Wisconsin engineer. Volume 120, Number 1 December 2015

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Published by the students of the University of Wisconsin-Madison | VOLUME 120, NUMBER 1 | DECEMBER 2015

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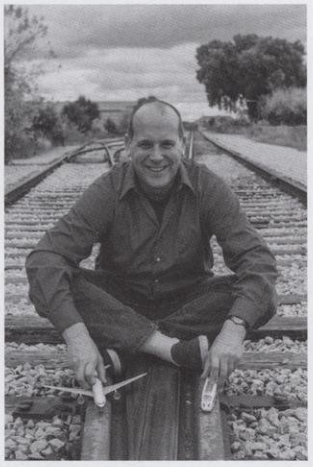

Michael Schlicting from Badgerloop:
The Future of Transportation

Cover photo by Ben Chen

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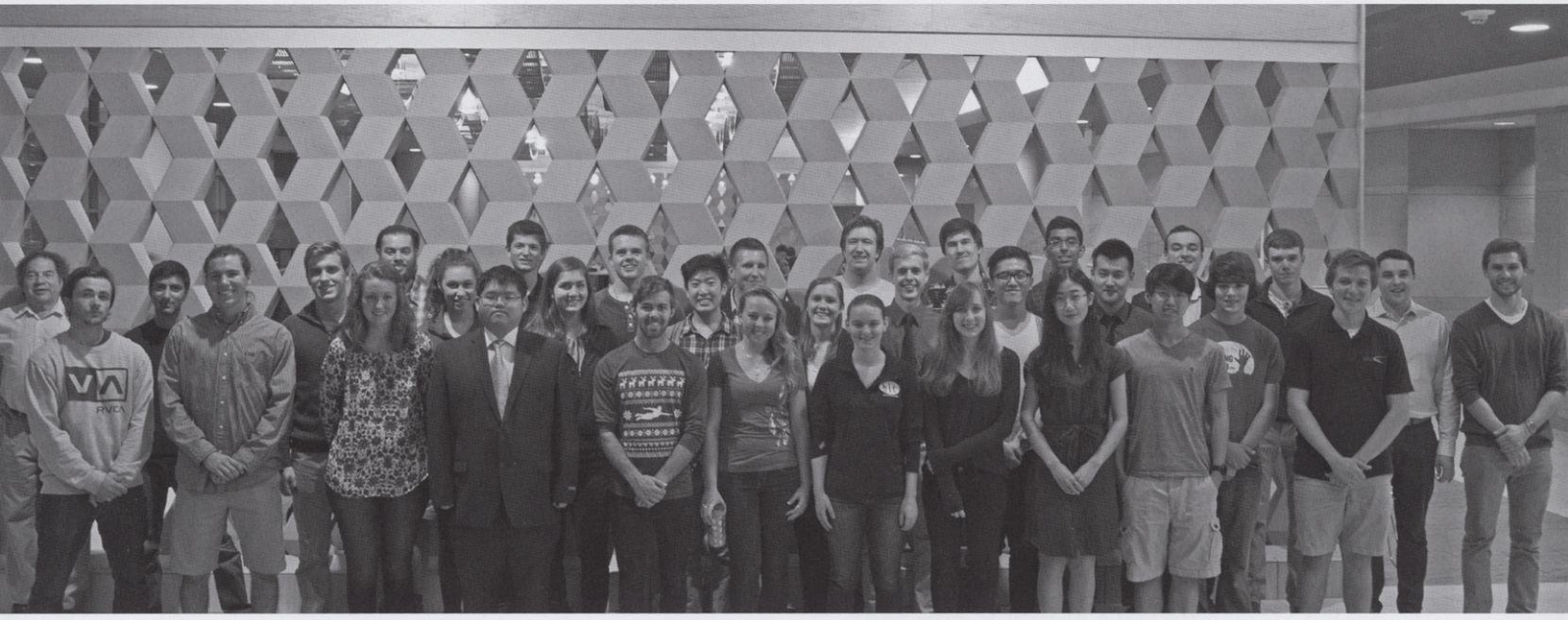

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The *Wisconsin Engineer* Magazine, a member of the Associated Collegiate Press, is published by students at UW-Madison. Philosophies and opinions expressed in this magazine do not necessarily reflect those of the College of Engineering and its management. All interested students have an equal opportunity to contribute to this publication.

Faculty Advisor: Steven Zwickel **Publisher:** American Printing Company, Madison, WI **Web address:** http://www.wisconsinengineer.com

Correspondence: *Wisconsin Engineer* Magazine; 1550 Engineering Drive; Madison, WI 53706 **Phone:** (608) 262-3494 **email:** wiscengrmagazine@gmail.com

The *Wisconsin Engineer* is published four times yearly in October, December, March and May by the Wisconsin Engineering Journal Association.

Subscription is $12 for one year. All material in this publication is copyrighted.

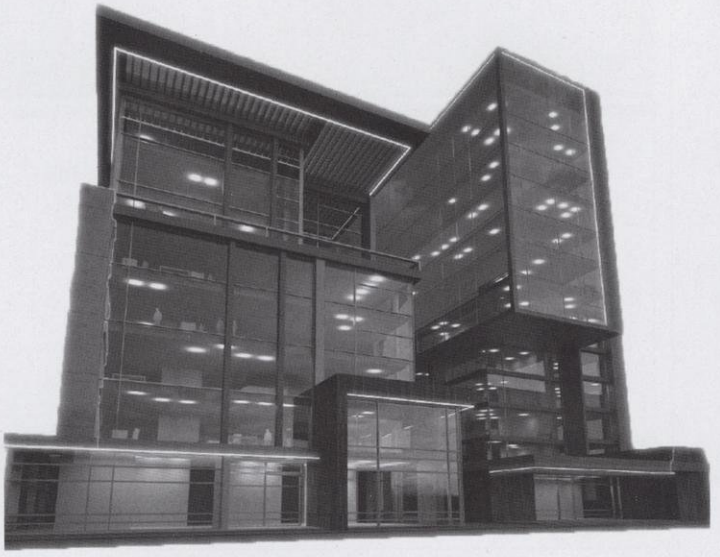
From Ideas to Industry

StartingBlock Madison: The future hub for Madison entrepreneurship

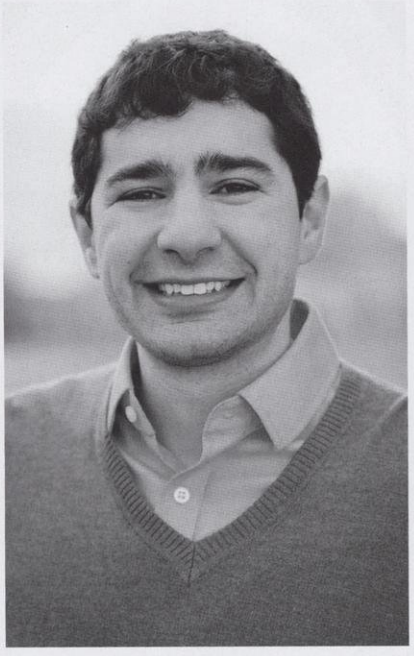
Industrialism was the driving force behind the economy in the United States at the turn of the 20th century. Now at the start of the 21st century, the growing industry is that of startups. Industrialism has become ideas and startups are at the core. Built on the idea that startups are our future and need the space and tools to grow, StartingBlock Madison was founded. Their motto, "Built by Entrepreneurs, For Entrepreneurs" encompasses their mission to scale-up and grow startups.

StartingBlock is a non-profit organization established in 2012 to drive the startup ecosystem in Madison. It was constructed to "replicate the density that drives startup success," says Executive Director of StartingBlock Scott Resnick. The founders of StartingBlock looked to their counterparts in entrepreneurial hubs across the country, such as 1871 in Chicago and 1776 in Washington DC, when envisioning Madison's hub.

With the idea of building and growing startups in mind, StartingBlock Madison will have a new 50,000 square foot building located on the 800 block of East Washington Avenue. The building will incorporate spaces for Gener8tor, Capital Entrepreneurs, and Sector67, all supporters of startups, as well as office spaces for startups. Sector67 is currently a space focused on creating and working with the next generation of technology. With its incorporation into StartingBlock Madison, it will gain more space to continue to learn, build, and teach about new technologies. In winter of 2016, they will break ground on the building and will be utilizing the space by next fall.



This project rendering shows StartingBlock Madison's new building concept. StartingBlock expects to break ground in the winter of 2015-2016, with tenants moving in the following year.



