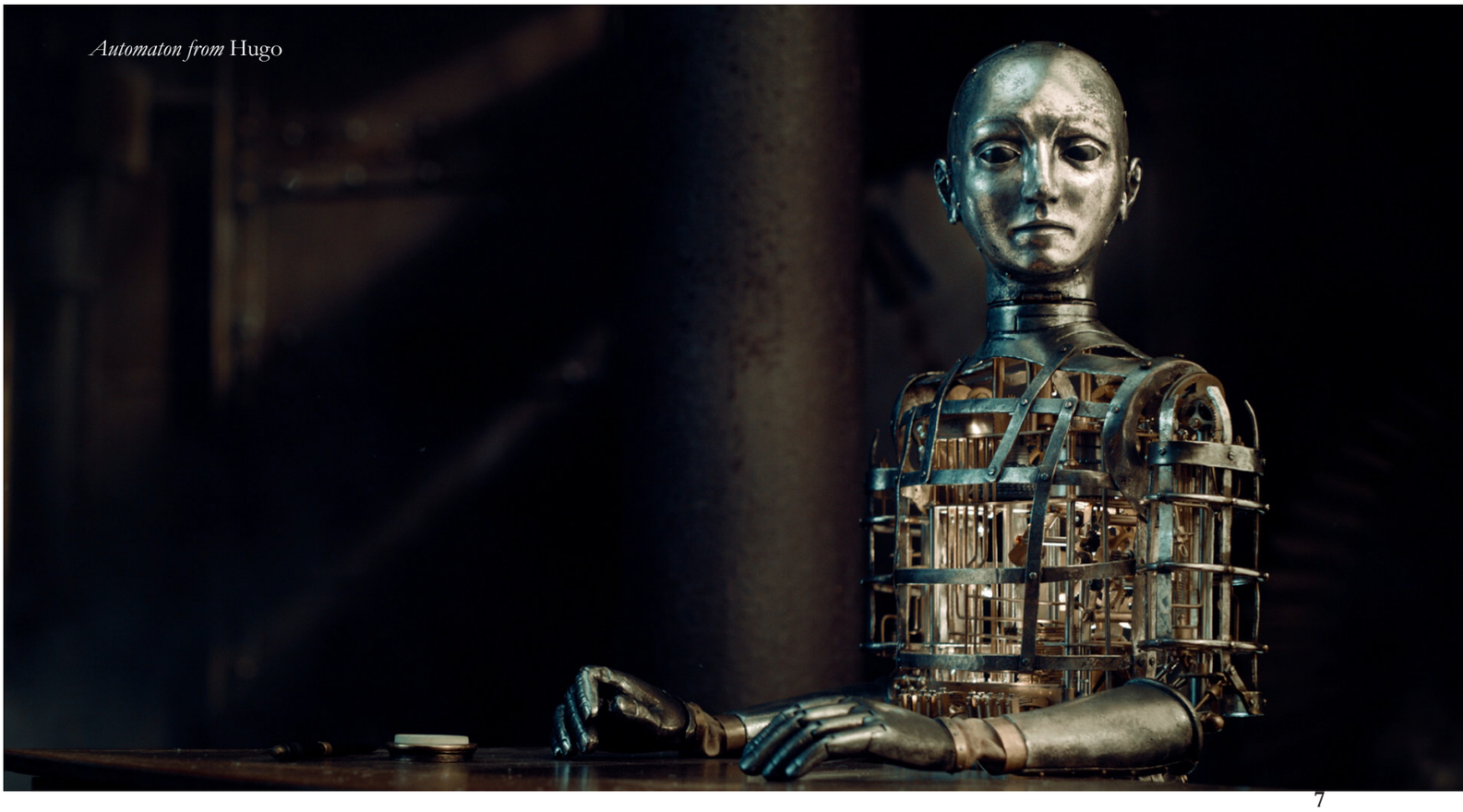
In *Avatar*, James Cameron uses a three-part camera technique designed to combine real-world elements with CG elements in the fictional world of Pandora. The camera technique consists of a modified stereoscopic three-dimensional camera, a virtual camera and performance capture staging. Using two camera lenses that converge on a single focal point, which is similar to the actions of human eyes when viewing an object, the stereoscopic 3D camera films live action sequences in 3D that can later be combined with CG effects.

The virtual camera allows Cameron to film computer-generated scenes in real-time; it controls staging, camera angle direction and manipulates commands to both the live and CG actors in the film. In performance capture staging, actors wearing head rigs with sensors in it and Lycra sensor suits perform their scenes on a sensory stage on which there are ceiling sensors. The ceiling sensors enable a computer to read their movements and expressions. This sophisticated technology is the key to *Avatar*'s amazing visual effects which earned it the Academy Award for Best Visual Effects in 2009.

While *Avatar* heavily relies on CG effects, one of *Hugo*'s masterpieces is a skillfully built mechanical model of the automaton. In addition to the automaton itself, a motion control system is implemented using a table and the automaton itself; this motion control system consists of small mechanical pieces attached under the table that can lead the automaton to draw any line drawing that is programmed into the system. To enable arm movement, there is a magnet attached underneath the table that can clamp onto the hand combined with mechanical actuators in the arms that would indicate when to perform simple movements such as picking the pen up and putting it down. Apart from the automaton, *Hugo* also uses an elevator with two rungs attached to it to film the scenes in which Hugo Cabret, the film's main character, skids down the ladder. The cross-rungs are added later through CG techniques.

