REVOLUTIONARY TECHNOLOGY

THE HISTORY OF ENGINEERING
Exploring the Origins of Everyday Objects

CYBORG BEETLES
Remote-controlled Mechanical Insects

http://sec.engr.utexas.edu/vector

Published by students, for students
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Have you ever wondered how much engineering went into the development of the pop tab on the top of a can of soda? Or what goes into the weave of a Kleenex tissue? Or even about how much the wheel means to the functionality of society?

Broadly speaking, probably not. These common low-tech elements of our world can easily go unnoticed as we focus on the things that require more of our technological attention, like computers or cell phones.

It’s easy to take a lot of technology for granted, especially since it’s designed to be seamlessly integrated into our lives. The engineering that goes into all of the inorganic - and even some organic - elements of our lives is what drives us forward and allows our society to work efficiently and economically, whether it’s through the implementation of corn syrup as a sweetener or the use of the sewing machine to piece together clothing.

At UT, so many of the technologies that have made our lives easier are ingrained in our lives as students, and throughout the university’s history, technological elements have been built into our campus as ways to increase student resources and productivity while not taking away from the money available for our education. Recycled plastics, efficient heating and cooling systems, and more compact fluorescent light bulbs have been used all over campus, and these technologies do not stand out enough to be noticed despite the revolutionary changes in energy or materials costs that they have caused.

This issue of Vector focuses on these revolutionary technological changes in history, spanning from the invention of the wheel to the modern invention of the “cyborg beetle.”

We also invited writers from Professor Randi Voss’s technical communications classes to send in their essays from their History of Technology paper assignment, wherein each student examined the history of a single piece of technology that people would normally find uninteresting or would take for granted. Summaries of these papers can be found in the printed version of this issue, but for the full text and more in-depth histories, go to the new-and-improved Vector website.

The history of the Vector magazine itself has recently attracted more interest from the engineering community, especially since the Vector staff has begun a project to catalogue the Vector archives in the SEC office.

Ultimately, we hope to make all of the past issues accessible online to illustrate the evolution of the Cockrell School of Engineering student body through print and the development of the Vector periodical itself.

Also, as always, if you would like to be involved in the creation of Vector’s history, send us an article discussing a technology that you think is too frequently overlooked, or submit an article in response to something you have found interesting within these pages. We look forward to hearing what you have to say!

Otherwise, enjoy this issue of Vector, and the next time you open a can of soda, take a moment to appreciate the time and work that went into the tiny fizz of pressure released due to the simplicity of the pop tab cap.

Jen Nordhauser, Editor-in-Chief
vector@sec.engr.utexas.edu
The Wheel Comes Full Circle

An obvious advantage the wheel gave early civilization was the ability to transport heavy objects from one place to another, allowing for huts and villages to be built. However, many overlook another crucial asset derived from the wheel—the ability to relocate and move farther inland.

Because water was and still is essential to life, early humans tried to live as close to a source of water as possible. But using the pottery wheel, they could manufacture jars and bottles to store and transport water and thus not necessarily have to live near it.

As time progressed, the wheel was not just used independently, but in tandem with an axle and a second wheel, to create wagons and carriages. Not only could goods and crops be transported, but culture and ideas. Thus, it is not a stretch to claim that the wheel has helped humanity to come full circle, if you will, and understand and adopt other cultures’ methods of living.

Today, we often only associate cars and bicycles with wheels and do not fully understand their monumental impact on our lives. Almost every college student enjoys music, and the wheel changed the way we experience and listen to our favorite tracks. The original iPods all came with their unmistakable click wheel, which allowed us to flip and cycle through our music, change volume, adjust equalizer settings, etc. Windmills, an important source of renewable energy, operate off the same design implemented by early wheel-and-axle systems.

Even the latest fashions depend on designers’ usage of a special kind of wheel: the color wheel. This innovative use of the wheel allows for colors to be matched and aligned in an aesthetically pleasing manner, the product of which stimulates consumer spending and boosts the economy.