Scott Resnick is the Executive Director of StartingBlock Madison, which plans to scale-up and grow startups while supporting entrepreneurialism in Madison.

The mission of StartingBlock is to scale-up and grow startups, and improve business by establishing partnerships with other cities. With the startups being located at a single central position, this makes it easier for entrepreneurs to build connections and investors to find projects to support. "Entrepreneurship doesn't happen in a vacuum. Great ideas come from interactions," Resnick says.

Another focus of StartingBlock is to improve business by establishing partnerships with other cities' hubs for entrepreneurship. This will be obtained by StartingBlock being a place for startups to be created, housed, and financed in Wisconsin. StartingBlock is establishing its roots in an area of Madison that is declining due to changes in industry. "Entrepreneurship is critical to the future of our city. It's the catalyst for our city's potential," Resnick says. As the shift from industry to entrepreneurship continues, spaces like StartingBlock Madison are essential in the continuous progression of our economy. WE

Written by: Emily Morzewski

Photography by: Matthew Henricks

Design by: Brent Grimm

Grainger Foundation Commitment Funding Undergraduate Innovation

The Grainger Foundation recently made a $22 million commitment to fund the improvement of undergraduate programs offered through the College of Engineering.

The silence and relative calm of Engineering Mall were broken by the sounds of marching band music and palpable excitement during the early afternoon on September 17th as students and faculty awaited the "special announcement" that the College of Engineering had stated would be shared with the public that day. The crowd applauded and cheered when it was announced that the Grainger Foundation had recently agreed to fund a $22 million commitment to the College of Engineering.

This is the second of two commitments recently awarded to the College of Engineering from the Grainger Foundation. The focus of the most recent commitment is to improve the educational and career services available on campus for undergraduates, as well as create a "makerspace" that will facilitate students' development of product design and interdisciplinary skills.

"There are several different components regarding how we are going to use the funds," says College of Engineering Dean, Ian Robertson. "One area that we're really happy the Grainger Foundation liked was the Undergraduate Learning Center." The ULC was in its final year of being funded by a previous commitment, so it would have likely been downsized in the coming years. "They liked that the center has had a very positive effect on the undergraduate students," says Robertson. "Part of the gift will be used to provide an endowment for that service." This endowment will allow the College of Engineering to continue providing services many undergraduates find beneficial and to expand and improve upon them.

Among the proposed improvements to the undergraduate services is the development of online courses that would allow students to strengthen the foundational math and science skills they learned in high school, helping them succeed in college level courses. Perhaps the most noticeable change, however, will be the multiple renovations to several buildings around the engineering campus. "You've probably already noticed the changes in Engineering Hall," says Robertson. The intention of the space recently completed in Engineering Hall was to create somewhere where students could meet and discuss group projects.

In addition to some of the renovations to classrooms already underway in Engineering Hall, most of the Engineering Academic Services will be moved to a single building, 1410, and Wendt Commons will be completely redesigned in order to make it a more conducive learning environment. The second and third floors of Wendt Commons will be completely reimagined, with the construction of large capacity classrooms that will accommodate the increasing undergraduate population as well as a "makerspace" entirely dedicated to allowing undergraduates to tinker and experiment with the latest design, visualization, and fabrication technologies.

One of the two main goals of the new "makerspace" is to expose students to technologies that will help them in their studies and careers. The second goal is to provide students with the skills needed to work effectively with engineers from other disciplines and develop the ability to create innovative designs that can be used for competitions or entrepreneurial ventures. In a field that is constantly becoming more interdisciplinary, global, and competitive, these skills are critical for students in order to remain competitive in the current job market and to continue developing new ideas and technologies that will shape industries in the future.

"What they [companies] really like is that we can teach you problem solving skills, that we can teach you how to take a really complicated problem, dismantle it into components, solve each component, and then put it all back together," says Robertson. "They're coming not just because they want you to be an engineer, they're coming because they like the rest of the skill sets you have."

Undergraduates in the College of Engineering can already notice the impact that the Grainger Foundation has had on the college through numerous gifts and commitments made in the past. This latest round of improvements is on schedule to be completed within the next several years, allowing current undergraduates to benefit from the Grainger Foundation's commitment before graduation. "The Grainger Foundation, David Grainger, has been very kind to the College; the impact they've had and their willingness to help us do these things is tremendous," says Robertson. "It's a moment when engineering is doing incredibly well and the job market is very good. It's a very exciting time to be here and to be an engineer." WE

Written by: Gabriela Betancourt

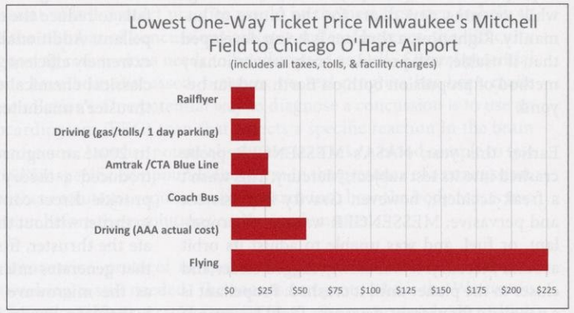
Photography by: Ryan Yan

Design by: Sarah Vodovoz

"The Grainger Foundation, David Grainger, has been very kind to the College; the impact they've had...is tremendous."

Your Next Flight is "On Track"

Badger Rail Society wants to prove that connecting planes and high speed trains is the future



While the United States consistently showcases their impressive engineering and advanced technology on the global stage, there seems to be a large void of progression in one of the most substantial fields: high-speed rail transportation. Sure we have cars, taxis, buses and airplanes, but it seems we are missing a key ingredient that so many countries are enjoying. This ingredient is the prominence of high-speed rail systems that have benefitted so many people worldwide. However, one idea in our local community can start a chain of advancement – at least that's the hope of Mike Schlicting, UW – Madison masters student and mastermind behind the Railflyer.

High-speed rail is by no means a new technology, but it is a technology that struggles to gain support within the United States from the government, especially in the state of Wisconsin. Mike states, "Ironically, the State of Wisconsin has spent more trying to stop higher speed trains, than had Wisconsin started operating them." In 2009 there was a plan to build new high-speed trains for Amtrak's Milwaukee to Chicago service. Governor Scott Walker eventually discontinued the plan even though two train sets and a factory in Milwaukee had already been built by the train manufacturer, Talgo. Talgo later sued the State of Wisconsin and won, settling for $50 million in damages, as well as keeping the trains they built. Mike commented, "High Speed Rail in the US has somehow become a political issue when it is not! It is in everyone's interest for the US to catch up to the rest of the world!"

Model countries for high speed rail such as Japan, China and France have had trains that travel at up to speeds of 220 mph and can hold over 1000 people per train. These trains have become increasingly popular and vastly preferred by the customers. Mike chuckles, "In Japan, you can set a watch to the arrival of bullet train because they're so reliable." Bullet trains have many advantages such as decreasing traveling time, reducing traffic and being more eco-friendly. However, in order to create a flame of popularity in the U.S., there needs to be someone who ignites the match.

Reluctantly enough, the torchbearer, Schlicting, may be on his way to bringing a more efficient, comfortable, and greener mode of transportation to our local communities in the near future. If you have ever taken a connecting flight from Milwaukee's Mitchell International Airport to Chicago's O'Hare International Airport, you may be able to relate. Mike says, "Flying from Milwaukee to Chicago is the equivalent of taking a semi truck to a grocery store." This may be due to the fact that your flight is "on approach" to O'Hare before you even leave the runway in Milwaukee. There has to be a better way to travel such a short distance. Available alternatives include driving, busing and if you don't prefer traffic; Amtrak. However, none of these options seem appropriate for the day and age of technology that we live in.

This is where the idea of Railflyer comes into play. Railflyer is a research project for linking airlines, airports, and trains. By building a higher-speed train with a maximum speed of 110 mph (almost twice that of Amtrak) from downtown Milwaukee to downtown Chicago with stops at Milwaukee's Mitchell Airport and Chicago O'Hare, Railflyer could help eliminate over 30 flights a day; cutting costs for the airlines and provide a more comfortable, reliable, and greener experience for the airline passenger. Each train would carry up to 500 passangers and take less than an hour. Airline passengers would purchase tickets with the airline like any other flight, meanwhile local passengers would buy tickets directly with Railflyer, costing about $29 each way. Mike states his confidence in his project by saying, "The airlines and airports want Railflyer, and Railflyer could happen next year if we just got all the parties together. In fact, the total startup cost would be the same price that the State of Wisconsin had to pay Talgo." This cost is low due to the fact that Railflyer can exist on the current Canadian Pacific rails, and the only cost would come from upgrades to signals, crossings, and a new interchange north of O'Hare. The purpose of Railflyer is not to stop using airlines, but to merely efficiently join the two together.