Another excellent example of the amount of skill and precision needed to create dynamic visual effects is the alien technology in the 2012 film *Prometheus*. Visual effects company Fuel needed six to eight months to come up with all the designs used in 250 shots of holographic effects surrounding the alien engineers. The logic behind these designs is based on the Big Bang theory: Fuel uses fluid simulation to map out the explosion of threaded fluid to a certain volume. The nebulas held by the alien engineers in the movie are a result of a frozen moment during the fluid simulations during which the fluid accurately resembles a nebula gas. Some of these scenes involve almost 100 million polygons and could take one to two weeks to render.

Even though filmmaking and engineering seem to be entirely different from each other on the surface, extensive knowledge of engineering techniques is essential to creating the complex visual effects we see on the screen today. As filmmakers continue to push the boundaries of visual effects, engineering will play an important role in the film industry for years to come.



Automaton from Hugo

Dr. Laura Suggs: Combating Cancer

Taylor Birk

The engineering stars are among us - many of the best and brightest engineers in the world are right here on the University of Texas campus. As students, we often overlook the incredible accomplishments of our very own faculty. Groundbreaking medical research occurs every day in the Department of Biomedical Engineering, where professors are investigating cancer diagnosis and prevention, tissue engineering, viral vaccinations, and novelties in drug delivery.

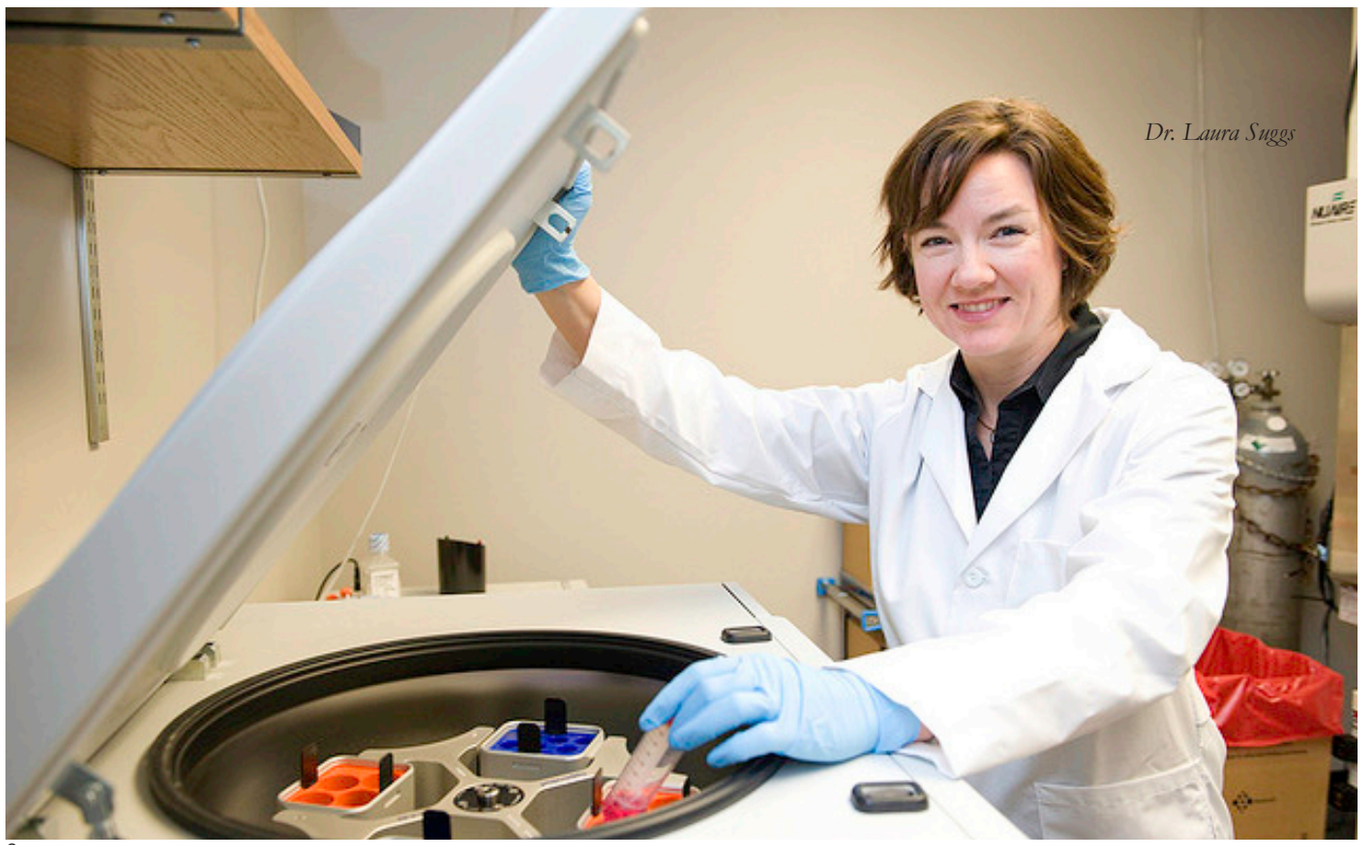
One such professor is Dr. Laura Suggs. Dr. Suggs received her Bachelor of Science in Chemical Engineering here at UT. She received her Ph.D. from Rice University, where her thesis focused on developing an injectable, biodegradable implant for cardiovascular applications. She has won several prestigious grants including the NSF ADVANCE Fellowship in 2002.