We see that the wheel has come along a way since its circa 3500 BC invention, but it doesn’t stop there. NASA engineers are working on a way to increase the performance of the flywheel, a wheel that transfers energy to run a machine. If made successfully, the efficiency of outer-space operations will soar, allowing for leaps in our knowledge of the solar system and surrounding planets.

- Cyrus Iqbal
Flying beetles the size of your fist may soon do much more than just freak you out. In fact, they may be the next aircraft at the US Air Force’s disposal.

Over the past two years, scientists at the University of California: Berkeley have been experimenting with beetle mind-control, specifically on beetles that fly. The idea itself is relatively simple: attach a small electric backpack to the insect with wires implanted into the brain that send electrical impulses to engage wing muscles.

So far, researchers have been quite successful with the eight-gram beetle, Mecynorrhina torquata, in coaxing them to fly for multiple 30-second bursts while even steering their flight paths. These projects are funded by DARPA, the Defense Advanced Research Projects Agency, in hopes that one day, these little insects can bear small cameras or other sensors that can easily slip past enemy lines undetected as uniquely camouflaged UAVs.

This new technology is particularly significant because much of the last century has focused on development of mechanical systems independent of direct integration with biological matter. Instead of the development of robots, perhaps this century will witness the creation of machines implanted to our bodies that increase muscle strength or eliminate paralysis.

Who knows? Maybe these early technologies are the foundations for human flight--no, not with energy drinks, but with real wings.

- Spencer Heilner
Advances in modern technology appear to occur faster than a blink of an eye, too quickly for most of us to notice.

These seemingly instantaneous leaps into the future in truth can require years if not decades to develop, even in the most mundane and unnoticible engineered elements of our day-to-day lives. To celebrate the baby steps that a few of these elements took to become what they are to us now, a few engineering students submitted their papers on under-appreciated elements of technology to VECTOR.

The full body of these papers can be found on the VECTOR website, and summaries of what they wrote about a few engineered objects can be found on the following pages. We thank them for their contributions to this issue.

- Jen Nordhauser
A History of: Dog Food

Supermarkets were invented in 1930, and became widespread by 1950. This ushered in a new era of modernization. By this time, the human perception of dogs had completely morphed into the perception of dogs as pets. The increased emotional attachment towards dogs made it easy for manufacturers to sell dog food. In addition, dog food was actually cheaper and more convenient than feeding the dog family food that needed to be saved for the next day to combat food shortages.

In 1957, Purina discovered how to use extrusion food manufacturing to develop dog food. The extrusion process includes pushing mush through a cylinder with small holes at the end. The high pressure pushing towards the holes smashes the mush down and forces it out the holes while the low pressure on the other side pulls the piece out and causes it to expand. This process led to cheaper and faster production, because each kibble was now bigger but made with fewer products.

There are few regulations in place regarding the use of meats. If euthanized pets are included in the food, the title or ingredient list usually includes the phrase “meat meal.” It is the ruthless search for cheaper and faster production like this that causes legal trouble for dog food manufacturers.

When an industry is so intertwined in all things dog, it is hard to know what to believe.

Written by Darlene King, Edited by George Song
A History of: Social Media & Disaster Mitigation

Social media is a powerful, expedient communication tool in responding to natural disasters such as typhoons, tsunamis, and earthquakes.

Although urbanization and industrial development have allowed these natural disasters to have a greater potential for damage than in the past, electronic media allows response teams, governments, and citizens to improve efficiency in their responses.

Because of this technology, more lives have been saved than in disasters of the “pre-internet era”. In 2009, Filipinos responded to Typhoon “Ondoy” by using social networking sites such as Facebook and Twitter in order to assist rescue efforts.

The quick response to the Chilean earthquake in 2010 also relied on media; the U.S. provided communications support and other necessities to the ailing nation within hours.

However, media not only aids in the relief effort, but it can also help mitigate disaster before it strikes, in the form of better building codes and extensive warning systems.

A tsunami-inducing earthquake, similar to the recent Chilean quake, hit the same coast in 1960. Many more perished in the former. Why? Through mobile phones and internet broadcasts, many more were warned of the looming disaster before the recent earthquake, and the community prepared itself before disaster struck.