This new technology would not only be beneficial to the riders, but is supported by the airlines, and would greatly assist the economies of Milwaukee, Chicago and even the community of Madison. "The route turns from barely breaking even today with Amtrak to making about 12 million dollars a year," Mike says. There is a very promising future with Railflyer, but it takes everybody on board to support such a vast, and beneficial change. Mike states, "below 400 miles it is much more efficient and much more comfortable to use high speed rail over airplane." It just makes sense, and this is just the tip of the iceberg in a mode of transportation that has already proven itself around the world.

This is where UW-Madison and the Badger Rail Society are important. While Mike's interdisciplinary research here at UW-Madison spans Engineering, Human Ecology, Business, Urban Planning, and even Sociology; the Badger Rail Society is where Railflyer will really happen. As a student chapter of AREMA, The Badger Rail Society is starting to work with other universities, business professionals, and companies to bring high speed rail to the Midwest. "What is awesome about the Badger Rail Society is that not only are we trying to change the world, but we are meeting industry professionals and recruiters while doing it."

The long term plan for Railflyer is to show that trains can be profitable. After proven, the Railflyer plans to expand throughout the Midwest. The domino effect would benefit everyone, from the riders who enjoy high-speed, low congestion travel to the communities who thrive. It appears that the tracks to the future have already been laid. Now it is just "Full Steam Ahead" for Mike and the Badger Rail Society! WP

Written by: Chris Hanko

Photography by: Ben Chen

Design by: Jason Wan

Moving Spacecraft with Microwaves

Researchers are exploring an experimental propulsion method that could fundamentally alter the fate of humanity.

Designing methods of launching an object beyond the gripping claws of Earth's gravity is one of the most challenging problems an engineer can expect to tackle. Even more challenging is creating new methods of propulsion that push physics beyond its edge while opening new doors for the future of humanity. Right now, a thruster is being developed that, if usable, will provide a truly revolutionary method of propulsion both on Earth and far beyond.

Earlier this year, NASA's MESSENGER probe crashed into its test subject, Mercury. This wasn't a freak accident, however. Gravity is persistent and pervasive; MESSENGER was out of propellant, or fuel, and was unable to adjust its orbit around Mercury. It was slowly tugged closer and closer to the planet until it crashed. Propellant is a necessity for present-day space flight because of Newton's Third Law: for every action, there must be an opposite but equal reaction.

As a demonstration, plop a stationary spacecraft in an empty spot of space. The denizens of the spacecraft want to go somewhere more interesting, so an engine is fired. Firing an engine in a classic chemical rocket is simply the process of extracting energy from fuel by burning, then speedily chucking it from the spacecraft in the direction opposite the destination. The problem is only a finite amount of material exists to eject, and once that runs out, the spacecraft is unable to maneuver until more fuel is provided. This creates a predicament because space is relatively devoid of matter; rocket fuel doesn't just appear (unless you have Nibbler on-board and pack a dark matter engine under the hood).

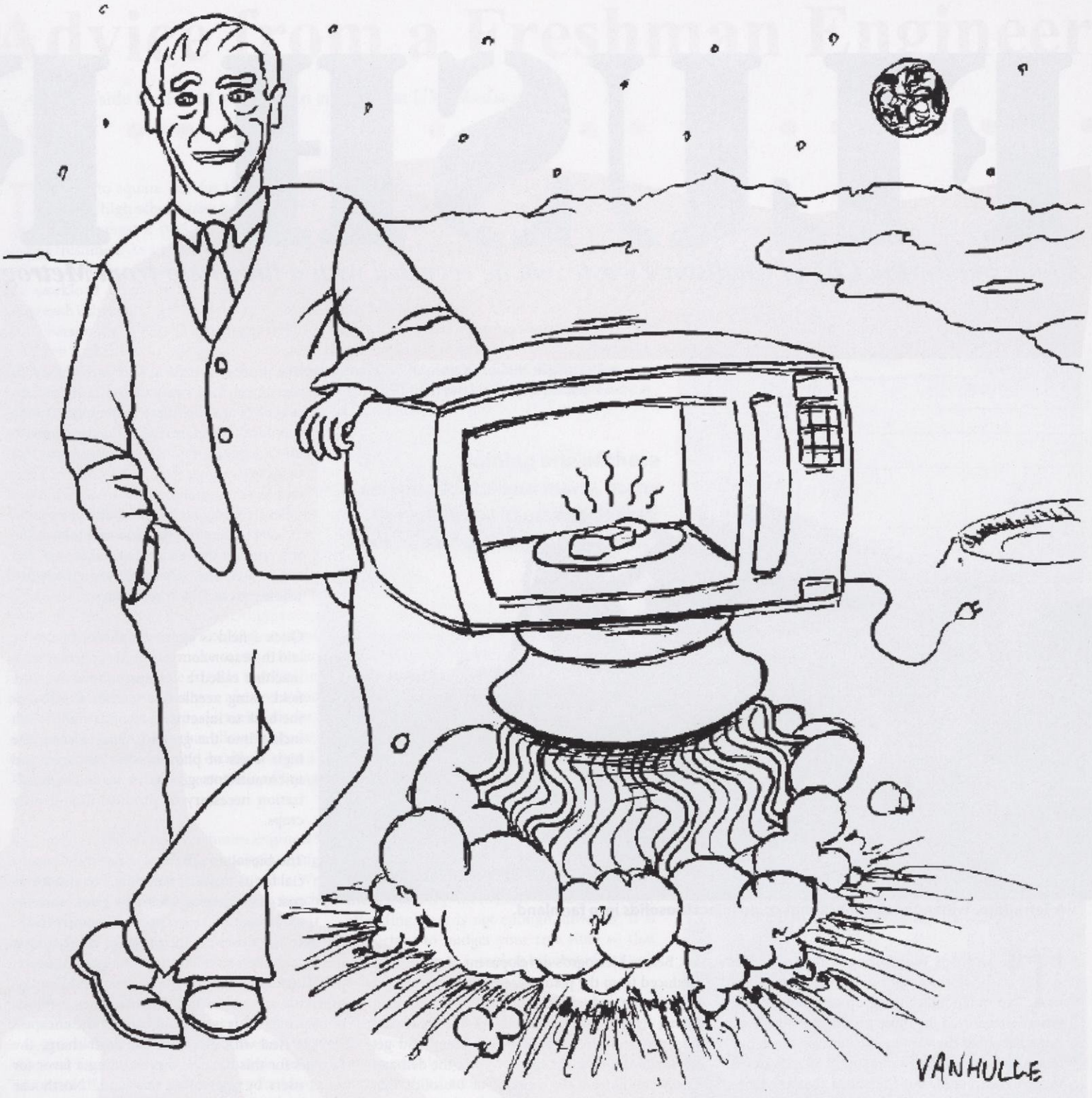
Robert Goddard, the father of rocketry, incubated initial ideas of alternative thrusters using electric fields early in the twentieth century, but these ideas only lived in laboratories until the ion thruster was demonstrated in the 1960s. The key differences these thrusters possess from classical thrusters are the usage of heavier elements such as xenon for the fuel and electric fields to expel the fuel at high velocities. However, this engine fails to reduce the dependency on chemical propellant. Additionally, this style of engine, while extremely efficient, is unable to compete with the classical chemical thruster due to the chemical thruster's unadulterated power.

In 2001, an engineer named Roger Shawyer introduced a theory that, if reproducible, could provide direct conversion of microwave energy to thrust without the need for propellant. To create the thruster, first find a magnetron, a device that generates microwaves in applications such as the microwave oven. Microwaves from the magnetron would be pumped through a waveguide, a structure that directs waves down a specific path. The waveguide would be designed to possess resonance, a phenomenon where the amplitude of waves increases at a specific frequency. The microwaves would then enter a tapered cavity. According to Shawyer's theory, microwaves at opposite ends of the cavity should experience differing velocities. The surfaces of the cavity would be subjected to radiation pressure, which is a force experienced by an object exposed to electromagnetic radiation (in this case, microwave radiation). However, according to the theory, the differing velocities would create a difference in force magnitudes at opposite ends of the waveguide assembly. By designing an assembly to optimize the resonance properties, one can amplify this difference in forces to produce a usable thrust force.