A recent three-year, $900,000, Cancer Prevention and Research Institute (CPRIT) grant is now funding Dr. Suggs's investigation of tumor cells and the progression of breast cancer. The goal of her work is to unravel the mechanisms of cancer cell growth. Through a new understanding of cancer progression, some of the guesswork can be taken out of cancer treatment. Recently, Dr. Suggs research builds off literature that suggests that the stiffening of the area around cells, specifically the extracellular matrix that forms the perimeter outside of a cell, can actually drive the cancer metastasis (the spread of cancer cells throughout the body).

Dr. Suggs has been working with several student researchers to develop a hydrogel-based system that mimics the stiffening conditions of the body. It is not possible to isolate the real biological system, so the hydrogels provide a way for the researchers to study this process outside the body and with some degree of control. The hydrogels are made of a seaweed-derived alginate that can be combined with gold nanoparticle and calcium. The hydrogels can also be injected with breast cancer cells for research.

The stiffness of the hydrogels can be controlled through the release of calcium and citrate. Calcium causes stiffening, and citrate reverses the stiffening. The process is controlled using near-infrared. The near-IR light activates gold-nanorods within the cells or gels, causing a release of calcium from the liposomes. Liposomes are artificially made vesicles in a cell that can hold molecules such as calcium. There release of calcium causes the desired stiffening. Now that the researchers have figured out how much stiffening can be induced by the light system, they want to refine their biomimetic process to conditions that match the stiffening around tumors in the body. The researchers can then investigate the use of drugs to soften the tissue, preventing the spread of cancer cells. Through this process, the researchers can explore the mechanisms that change normal cells into malignant cancer cells.

Like Dr. Suggs, the engineering faculty members at UT are truly living the engineering dream. They pursue their passions in understanding and shaping the future of medicine, advancing computer technology, and leading discoveries in areas such as renewable energy research . As students, it is important for us to recognize the accomplishments of our own engineering stars.



Dr. Laura Suggs

mong Us

Dr. Hans Mark: Aerospace Expert

Patricia Renyut

IF YOU'RE AN engineering student at UT and you haven't heard of Hans Mark, you're missing out on knowing one of the University's most influential people. As former Secretary of the Air Force and former Deputy Administrator of NASA, Dr. Mark has seen it all.

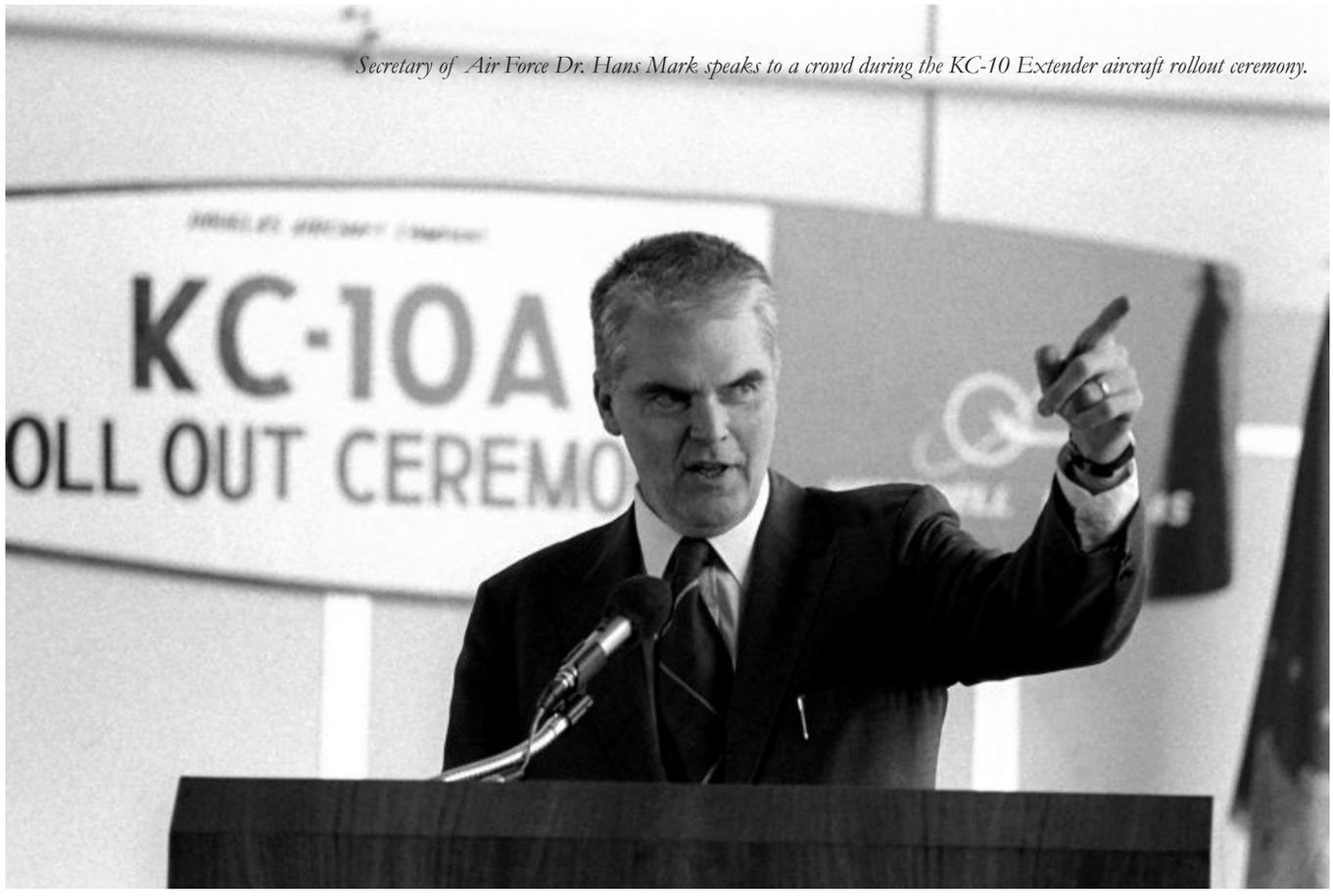
Just one step into his office and its apparent that Dr. Mark goes about engineering a little differently than most. If he needs to look up numbers, he doesn't use Google, he pulls a rather large book off of his bookshelf and thumbs through the pages. This is an occasional occurrence as Dr. Mark has more aviation knowledge in his head than in most textbooks.