Technology has made communication tools resilient and widespread, and these tools have given power to victims of disasters around the globe. Through this, people can effectively provide global aid and change the world.

- Written by Susan Zurbuch, Edited by Dalton Dinderman

A History of: Beef

“Beef: It’s what’s for dinner!”—or should we say, “Genetically altered beef: It’s what’s for dinner!”

Most of the cattle raised in this country for food are enhanced with bioengineered growth hormones used to increase both milk production and growth rates. During the 1950’s, scientists discovered that sub-therapeutic doses of antibiotics (doses too low to be used to treat infection) increased both the growth rate and weight of cattle.

Then in the 1980’s, scientists found a way to replicate the naturally occurring growth hormone in cattle, rBGH. Dairy cows injected with rBGH see a fifteen- to twenty-percent increase in milk production in their lifetime. Both technologies have allowed the amount of beef produced to be constant over the years, while the number of beef cow operations has steadily declined.

However, studies now show that people who frequently eat this beef receive low levels of bacteria not killed by the sub-therapeutic doses of antibiotics. Additionally, rBGH creates an increase in another substance called insulin-like growth-factor 1, which may increase cancer rates, especially breast cancer rates, in humans.

Knowing this, it will be interesting to see if organic foods and sustainable agriculture will continue to gain traction amongst both cattlemen and consumers.

- Written by Christopher Albert, Edited by Matt Leos
Truly good inventions are those that you have little need to notice.

Such is the case with the stay-on-tab used to open soda cans. This invention is incredibly convenient, allowing us to pop open a cola at a picnic, on a beach, or as we rush between classes. Unfortunately, before 1959, this convenience did not even exist.

Despite the rising popularity of canned foods and beverages, there was no easy mechanism to open them; people instead had to carry around manual can openers, known as church-keys, to punch a hole into soda cans. This was a hassle that engineer Ermal Cleon Fraze sought to fix.

Ermal Fraze was the founder of his own company, the aptly named Reliable Tool and Manufacturing Co. His business was doing well, boasting General Motors, Ford, Chrysler, and NASA as his clients during World War II. However, his most profitable invention was yet to be made.

On one late night, Fraze was having trouble sleeping, so he decided to spend a few hours working on a problem. He recalled that earlier that year at a family picnic, he had forgotten to bring his churchkey to open canned soda; instead he had to use his car’s bumper to pry each can open. Fraze figured there had to be a better way, so that night he sought to design a method to eliminate the need for a can opener.

He ended up inventing a lever, known as the “pull tab”, which pierced a hole in the can and pulled away to make a small opening. As with many good inventions, the pull tab had its naysayers. Breweries did not want to pay the extra cost of attaching tabs to their cans, and many believed that tabs were merely a fad.

However, by 1965, over three-quarters of all breweries were using them, and Fraze had earned over $500 million from his invention. Despite the popularity of the pull tab, it left sharp, jagged edges that cut people’s fingers, lips, and even noses! Furthermore, it became an environmental hazard. Since the pull tab detached from the can after use, they were notorious for being littered on beaches, parks, playgrounds, and other public areas. Pets and wildlife would eat the tabs and children would cut their feet on them.

There were even several instances of people choking to death on the tabs!

Eventually, in 1975, the Falls City Brewing Company devised the “stay-on-tab,” which is still used today. Its design maximizes lever power with the least amount of material. As an added benefit, the tabs are difficult to detach from the cans, thus preventing littering. Its design is simple, but took many years to innovate.

Before the can is opened, the tab serves as a class two lever, where the end of the tab serves as the fulcrum and the rivet the load. The moment the can breaks, the tab becomes a class one lever, where the rivet serves as the fulcrum, and the end of the tab as the load. This change in lever class maximizes power, allowing the consumer to open the can with ease.

If the tab were to instead always remain a class one lever, the consumer would have to fight
As my pledging process progresses, I continue to learn new things regarding Theta Tau traditions. I went through the mid-vote event, where current actives judge you based on multiple criteria: attendance, participation, and overall persona. The purpose of mid-vote is to help me identify the areas on which I needed to improve in order to enhance my overall pledging process. In addition to mid-vote, I have had to study and diligently memorize the important facts regarding the fraternity.