General responses to the operational theory of the RF resonant cavity thruster have varied from hostile to immensely hopeful. The standard argument against realistic operation note that classical propulsion methods require force to be imposed on the ejected mass of the propellant, which isn't happening because no mass is being ejected. Additionally, critics point out that an output force cannot exist since the cavity is a closed system and will only strain the device walls (it should be noted that, according to Shawyer, by taking Einstein's Special Theory of Relativity into account, this effect is eliminated).

However, a slowly-growing pile of evidence appears to support the thruster's operation. The theory received seven positive independent reviews from notable aerospace and electrical institutions. Shawyer created a company to develop a functional thruster, which has produced both experimental and demonstrative versions of the thruster, dubbed the EmDrive. Researchers from China, NASA Eagleworks, and, most recently, Dresden have all reported thrusts from their initial tests of the concept (it should be noted that each group created slightly different versions of the thruster). NASA was the first to allegedly observe positive force measurements when testing the thruster in a hard vacuum, which is one of the most critical developments to date because the vacuum eliminates the error that can be introduced by atmospheric matter while testing the system. At this point in time, more testing is underway to eliminate additional potential

"Humanity could harness the free energy of suns to move through interstellar space..."



sources of error.

If this theory translates to practice, a number of existence-altering shifts will occur. A device that creates thrust without propellant will enable objects in orbit to remain in orbit for the complete lifetime of the on-board equipment. When equipped with this thruster, the International Space Station would no longer require boosts from visiting capsules; the ISS's solar panels would capture the necessary energy to provide orbit-preserving thrust. Humanity could harness the free energy of suns to move through interstellar space without requiring expensive, heavy, and dangerous propellant. By providing 9.81 m/s^2 of acceleration per kilogram of mass with the thruster, objects on Earth would be able to enter a controlled state of levitation independent of surfaces. While it's still just a theoretical device, a true electromagnetic thruster would change the destiny of humanity, all while using technology found in devices that warm Hot Pockets. WE

Written by: Stephen Eick

Illustration by: Alex VanHulle

Designed by: Helen Keyes

FLUSH FORWARD

A look at how the City of Madison's waste can be recycled with a little help from Metrogro.

A Terragator with nozzles at back that could inject biosolids into farmland.

The world is overflowing with waste. The trash we throw in our garbage cans piles up in landfills, taking up space that could otherwise be used for more productive purposes. But what about the waste we're flushing down our toilets and rinsing down our sinks? Wastewater is treated and reused, but the solids that are separated are often times placed into specialized landfills or incinerated. Madison Metropolitan Sewerage District (MMSD), the plant at which the city's wastewater is treated, has a more environmentally forward approach: using the solid organic waste to fertilize local farm fields. Thus, the Metrogro program was developed to distribute biosolids to what is now 494 farms and counting.

Metrogro has successfully developed into a biosolids-recycling program that has been in operation since the early 1970s. Michael Northouse, the manager of Metrogro, has been a part of the program from its starting phases and has since helped it grow into the massive fertilizer provider it is today. Before Metrogro's development, the biosolids produced from the plant were used in other ways. "Back in the early days, [the plant was] still producing fertilizer from the city's solid waste and then people from gardens would come and get it," Northouse says. "As the city grew, the demand wasn't enough for the amount of biosolids that they were generating, so the plant put the biosolids in storage lagoons for years. Once the lagoons became full, the Metrogro program started."

"This is probably one of the cheapest ways to deal with biosolids… If we didn't use this method, we would probably have to take the waste to to a landfill or incinerate it, which adds up [in cost]."

The process of placing Metrogro's biosolids on a farm field starts with a farm site approval. "For every place that applies [to the program], Metrogro has to do a site approval," Northouse says. Regulations state that fields with higher than a 12% slope, or fields that have too shallow of bedrock or a water table are ineligible for biosolids placement. "I have to map out the field and look at the soil types in the field because there are certain regulations. So we have to go through a whole process," Northouse says.

Once a field is approved, biosolids can be laid in-season courtesy of Metrogro. A large machine called a Terragator rolls over the field, using needle-like nozzles attached at the back to inject the biosolids eight to ten inches into the ground. Once placed, the high levels of phosphorous, nitrogen and micronutrients give farm fields the fertilization necessary to produce high-quality crops.

The biosolids program is not only beneficial for its material recycling, but also for its cost-effectiveness. Metrogro gives biosolids to farmers, and even plants it on their fields, for free. The funds for the program come from a portion of the sewer bill that Madison residents pay. The funds required from users would be significantly greater if MMSD chose other methods of disposal. "This is probably one of the cheapest ways to deal with biosolids. We don't charge the farmers for this because they're doing a favor for us as users by generating this land," Northouse says. "If we didn't use this method, we would probably have to go to a landfill or incineration, which adds up [in cost]."

With the placement of biological waste on land, there are reasonable concerns voiced by the public. Worries of water contamination, unpleasant odor and hazardous chemicals are calmed by the extensive efforts of the Metrogro program. "We do well monitoring. When we do these fields, we'll randomly test the wells of nearby houses to give the people assurance we're not polluting their water," Northouse says. In addition, the possibility of odor from the waste is eliminated due to the injection process involved in field application. The solids are incorporated into the ground, which conveniently masks odor, eliminates the possibility of runoff and ensures maximum nutrient absorption by the crop. The health hazards of the biosolids are also minimal because of the intense treatments they must go through. "The DNR and EPA set standards that we have to meet with heavy metals. We meet or exceed them, because there's so much pre-treatment," Northouse says.

However, some chemicals are unavoidably present. "We have a lot of phosphorous in our product, which is great for the farming end of it. But at the environmental end of it, there's a lot of issues."

Phosphorous is a vital nutrient for the crops that farmers are growing, but it is a serious problem for surrounding bodies of water. Farm runoff can travel into ponds and lakes, which when contaminated with phosphorous can lead to algal blooms, an infestation of algae that can kill almost all living organisms within the body of water. This is an unfortunate downside to an otherwise very productive system.

The City of Madison has taken many steps toward a greener way of life, including transforming waste from what could be another huge landfill to a product that encourages life and growth. Fortunately, biosolids are a renewable resource, so the Metrogro program is bound to last for many years to come. So as long as the people of Madison are still making trips to the bathroom, farmers will get their Metrogro. WE

Written by: Kelsey Bright

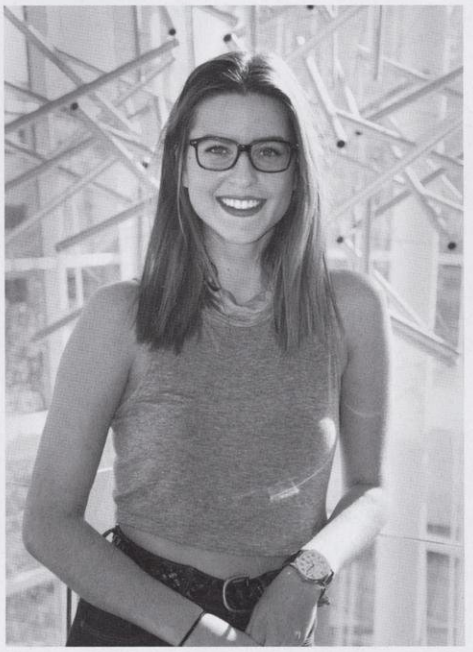
Photography by: Catie Qi

Design by: Margaret Butzen

Micheal Northouse standing proudly at the front entrance of the plant.