Why? Because he has been in the industry longer than most, if not all, of us have been alive. He has been a part of everything from stealth planes to tiltrotors. One day he went into a shed with a hammer and some composite materials, and the next day he rolled out a B-2 stealth bomber.

In all seriousness though, Dr. Mark is a walking wealth of knowledge. He has been an integral part of the aerospace industry during its most prolific time. He worked with Wernher von Braun, Kelly Johnson and even Carl Sagan. Talking with Dr. Mark for 5 minutes will net you more knowledge than a semester long class. If you like aviation or space, I urge you to try and go see him on the top floor of the WRW, it'll be a conversation you'll never forget.

These days our government's role in the aerospace industry isn't what it used to be. Like the loss of our Space Shuttles, projects are continuously defunded and NASA is given a fraction of the money it used to be. All of those things that we read about in texts books or online, like the origins of stealth bombers or even the Challenger tragedy, Dr. Mark actually experienced. For the majority of the history of the aerospace industry, Hans Mark was there.

Just one step into his office and its apparent that Dr. Mark goes about engineering a little differently than most.



Secretary of Air Force Dr. Hans Mark speaks to a crowd during the KC-10 Extender aircraft rollout ceremony.

Tony Stark from Iron Man

Technology and the Future

Screens, holograms, and beyond

Emily Tat

I MAY BE just a tad bit biased but one of my favorite movies of 2012 was *The Avengers*. My favorite Marvel superheroes, tons of funny lines and scenes, and some of my favorite actors and actresses all rolled up into one cinematic experience – what's not to like?

The world featured in the movie is similar to our own but with a clear lead in technology. The Iron Man suit, reflective-panels on the Helicarrier, and physics-defying Captain America Shield aside, there are still some pretty awesome pieces of technology used by the characters.

Anyone who has watched *The Avengers*, or any Iron Man movie really, will have noticed the interactive holograms, Stark phones and see-through computer screens. We have touch screens, but they take touch to a whole new level, with the screen being optional.

Obviously, the tech isn't real yet; the screens were just pieces of glass with animation added on later by FUI artists. But is it possible that the technology featured in the movies will one day be made real?

We already have giant touch screens used in places like the arcades – Fruit Ninja at D&B – and even in our very own ECJ second floor. Gaming systems like the Kinect use projector and sensor technology to simulate full-body gaming. Laser projection keyboards have been a thing for years (albeit with poor usability and a high price tag). Disney's R&D department currently has a "swept frequency capacitive sensor" in the works known as Touché which will allow people to use any material as a touch screen, though still in the early stages. The way tablets are constantly being refined shows that companies are forward thinking. Apple has patented hologram technology which implies development into this technology which would have once been thought of as pure science-fiction.

And while we're not close to having our own sassy AI butler advising us in our HUD, the Google Glass is definitely a step in the right direction in that regard, with the ability to record and share videos live, send messages, take pictures, ask questions and receive answers.

It might be a while before all of this technology will be largely available to the general public, but it's only a matter of time.

From Engineer to Celebrity

Stellar Celebs

Bryan Nguyen

JUST BECAUSE you study fluid dynamics or dissect computer algorithms doesn't necessarily mean you have to work in the engineering world. Many other industries find uses for engineers, such as the financial and medical fields.

But what if you wanted to chase fame? Well, fortunately, you don't have to be the next super genius and be the next Bill Gates or Steve Jobs. In fact, you could be the next superstar actor or American hero. Just ask Rowan Atkinson or Neil Armstrong.