What strikes me the most is how integrated I feel within the fraternity. I am not just a name or a face that they seem to remember from some random event; I am my own person with my own individual characteristics attached to it. Active brothers passing by always greet me when I walk to class, asking me how I am doing and we laugh about a recent event, or they ask me to lunch or dinner to try to get to know me better, as I am about to become one of their own: a fellow Theta Tau.

Halfway through my pledge semester, I can’t say I have any regrets about pledging Theta Tau. As a professional engineering fraternity, rather than a social or cultural one, the members actually understand that as engineering majors, we already have exhausting time commitments with other organizations and exams. Not only do they understand, but they’ve been there. They were once Theta Tau pledges, trying to balance pledging with exams, extra-curricular activities, volunteering, sleep, and that occasional trip to the gym. The respect and understanding I receive from the actives when I have a prior commitment only makes me try even harder to be an outstanding pledge. I even found ways to combine my activities: instead of volunteering on my own for Explore UT, I signed up to volunteer there through Theta Tau.

It was a fun experience, helping our fraternity’s Rube Goldberg team present their award-winning machine to bright-eyed future engineers as they watched a cascading series of movements eventually water a plant. I’ve also extended my studying habits to the fraternity; as pledges, we are quizzed weekly over a variety of Theta-Tau-related information, like our history, purpose, founding fathers, and notable alumni. Currently our pledge class is preparing for our taco fundraiser, so keep an eye out for us, and we’d be glad for the support! Even though I’ve already had so many great experiences with my brothers, what’s fueling my semester is knowing that there are even more to come. So here’s to one more amazing month as a Theta Tau pledge!
Beginning with this issue, Vector will feature a different famous engineer in history from a different department in the Cockrell School of Engineering. This month, we will begin with the history of an engineer within the realm of Aerospace Engineering.

Without the power of flight, the marvels of the world—glorious mountain ranges to breathtaking architectural feats—would be largely inaccessible to the masses.

From humble beginnings in their small home, Orville and Wilbur Wright made the long-standing fantasy of flying from one location to another a reality. Inspired by their toy “helicopters” (made from bamboo sticks and rubber bands), these visionaries soon improved and designed their own flight machine as mere children.

Their fascination for flight took off, as the brothers one-upped each other at competitions and at play, culminating in their successful completion of the world’s first successful airplane and subsequent revolutionizing of airplane models. So remember, if you or a relative flies into town to meet one another, thank the Wright Brothers.

- Cyrus Iqbal

Alec wants YOU to write for Vector

Write for Vector
Send in your articles, society ads, Vectortainment, and more to articles.vector@gmail.com.

Want to be on the Vector Staff?
Join us from 8-9pm Tuesday nights in the Alec Room, ECJ Engineering Library.
We would like to thank our corporate supporters ConocoPhillips, Dow Chemical, and Provenance Consulting for their willingness to support the development of entrepreneurial knowledge in budding engineers. We look forward to seeing you participate at our competition next year!

- Jerry Lin

This is engineering and business combined in its truest form.

“Presenting at the case competition is better than any interview you could wish to have.”

- Brian Goldstein, Dow Chemical Product Marketing Manager

Over the course of two weeks, teams of four spent numerous hours preparing their case, complete with a fifteen-page business plan, to present to the judges at Roden’s third annual, engineering-based, case competition. Roden challenged the eleven teams to engineer a unique product based on the substance aerogel.

The case gave each team the theoretical breakthrough capability of manufacturing aerogel in any form they desired at a moderate price. As with all case competitions, they had to produce a feasible, marketable, and creative product.

On Friday, March 4th, 11 teams presented at the semifinal round. VVV Consulting, Shear Stress, Delta Consulting, and Insight Consulting advanced from their respective rooms to the final round, which took place the next morning at the AT&T Executive Conference Center. The teams, Judge Patrick Nonhof, and Roden Scholars enjoyed lunch together before the announcement of the winners.