Staffer Spotlight

Here at the Wisconsin Engineer Magazine, we love to acknowledge the hard work of our staffers each semester. Last spring, two members of the writing staff, Stacy Montgomery and Brandon Grill, were awarded the Edward M. Kurtz Prize and the Jesse B. Kommers Award, respectively, for their outstanding articles in the May and October issues of the magazine. We asked Stacy and Brandon to say a few words about both themselves, and their experiences as members of the Wisconsin Engineer Magazine. Here's what they had to say…

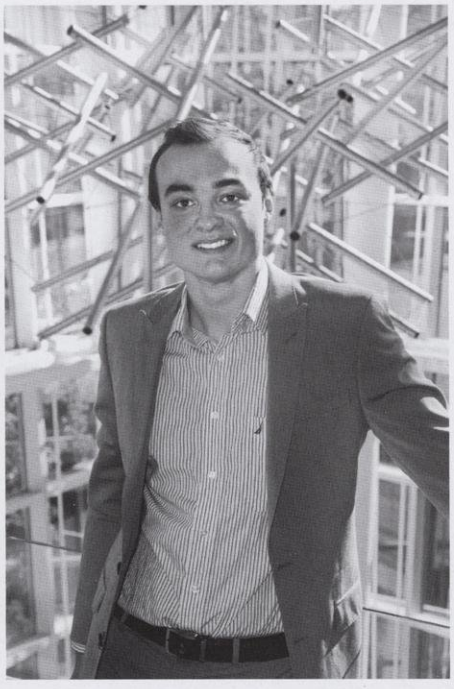


Stacy Montgomery

Hello reader, I'm Stacy, a sophomore in the College of Engineering at UW-Madison that (obviously) writes for the supreme Wisconsin Engineer Magazine. As a writer, my job is to go out and find ideas (or have one assigned to me—shout out to the editorial staff, this is a tough job), and talk with some really genius people about their really genius ideas. My love for engineering and writing for this magazine go hand in hand. I love engineering because it's very interdisciplinary. With that, the goal of my writing is to explore all of the connections between the different fields of science and real life. Talking with professors and researchers about these topics is also very rewarding, because I get to learn about what these people have dedicated their lives to. Personally, I'm obsessed with environmental issues, so I tend to draw inspiration from that for my writing. It has taken me everywhere from computers, to agriculture, to engines (and beyond). The trick to this gig is in the topic itself. How passionate you are about a topic will be reflected in the quality of your work. The inspiration to ask meaningful questions about the topic and to seek answers, ultimately, is my goal. That, and to add an extra line to my résumé. Thanks for meeting me! WE

Brandon Grill

There's something that has always troubled me about the way my peers choose to spend their time. So often students at UW-Madison seem to be under the impression that the only way to get ahead in their chosen fields is to stick to a theme and be involved solely in organizations or jobs within it. Business majors join business or consulting clubs, engineering majors stick to robotics and Formula SAE, etc. While this focus can foster a deep understanding of the topic, I've found that I develop as a student and as a person when I participate in clubs in a wide variety of fields. My broad involvement has taught me skills and experiences that I know will help me in whatever career I choose.



My major is in art history, and I hope to apply to medical school in a few years, yet I write for the Wisconsin Engineer Magazine. Most people wonder why an art historian continues to write for an engineering magazine, or why a future doctor would waste his time with art history. But to me, it makes perfect sense. When I write articles for the magazine, I research my topic, conduct in-person and phone interviews, and then take everything I compiled and make it accessible to the reader. In this, I am learning skills that are highly beneficial when it comes to papers and projects in my art history classes. Formally analyzing a work of art is little more than an active research of the topic I want to write about, and making it readable to my audience, a task very similar to the one I do while writing magazine articles. Similarly, the critical thinking skills involved in analyzing a work of art and putting it into historical context is almost like solving a puzzle; a physician uses those same skills to assess a patient and then make decisions about how to put their symptoms into context. I'm also a First Responder with the UW Police Department and I fence competitively with the UW Fencing Club; the fast paced nature of both of these endeavors complement each other even though they are unrelated on the surface.

The truth is that every activity in every subject can be boiled down to skill sets, which are applicable in nearly any other field. Spending my time studying the history of art does not mean that I'm off the standard "pre-med" path. Writing for the Wisconsin Engineer Magazine doesn't mean I'm networking with the wrong group of people. I'm glad to be a valued part of the magazine even though I am different than the majority of members. I strongly encourage engineers to step out of their comfort zone just a little and write for the magazine, and I encourage writers in other fields to perhaps give technical writing a try as well! WE

Photography by: Heather Schumaker

Growing the Community

A nonprofit located on Madison's south side is tying the community together with urban agriculture and demonstrating a resilient lifestyle.

Growing Power is a Milwaukee-based nonprofit organization which has grown nationally, as well as globally. Founded by William Penn in 1993, Growing Power started as a program that made resources available for urban teenagers to learn how to grow food for their community. According to the program's website, it has grown into a program that demonstrates sustainable food systems in an "idea factory for the young, the elderly, farmers, producers, and other professionals." Madison's chapter of Growing Power specifically focuses on teaching the public how to live a sustainable lifestyle in an urban environment.

Based out of the Badger Rock Center on Madison's South Side, Madison's Growing Power focuses its goal on partnering its neighbors with the skills and opportunities needed to live a resilient lifestyle. This is done through the work of a variety of groups, all occupying the Badger Rock Center. The collaboration is coordinated by The Center for Resilient Cities (CRC), an organization that prides itself on being a "critical catalyst for a number of highly successful, sustainable neighborhood development projects that integrate a multitude of community systems," according to CRC's website. One of the key components in this intricate web of organizations is Growing Power, which focuses on farming and agriculture at the Badger Rock Center. "Growing Power has been looking to establish a foothold in Madison for a long time, and [the Badger Rock Center] became that opportunity," says Martin Bailkey, Growing Power's outreach coordinator.

Growing Power not only serves the community, but welcomes community involvement in a variety of ways.

"Growing Power has been instrumental in getting the Badger Rock Middle school started," says Bailkey. This charter school in the Madison Metropolitan School District is based in the Badger Rock Center and teaches approximately 85 sixth through eighth graders. Robert Pierce, Madison's Growing Power's main coordinator and farmer, works closely with the school, teaching the students basic skills in composting and vermicomposting. In the springtime, Pierce supervises the students as they plant seeds and transplant plants, while the rest of the school year is devoted to composting bed maintenance. The students learn various ways to grow food, especially in an urban environment. The curriculum at the school, though not designed by Growing Power, is highly influenced by the program and focuses on all aspects of sustainability.

While Growing Power demonstrates the resilient lifestyle to many people, it also accomplishes much more. Growing Power holds monthly community dinners at the Badger Rock Center on the last Thursday of every month. Attendees are served dishes made from seasonal, locally grown foods, homemade by Pierce himself. During these community dinners, people are encouraged to present concerns and problems they see arising in the community and possible solutions. Sometimes, even members of Madison's local government attend the dinner to hear community members give voice to their ideas. In addition to the community dinners, Growing Power encourages the public to visit the Center at leisure and to look at the types of urban agriculture that are possible and learn replicate it in their own homes. Community involvement is very important to Bailkey, Pierce, and Growing Power, so they make sure most of their projects are community-oriented and can include all, even those who are new to the urban agriculture scene.

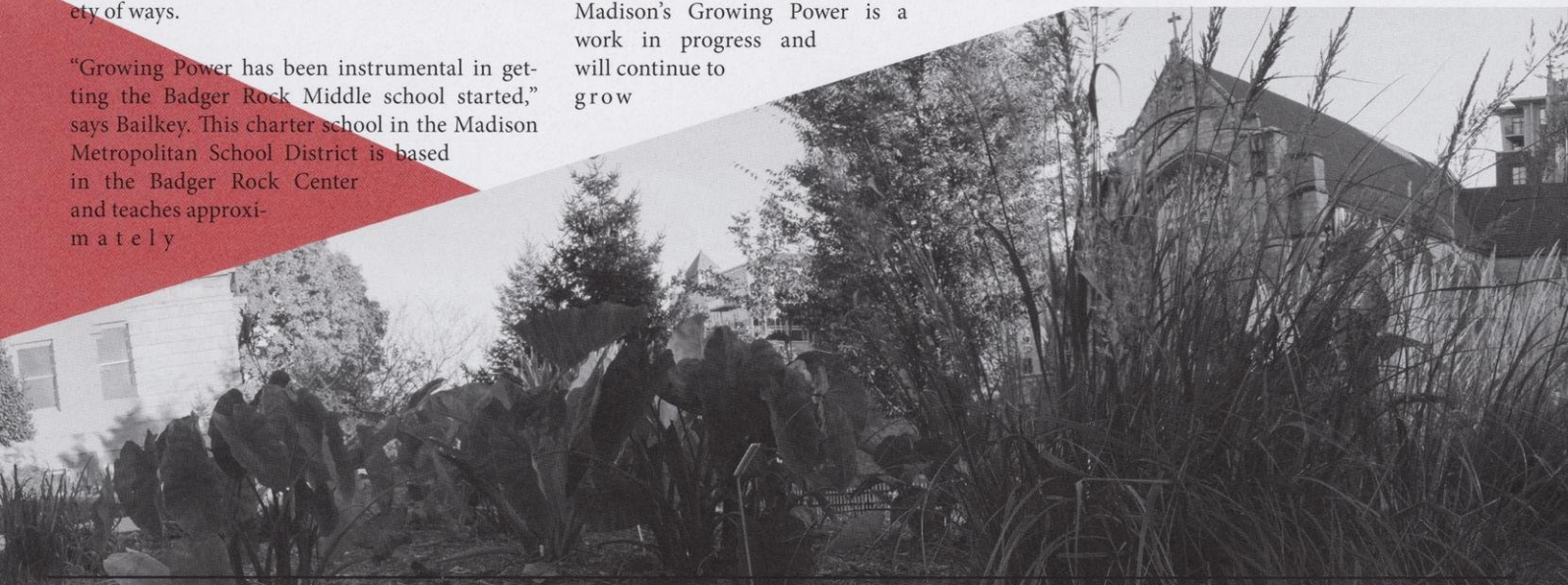
Despite how much they have accomplished, Madison's Growing Power is a work in progress and will continue to grow as community involvement strengthens. Although it isn't quite a working farm, "it still has room to grow as a demonstration farm site," says Bailkey. Their next step in Madison is aquaponics: "the method of growing crops and fish together in a re-circulating system," according to Growing Power's website. In an aquaponics system, water from a fish habitat is drained from a tank and is pumped into growing beds, which nourish crops. The bacteria from the fish waste is broken down from nitrite and then into nitrogen to provide nutrients for the plants. The water then flows back into the fish tank and the whole process is repeated to create a symbiotic, self-sustaining system.