Neil Armstrong studied aerospace engineering at Purdue and USC before going to participate in the Korean War. There, Armstrong became known for his aerial prowess and skills, landing him a spot as a test pilot for the US and a chance to partake in the first expedition to walk on the moon. Then,...well the rest is history.

Atkinson, better known as Mr. Bean, studied electrical engineering at the Newcastle University before getting his masters at Oxford. So what exactly prompted the world-renowned comic to give up a prosperous engineering career for a future in the media? Atkinson actually worked at multiple plays and comedy shows to pay for his schooling, and eventually his talent was discovered in 1976.

But he isn't alone. Engineer-turned-TV celebrities include Montel Williams, Donald Sutherland, Alfred Hitchcock, Teri Hatcher, and Cindy Crawford (for a semester). Before starring in That 70's Show as Kelso, superstar actor Ashton Kutcher went to Iowa State to study biochemical engineering with the quest of perhaps someday curing his brother's heart ailment (he later stated he was drunk the whole time).

Even imposing actors such as Dolph Lundgren (Ivan Drago in *Rocky IV* amongst other roles) turned out to be brainiacs. Lundgren has a Masters in chemical engineering and was on a Fulbright Scholarship to MIT when he decided to quit and become the hunk of an actor he is known for today. Similarly, Dylan Bruno (*Numb3rs, Saving Private Ryan*) studied environmental engineering AND played football at MIT.

There are quite a few engineers in the media, but there are also engineers in the music industry and other areas. Tom Scholtz, the leadman of Boston, wrote his hits while sitting in his dorm at MIT. Jazz legend Herbie Hancock studied electrical engineering before he wrote hits such as "Maiden Voyage" and "I Thought It Was You."

Even many leaders around the world came from engineering degrees. Former Presidents Jimmy Carter and Herbert Hoover graduated with engineering degrees, and Hoover actually became the lead mining engineer in China before becoming the leader of the United States. Before he became a world-wide known symbol of freedom and won a Nobel Peace Prize, Yasser Arafat studied civil engineering at the University of Cairo.

The list goes on and on. Many other engineers have found success and fame outside of their fields, by daring to venture and try what they say is impossible. But if fame and fortune don't pan out for you, at least you're an engineer, which on its own is no small feat!

British comedian, Mr. Beans

Back to the Future

How movies make the future look cooler than it actually is

Kristen Siegele

IF YOU RESIDED in the alternative future universe created by the 1966 movie Fahrenheit 451, life would be a little different. For example, you wouldn't necessarily be reading this magazine article as much as absorbing it via brain probe or wireless audio-visual device. Perhaps you would later speed to school via the hover board highway, and then take attendance by stamping your thumbprint on a beeping identity scanner at the front of the class. With the multitude of wild innovations delineated in aged movies attempting to imagine what our time would look like, the potential technological devices available in this alternative future universe dazzles the mind.

There are so many inconceivable gadgets that movies of the past assumed would be mainstream by this day and age, but still stubbornly refuse to exist – Where has the world gone wrong? Why have our past thematic predictions for the current future failed so miserably? In a world where hover boards and humanized robots have yet to exist, current movies continue to attempt to predict the state of our future. However inaccurate, it must be said that predicting the future is a daunting task. Here are a few brave thematic pictures that have made the attempt:

1984

Classic. George Orwell may have done it best in the category of future tyrannical governments and oppressive regimes. The movie takes place in a dystopian society where every action is monitored, recorded, and analyzed. We begin with the basics.

Telescreens: Devices that you watch and they watch you back. Total government surveillance on its citizens, reading their thoughts and actions. Even in the future, there is not a governing body that has stripped our rights of privacy to the bone just yet.

Interestingly enough, such technologies are being toyed with. Samsung has developed a television with a variety of never-before-seen features, including: microphones, speech recognition, and facial tracking devices. So in this case, the question is not whether we have the technology, but rather, do we have a government willing to utilize such tools in the future? We'll leave Orwell to figure it out.

Back to the Future

An obvious contender. This trilogy of cinematic imagination about flying cars and outlandish fashion styles may be one of the best representations of predictions gone hilariously wrong.

Hover Boards: A cool idea, but not feasible in our time. There is some debate over this, but the technology necessary to create a working hover board will need some intense fine-tuning if we are to see it any time soon.

Scientists have observed that insects hover better when their weight tends to be more distributed at the top, which is the opposite for most vehicle designs. Quantum physics plays a key role in the development of a hover board, including developments in the Higgs boson particle. This controversial particle will not be ready to be applied to real world technologies for some time.

Fahrenheit 451

More dystopian societies. Firemen setting books on fire, mobile phones glued to every ear, information being sent to the masses at lightning speed. Was Ray Bradbury so far off? The firemen bit is a tad dramatic. But Bradbury may have a point here. Was our generation dubbed as the generation to be doomed by our obsession with technology from the start?

I can just find that out on Wikipedia by clicking on my iPhone later.

Humanoid Robots: Although this idea is appealing, any sort of viable "human robot" technology has yet to be invented. Other movies like I, Robot and Star Wars have also introduced robotic characters into their movies.