1) VVV Consulting produced a layered window pane that provided better insulation than the walls of the house and utilized dye-sensitized, aerogel solar cells to capture energy for the house; they created a business plan for their company that would donate half of their profits to provide lighting in night schools in Africa.

2) Insight Consulting produced an extremely-effective water filter to be used in portable filters, under sinks, and for donation to third-world countries.

3) Delta Consulting produced aerogel wall insulators to save energy lost by heat transfer in all structures: from households to warehouses to refrigerated trucks, to portable vaccine containers for developing countries.

4) Shear Stress produced an innovative piece of kitchenware called Kestler’s Cooker that provided simple and efficient cooking for those that want to decrease their food preparation time and effort.

And the winners are:

1st – VVV Consulting: Bhargav Srinivisan, Leanna Swain, Naveen Mehta, Kelley Rytlewski

2nd – Insight Consulting: Shantu Jain, Sameer Ramani, Aakash Kumar, John Singleton

3rd – Delta Consulting: Robert Huynh, Linda Ye, Vaibhav Agarwala, Lee Wang

4th – Shear Stress: Heming Bai, Melanie Kong, Stephanie Shih, Pranay Mohan

We would like to thank our corporate supporters ConocoPhillips, Dow Chemical, and Provenance Consulting for their willingness to support the development of entrepreneurial knowledge in budding engineers. We look forward to seeing you participate at our competition next year!

- JERRY LIN
Calling all Mechanical Engineering students and all other interested/curious parties!

Stop by ETC 2.105 to find out more about the UT Student Chapter of ASME (American Society of Mechanical Engineers) or to become a member. ASME hosts biweekly meetings during which corporate representatives from various engineering companies talk about their jobs and engineering experiences.

All ASME members receive FREE DINNER at each meeting! ASME also organizes a multitude of social and academic events, some of which include: broomball, tailgates, a graduate school panel, a study abroad panel, and intramural sports. Our next general meeting is Wednesday, April 26 at 6:00 pm in ETC 2.108. Feel free to stop by!

- Mara Sweeney

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Engineering Chamber Orchestra
Concert Series - Spring 2011

Featuring works by Debussy, Hadyn, Villa-Lobos and more!

Friday, April 29, SAC Black Box Theater &
Friday, May 6, Union Quadrangle Room
7:00 pm, Free Admission
Grog immediately regrets his invention of the television when he finds that Jurassic Shore is the only thing on.

After seeing his reflection in the water, Kronk decided that his invention of corrective lenses was a bad idea.
E-Week Results

Where were YOU during E-Week?

As always, the annual E-Week competition between the many student organizations in engineering was an absolutely insane week. We laughed... we cried... we laughed again... and we found out just how far we were willing to go in order to make fools of ourselves in the names of our respective student organizations.

I personally saw no fewer than three Lady Gaga impersonators (all male, of course) throughout the week, ran into a Miley Cyrus impersonator, and watched an entire banana cream pie spontaneously disappear into a competitor during the Pi Sigma Pi pie eating contest.

Besides the almost fanatical devotion of many of the student orgs to the competition, the cunning of several organizations went far beyond that of previous years. One organization managed to hijack a filming of another organization trying to unicycle across the Dean Keeton overpass for the SEC Scavenger Hunt, and the IEEE team went so far as to crash a wedding in order to snap a photo with the legendary Bevo himself. This, of course, leads us to the question, “How can I get Bevo at MY wedding?” But I digress...

After a grueling week of trivia, construction, dancing, sports, and stuffing ourselves with as many marshmallows as our squirrel cheeks could hold, two student organizations reigned supreme!

In the Large Student Organization Division, The American Society of Mechanical Engineers (ASME) won with a whopping 2993 (and a half…) points! In the Small Student Organization Division, Eta Kappa Nu (HKN) won with an insane 2230 points!

In conclusion, congratulations to this year’s E-Week Champions and to all the student organizations and individuals who participated in this year’s E-Week Competition, honoring engineers everywhere! And don’t forget, it’s never too early to begin training for next year’s E-Week Competition!

- Michael Rodriguez
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