"The students learn various ways to grow food, especially in an urban environment."

Growing Power's attempts to unite the community and demonstrate a resilient lifestyle is made possible by the partnership they have with the Center for Resilient Cities and the Badger Rock Middle School, in addition to community involvement. The farming they perform and educate upon serves as a demonstration of how anyone can live a resilient lifestyle based on urban agriculture.

Written by: Katherine Underwood

Photography by: Robin Ritchey



DIY Science: 18+ only

Where adults can be kids again with science!

There are so many opportunities for kids to have fun with science. Local schools, big college institutes, science fairs, camps and clubs are all reaching out to children to get them more involved in STEM fields. Almost every adult can remember some sort of hands-on science activity when they were young. They may have done an experiment as simple as shooting a film canister rocket with Alka-Seltzer or as advanced as taking a 3-D printing lab. However, it seems there aren't many opportunities for adults to enjoy and experience science. DIY Science is a program that lets adults do just that.

"We were looking at the people we reach and noticed there weren't many opportunities for adults to engage in science. This program is like an adult field trip."

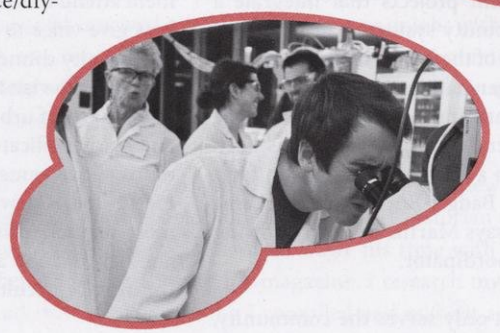
- Val Blair

DIY ("Do It Yourself") Science is a program started in January 2014 at the Wisconsin Institutes for Discovery. The primary goal of this program is to provide fun and engaging hands-on experiences in cutting-edge research topics for anyone over the age of 18. DIY Science has covered everything from simple PCR techniques to more advanced astrobiology. So far, it has mostly engaged in natural science fields such as biology. However, "the topics are not limited and we are willing to work with all sorts of ideas," says Val Blair, the research and outreach manager for the Morgridge Institute for Research.

Most recently, on September 25th 2015, a DIY Science event was held at the Wisconsin Institutes for Discovery. The topic of the night was "Regenerative Biology" and it was organized by Dave Vereide, an expert in the field and a fellow of the Morgridge Institute for Research, along with help from the DIY Science team. All the participants were dressed in full scientist regalia: gloves, goggles, and lab coats. The event started with a brief description of research itself, followed by hands-on activities and many short presentations. During the program, participants learned how to use a micropipette and operate a high resolution microscope. The event ended with a lecture by Vereide himself and a Q & A session. "Our audience varies from as young as undergraduate freshman to retirees," says Blair. All the participants were excited to learn, and the program was both sophisticated and simple enough to reach all the participants. One of the benefits of participating in the DIY Science event is not only being able to learn about cutting-edge research and how to operate scientific apparatus, but also being able to learn at the beautiful Discovery Building where real, ground-breaking research is happening on a daily basis.

The cost to participate in DIY Science program is about $10. For more information about future events, visit

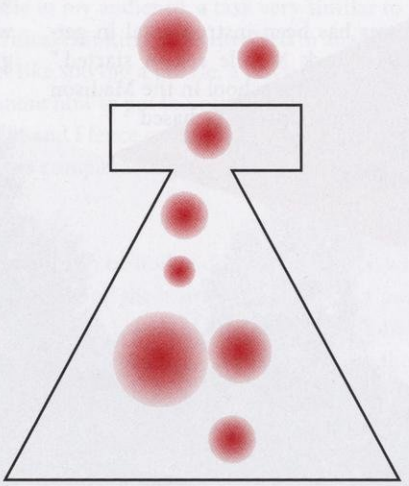
http://discovery.wisc.edu/home/town-center/programs--events/diy-science/diy-science.cmsx



Written by: Hanwook Chung

Photography by: Heather Schumaker

Design by: Brent Grimm



Advice from a Freshman Engineer

A look inside the life of a freshman engineer at UW-Madison.

It is back to square one for the one-time seniors of high school, now finding themselves amongst a pack of wolves called college freshmen. As an engineer, much of the college adaptation process sounds very scary; the workload is greater, classes are farther from each other, and you are away from loved ones. Personally, my first semester of college has been a thrill. It is not that I don't miss my family, but the unlimited opportunities offered at UW-Madison have made me feel satisfied and accomplished throughout my freshman year thus far, especially as a freshman engineer with even more opportunities.

Your life as an engineer begins on move in day. Being able to make friends on move in day will help you go far in living here at UW-Madison, knowing that everyone is going through the same feelings as you. The personality and diversity at UW-Madison is why I chose this university. It is very enlightening to hear others' life stories. Keeping an open mind has helped me to make many friends. It may take time to make friends that live in the same hall as you, but you are not alone and there are study groups, lectures, discussions, and organizations that allow you to interact with other people and establish a bond. This may be one of the biggest parts of being a freshman.

So, what is it like to be a freshman engineer? From the first week of classes, engineering students received the best treatment by far. We had our own engineering breakfast, a lunch with engineering speakers that shared their experience at UW-Madison, an engineering bash with free food, and booths showcasing the different organizations available for engineering majors. UW-Madison recognizes the value of freshman engineering students and provides all the tools that are needed to shape us for our careers. For example, when you enter the Engineering Centers Building, you can see the different workshops going on for all kinds of engineering projects. This provides insight to freshmen engineers on what they can expect in their upcoming years here at UW-Madison and can help them get hands on experience before they take courses that will involve working in these workshops.

There are many opportunities as a freshman to make new friends as well as to enjoy the competitiveness of the game. Student organizations are a perfect way to meet new people and to adapt to the life of a college freshman. There are over 900 student organizations here at UW-Madison and these student organizations have become a huge part in the lives of freshmen engineers. There are a broad variety of clubs that a freshman engineer can get involved in; the opportunities are seemingly endless. Joining a student organization can help freshmen establish their presence here at UW-Madison.

"Joining one of these organizations and many, many more can help establish your presence here at UW-Madison".