As we can see, it will take a few more engineering discoveries to make these ideas become a reality. Until then, we can still enjoy dreaming about whatever exciting gadgets new movies can come up with.

Big Brother is watching you. 1984

The Construction Industry

Construction 101

Aliyah McRoberts

THE CONSTRUCTION INDUSTRY is a huge industry that has over 7.3 million employees and an industry annual revenue of about 1.73 trillion US dollars. It is a low-margin industry but also a high-turner over industry in regard to new and old firms and there are approximately 730,000 construction companies in the US.

The construction industry is comprised of all types of building projects including residential, commercial, industrial and transportation infrastructure. It is the second largest employing industry in the Unites States (the Federal Government is the first.) It is also a high risk work environment due to the potential risks of accidents involved in the building process.

There are three main components of a project: scope, budget and schedule. Scope refers to the project boundaries being carried out, and the deliverables at completion. Budget refers to the cost of the project, and schedule involves the sequencing and timing of the project. For example the new Bill and Melinda Gates Computer Science Complex cost about 120 million dollars to build and covers 230,000 square feet. This project was built by general contractor Austin Commercial. The building accommodates 60 faculty members, 1,400 undergraduate students, 250 graduate students and 50 staff. From the day the idea of building the project emerged to the delivery and completion of this project was five years.

There are three main players required to complete a project: the owner, designer, and construction contractor. In the case of the Bill and Melinda Gates Computer Science Complex, The University of Texas at Austin is the owner, Austin Commercial is the construction contractor and Pelli Clarke Pelli Architects is the designer. The owner's main tasks are to define and follow the operational criteria for the completed project. The designer's responsibilities include design alternatives, computations and drawings. Lastly, the construction contractor is responsible for the on site coordination of all the parts and in charge of the physical construction part of the project. For Bill and Melinda Gates Computer Science Complex, the contractor was responsible for hiring flag men to ensure study safety during the building process and that materials were delivered during class time to avoid the student congestion of the passing period. The success of the project depends on the coordinated and functioning relationship between all three parties.

Management is comprised of five components: planning, organizing, staffing, directing and controlling. Management is an important aspect of the construction process because without a coherent and effective management strategy the entire project falls apart. For example, the coordination of material orders and delivery to the site play an intricate role in avoiding the delays and disappointments in the building process. The construction process involves so many intricate parties working together.

In comparison to other industries, the construction industry can be considered less technologically advanced than other industries. There are efforts to change this situation, for instance the introduction of Building Information Modeling (BIM), which is a digital representation of physical and functional characteristics of a facility. Often projects run behind schedule, which ultimately end up costing more money, but by developing technologies that can improve efficiency, projects can be completed on schedule and for less money. These technologies are vital because there are so many parties involved in a project that there must be a platform that is accessible to all. Indeed this platform helps in keeping the project well planned out, on budget and with high productivity and safety performances.