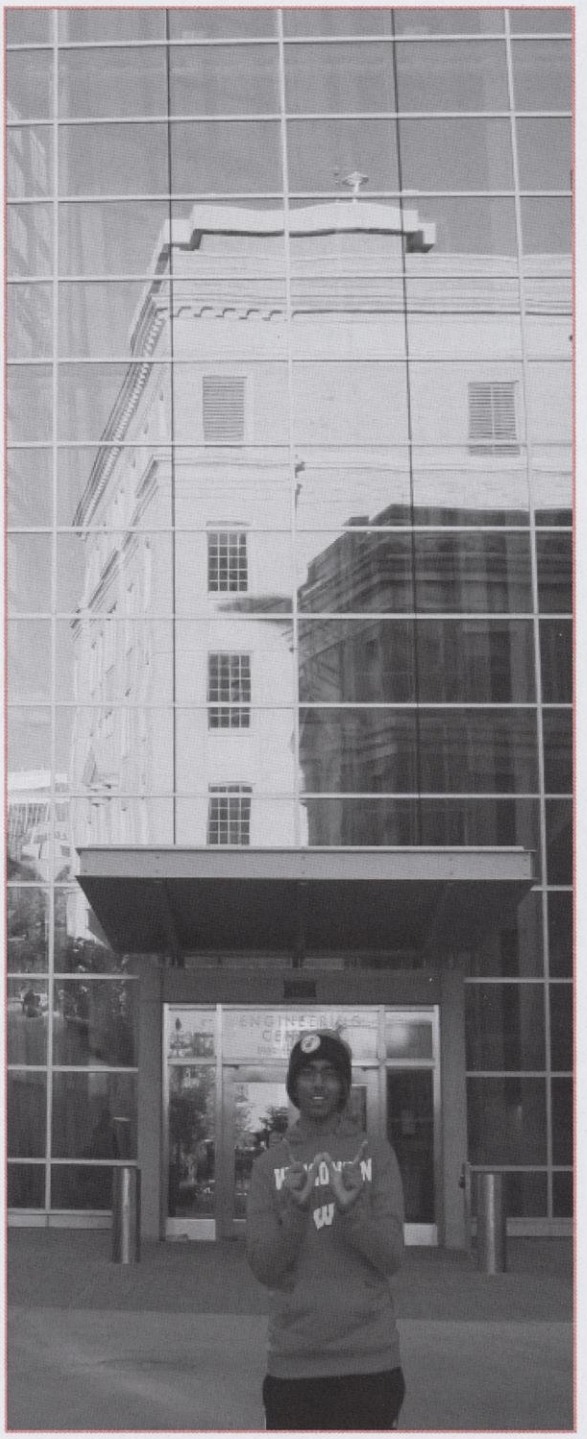
As freshmen engineers, late night study sessions are sure to occur. You may have already experienced late night studying and all-nighters before exams in high school, but you must use your time wisely when it comes to midterms. I can say that midterms are a huge deal in college compared to high school – mostly because they make up most of your final grade in the class. The best thing about classes is that the schedule is all up to you. You may have some days where you may have two classes and some you may have three, just remember to treat every day as important as the last and try not to blow off classes. Simply attending class is not enough, however. It is important to budget your free time so that you have time to complete homework, as well as setting time aside for fun.

The first semester here at UW-Madison may be stressful –but I've found that you can adapt quickly to the environment. Come with an open mind and be ready to try new things here at university. I guarantee it will be the best time of your life!

Written by: Krishna Patel

Photography by: Kyle Pedersen

Design by: Brent Grimm



Writer and freshman engineer Krishna Patel in front of the Engineering Centers Building.

Gridcoin and BOINC: "Crowdsourcing" Scientific Discovery

People of any educational background can now help make scientific advances from home and even get paid for it.

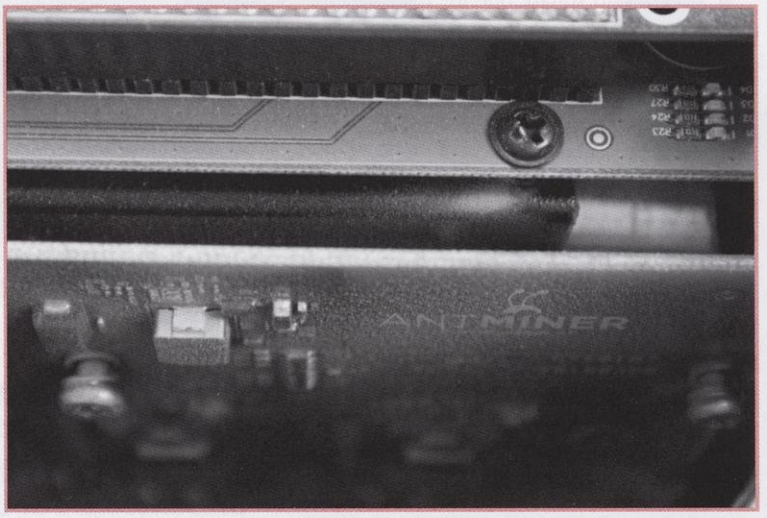
Scientific advancement relies on numerous resources, many of which are hard to come by. Skilled faculty, equipment funding, and adequate research assistants are all needed in order to take a proposal and turn it into a discovery. Often overlooked, but increasing in demand, is the need for computational power. Whether in astronomy, physics, math, or computer science, research often collects massive amounts of data without efficient processing power to properly interpret it. A project by the University of California at Berkeley, led by David Anderson, was developed to alleviate some of the processing needs of their scientists by soliciting support from the global community.

BOINC, standing for Berkeley Open Infrastructure for Network Computing, is a software and network that links hundreds of thousands of personal computers together to process data collected by research teams. Originally developed for use with SETI@home, a similar project used to help process astronomical data, BOINC has since been expanded for use with projects in a variety of fields. With BOINC, even those without a background in research or the means to financially support projects are able to provide partial use of their computers to enable scientific progress.

While BOINC is supported by many, there is little incentive to help the network other than an altruistic desire to further research. In fact, running a computer processor to its capacity uses significantly more electricity than when it is idle. This means that the average BOINC supporter must pay to support their projects in the form of their utility bill. Rob Halford, a computer scientist interested in the BOINC system, devised a way to reward contributors to the BOINC network. He developed a cryptocurrency called Gridcoin as a way to reward those who offer their resources to scientists.

Much like Bitcoin, the most popular cryptocurrency currently in existence, Gridcoin is a decentralized currency able to be transferred with ease, much like physical cash. Gridcoin is comparatively a minor competitor as of now, but shows signs of increasing in popularity and value. Just like Bitcoin, Gridcoin has inherent value due to its limited supply. Gridcoin can be bought and sold in exchange for government-backed currencies such as the United States Dollar, or it can be traded on exchanges for Bitcoin and other smaller cryptocurrencies. A key difference between the two coins lies within the way they are created. Bitcoin is distributed evenly to "miners" (those who volunteer their hardware) based upon how many arbitrary computations they perform. Any computer has potential to be a miner as long as it runs the specific Bitcoin software; by performing these computations, the Bitcoin network knows to allow creation of new coins, much in the way the Federal Reserve orders creation of dollars. Mining Bitcoin is purely a method of distributing the coins fairly, and has an overall negative effect on the environment due to the massive amounts of energy consumed. Gridcoin, on the other hand, uses virtually all of the processing power used in mining to support research projects. Since this computer processing would likely have had to be done eventually anyway, Gridcoin has a very small net carbon footprint in comparison to Bitcoin.

Tobias Becke, a German Energy and Environmental Engineer and Community Manager for Gridcoin, is excited about the prospect of a cryptocurrency being used to advance science. Like creator Rob Halford, Becke is bothered by the amount of wasted energy and resources used in the mining of Bitcoin. He still, however, is very much invested in the growth of cryptocurrencies as a means of decentralizing and digitizing the monetary system. He started by asking the question, "What could we do with our old computing hardware?" It seemed to him a waste to simply dispose of old computers when there are so many research teams that desperately need help processing their data.



Internal Hardware of a Bitcoin miner.

Becke believes that Gridcoin will rise to be one of the top used cryptocurrencies because of its social and moral advantages over Bitcoin. It is not just a prediction, but also a hope of his to see Gridcoin being more widely adopted. As more people become involved in the mining of Gridcoin, scientific progress will speed up as more of the researchers' resources can be focused away from the need to process their data. Many data heavy projects will be encouraged to start when the need for computer resources becomes less of an issue. Perhaps most importantly, people around the world will have more of a part in the progress of research. More of humanity will be involved in its own advancement. A main goal of Becke's is "to increase research rates globally many times over," using Gridcoin as an incentive.