The Bill and Melinda Gates Computer Science Complex

Student Engineers Educating Kids

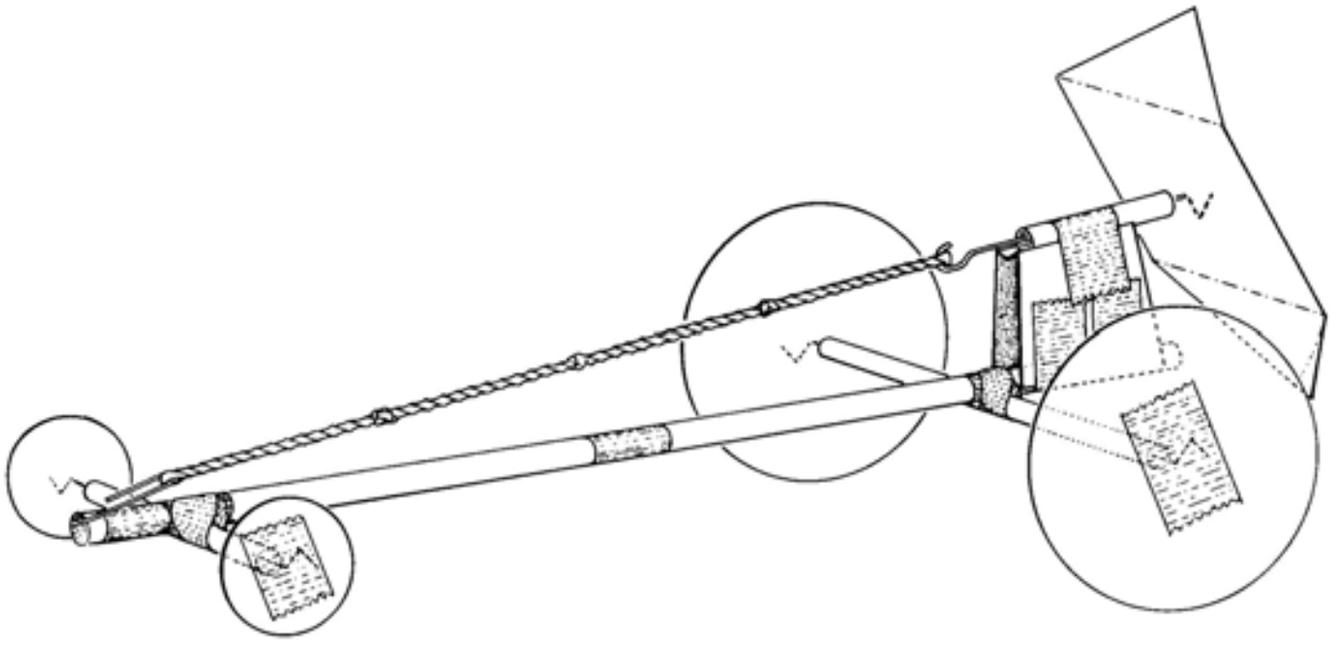
For the sake of the kids

Sushmitha Chakka

SEEK, or Student Engineers Educating Kids, is an exciting after-school mentoring program. Engineering students of all disciplines demonstrate how fun and exciting engineering can be to AISD middle school students. We do this by engaging in interesting, hands-on, engineering-related projects with the students. Examples of projects include making ice cream, constructing roller coasters, and launching a rocket. At the end of the semester, the students get to visit our campus and see what engineers do by visiting engineering buildings and touring labs.

SEEK mentors have an opportunity to interact both socially and academically with young students and to influence them in a positive way. It is so exciting when mentees show strong interest in the projects and say that they are now excited about pursuing an engineering discipline. The foremost goal of the SEEK program is to show students that they too can pursue a math or science intensive field. Simply befriending middle school students and teaching them engineering concepts in a fun, hands-on way has the potential to change their futures. The students we work with all have the potential to attend college and accomplish great things in the future. Many of them simply do not know that this is an option for them, or do not have the self-confidence necessary to make this choice. SEEK helps them reach their full potential.

Joining SEEK is a great way to become a role model and make a difference in a young student's life. It also gives you an opportunity to meet engineers of other disciplines, and can be used for two hours of class credit. All you need to do to join and get involved is fill out a short application at the end of the semester. Check out utseek.org for more information, and keep your eyes peeled around campus for more information about SEEK!



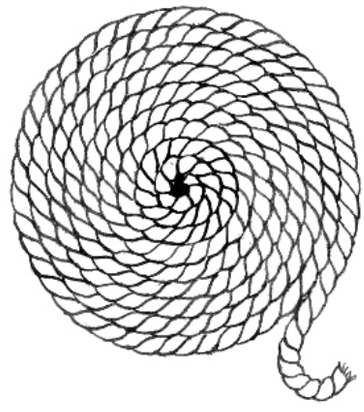
One of the projects offered by SEEK: The Propelleracer

Riddles

Putting your engineering knowledge to good use

Anurag Banerjee

Riddle 1: One year, UT decided to hold a contest for any Longhorn who thought they were smart enough for a chance to win a special prize. The game, as presented by Alec, is as follows. 3 bags containing burnt orange footballs, maroon footballs, and a mix of both burnt orange footballs and maroon footballs are presented to you. Each bag has a label referring to its contents; however, the labels are all mixed up. You knew for sure that no bag has the correct label! Now, you are given a chance to withdraw one item from any bag of your choosing and from that, you must determine the contents of each bag. If you win, Alec presents you with Bevo as a pet to cherish and keep forever! What strategy should you employ to correctly identify the contents of each bag?



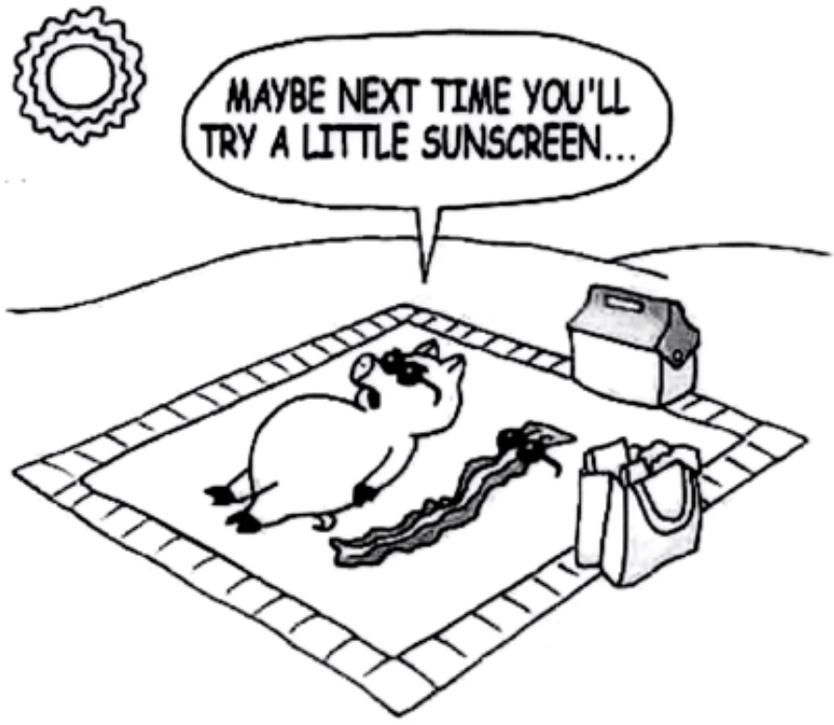
Riddle 2: UT decided to enact a new brain teaser for its students. This time, the game involves cooking a perfect birthday cake for Alec. The cake must cook for exactly 45 minutes; otherwise, the recipe is ruined. Unfortunately, all you have to tell time are two burnt orange ropes and a lighter. Each rope burns in exactly an hour. Additionally, the ropes are of varying thicknesses; therefore, you cannot tell how much longer is left to burn based on their lengths. Your task is simply to measure out exactly 45 minutes of time in order to cook the perfect cake.

Answer 1: Pick a ball from the bag labeled "Mixed." You know since no bag has its correct label, the "mixed" bag should consist of only burnt orange footballs or only maroon footballs. Based on what you drew, you know that the bag containing only the other color should be in the bag labeled with whatever you drew from the "mixed" bag and the actual mix bag should be in the remaining bag.

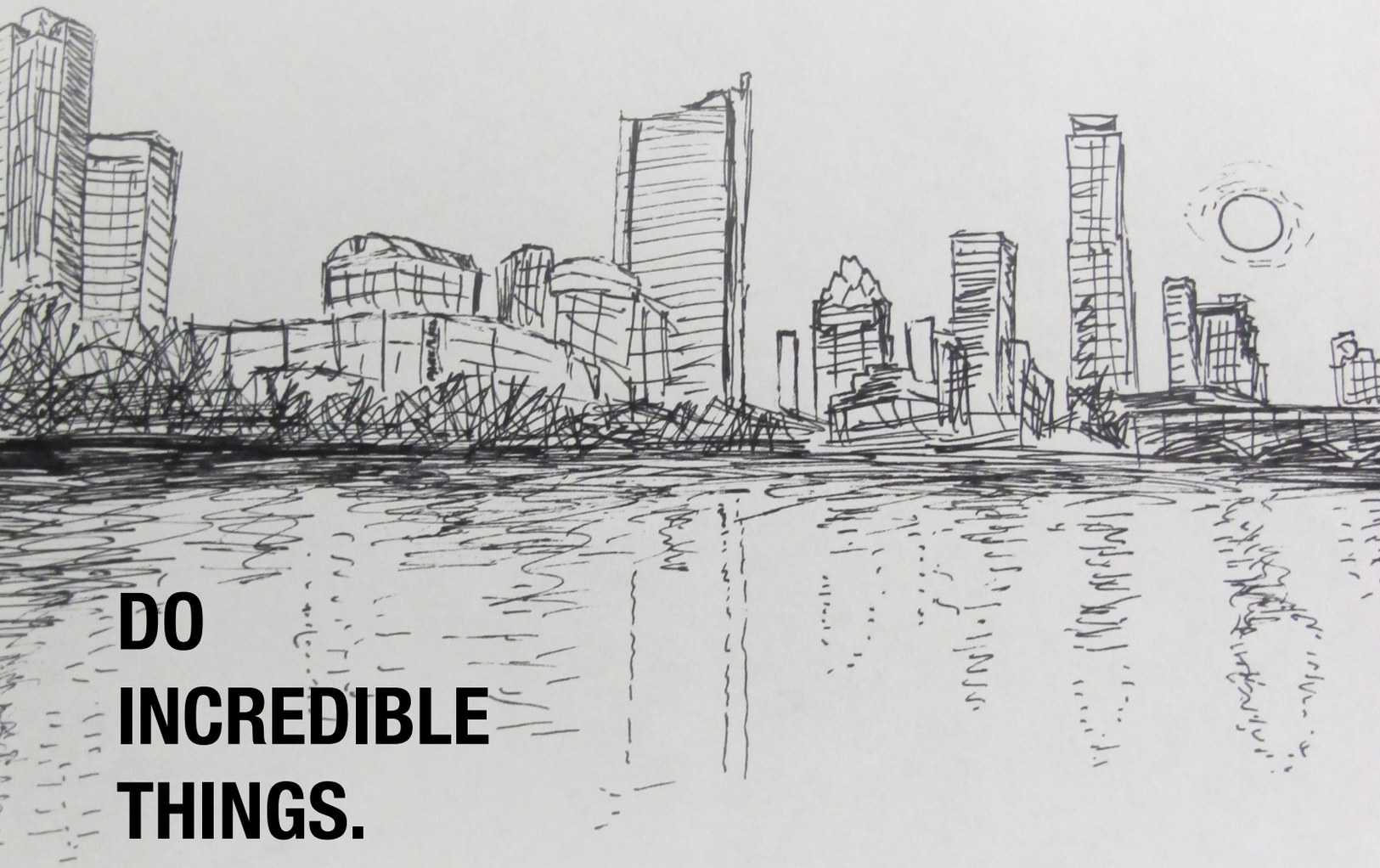
Answer 2: The correct answer would be to start by burning both ends of rope (A) and burn just one end for rope (B). By burning both ends, you know it will only take 30 minutes to burn (A) completely. After 30 minutes have passed and rope (A) is burned away, you will have a 30 minute rope for B wherein you can burn the unburned end to pass exactly 15 minutes. 30 minutes plus 15 minutes will count out exactly 45 minutes and so you can cook a cake for Alec after all!

GOOD LUCK ON FINALS!

HAVE AN AWESOME SUMMER!



From,
The Vector team



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