Gridcoin, of course, still has many hurdles to pass. There are thousands of cryptocurrencies all trying to wrestle control of the market out of the hands of Bitcoin; Gridcoin often times fades into a simple "GRC" stock-like ticker on an online investment exchange. Becke believes that Gridcoin is still the most versatile research-based coin in the market, and has high hopes regardless of how many competitors exist. "I want to believe that GRC will continue growing. Someone bought a pizza for 10,000 Bitcoins just five years ago. I believe we are at that point with Gridcoin." Considering that 10,000 Bitcoins are now worth $2.5 million, Becke sets his goals high. The total value of all Bitcoin is about $3.6 billion at this point, while Gridcoin is worth just under $1.5 million. Considering that any coin can gain unprecedented momentum in such a short period of time, he might just be right, and researchers around the world should rejoice in this optimism. WE

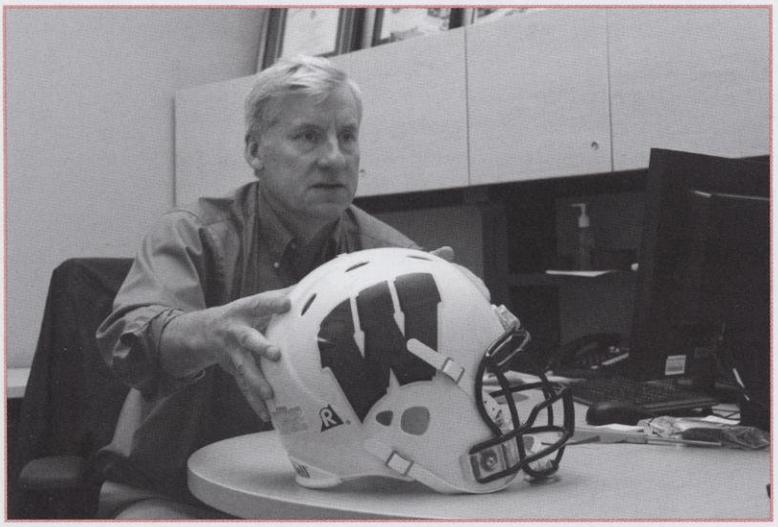
Written by: Brandon Grill

Photography by: Simon Hensen

Design by: Jason Wan

Concussions: A Difficult Diagnosis

Get the heads up about one of the scariest injuries plaguing athletes of all kinds



"The pendulum has shifted from concussions being a very innocuous injury to being a more serious concern"
- Tim McGuine

As a sports fan, not much is scarier than seeing a fan favorite lying on the turf, motionless, from the effects of a concussion. Not only are the causes of concussions especially gruesome, but the long-term effects can also be equally as terrifying. Numerous ex-football players have filed lawsuits against the NFL for hiding the traumatic effects that concussions leave on the body and the mind. A prominent example of the alleged long-term effects occurred in the case of deceased linebacker Junior Seau. At the age of 43, Seau committed suicide, and it was later found that he suffered from chronic traumatic encephalopathy – a condition stemming from concussion-based brain damage. As a result of these injuries, a concussion protocol has been implemented for all levels of athletes ranging from high school to professional. There has also been an attempt to redesign helmets and to change the rules of football to punish helmet-to-helmet contact.

Tim McGuine, an orthopedic researcher and manager of the UW Health Sports Medicine Center, specializes in identifying and understanding the risk factors, prevention, and outcomes of sports related injuries. McGuine has spent time researching concussions in high school athletes and has found numerous trends relating to concussions in high school athletes – some of which may surprise. McGuine found that the sport with the second highest rate of concussions was girls' soccer. The concussion rate for girls' soccer players is about 40% the concussion rate of football players, despite it often being considered a less violent sport. McGuine attributes this to girls' soccer players playing far more games than a football player would in a year, explaining that the risk factor is so high as more time on the field increases the likelihood of a concussion. McGuine states, "The pendulum has shifted from concussions being a very innocuous injury to being a more serious concern, but I think we have to be careful we don't swing the other way." Through his research, McGuine has found that various trends in concussions. For example, an individual who has previously suffered a concussion is more likely to suffer a second one. The most telling of the trends is an increase in full contact activity leads to an increase in concussions.

Though concussions are part of contact activity, they still need to be heavily monitored. While using better technology and newer helmets is helpful, the best way to reduce the likelihood of concussions is to reduce the amount of full contact activity. Reducing the number of games and limiting the amount of full contact practice would be the best first step to help to reduce the number of concussions athletes suffer. However, the difficulty of diagnosing concussions needs to be addressed as well. Several potential solutions have been discussed; however, no real progress has been made on these solutions. One potential way to diagnose a concussion is to use an electrocardiogram (EKG) scan that detects a specific reaction in the brain for concussions. Another potential solution is to take a blood sample to test the blood for specific compounds that form in the presence of a concussion. Both of these solutions require more research into how the body reacts to a concussion before these solutions can be implemented.

While concussion protocol in sports has progressed, McGuine believes some tweaking is still needed. The concussion protocol for the Wisconsin Interscholastic Athletic Association (WIAA), the governing body of high school sports in the state of Wisconsin, states that an athlete must complete a 5-step program while remaining symptom-free before returning to active competition. According to McGuine, measuring symptoms and defining whether an athlete is concussion-free is difficult. Many of the baseline tests used to declare an athlete concussion-free are not very reliable. A healthy person can take a baseline test two different days and the results could change dramatically, making it hard to determine whether or not a person is symptom-free. McGuine believes that the increased media attention and the ambiguity of concussion diagnosis lead to false positives. At the high school level, 40% of girls' soccer teams have had a player diagnosed with a concussion by a medical practitioner, which is likely due to practitioners erring on the side of caution with concussions. Perhaps if a more sophisticated way of diagnosing concussions were found, incidents like the death of Junior Seau and players retiring out of fear for their health, as was the case with Chris Borland, could be avoided and treated. WE

Written by: Alex Chay

Photography by: Saager Paliwal

Design by: Jason Wan

California's Drought

California is teetering on the edge of its water supply after over four years of thirst.

Since 2011, a large area of high pressure over the pacific coast next to California, appropriately named the "Ridiculously Resilient Ridge," or RRR, has been diverting storm systems further north. High pressure ridges are not uncommon, however, the stability of this one specifically is unmatched in the record books. This ridge was later enforced by another anomalous weather event dubbed "The Blob." This blob is a zone of highly irregular water temperatures above 3° C off the coast of the Pacific North West region. The combination of these two areas has left California high and dry for four years, depleting nearly all of their water sources.

Both the RRR and The Blob have existed for many, many years. As a result, scientists question whether the current drought can be attributed to climate change or global warming. Jack Williams, Professor of Geography and Director of Nelson Institute for Climatic Research at UW—Madison says, "We're heading into new climate conditions. We haven't seen a world that has sustained high temperatures; so a lot of this is learning as we go. It is very difficult to attribute any single climate event to climate change. What we can definitely say is that climate change makes these sorts of droughts more likely." Williams claims that with climate change, we are bound to see an increased variability in weather, making weather events, including droughts, more extreme.

The persistent lack of precipitation in the last four years has impacted the snowpack in the Sierra Nevada Mountains as well. Roughly one third of California's drinking water originates from this runoff. California Department of Water Resources has been tapping into Tahoe City, which is situated off the north shore of Lake Tahoe, as snow levels drop. Between October and March of 2014, only 20 inches of snow had fallen in Tahoe City-12 feet less than average. To top it off, California did not receive snow at all in January of 2014, usually Tahoe City's snowiest month. 2014 was also California's warmest year on record.

This snowpack depletion has caused scientists and legislators to become anxious for winter weather. Snow is the deciding factor in the debate of whether the approaching 2015 El Niño weather system will help or hinder California's current conditions.

El Niño conditions usually take place every two to seven years when the equatorial westerly winds diminish. As a result, the Humboldt Current, a cold ocean current, weakens, allowing the waters along the coast of South America to be warmer than usual. The warmer water leads to a shift in weather patterns that typically cause West Coast storm systems to move further south.

So, the regular rains of Seattle will be diverted to Southern California and Mexico. Does this mean that California's drought will finally be relieved with the predicted torrential downpours associated with El Niño? Many scientist think otherwise. In the most recent El Niño, that of the '97-'98 winter, rains reached California in quantities never seen before – but only southern California. Precipitation in the south won't replenish the snow in the Sierras. "People are very hopeful that this El Niño will, if not end the drought, really pare it back. But, those who are in the business of forecasting El Niños are always very quick to say we have a very limited sample size, and each one is very different," Williams comments. Williams is optimistic because this El Niño is predicted to be a relatively strong one; however, he pointed out that even with excessive precipitation, it is hardly likely to replace all the ground water that has been pumped over the last four years. Adding to speculations, as of October, the National Weather Service and the National Oceanic and Atmospheric Administration released hopeful 3-month predictions of temperature and precipitation that showed all of California being hit by the El Niño rains.

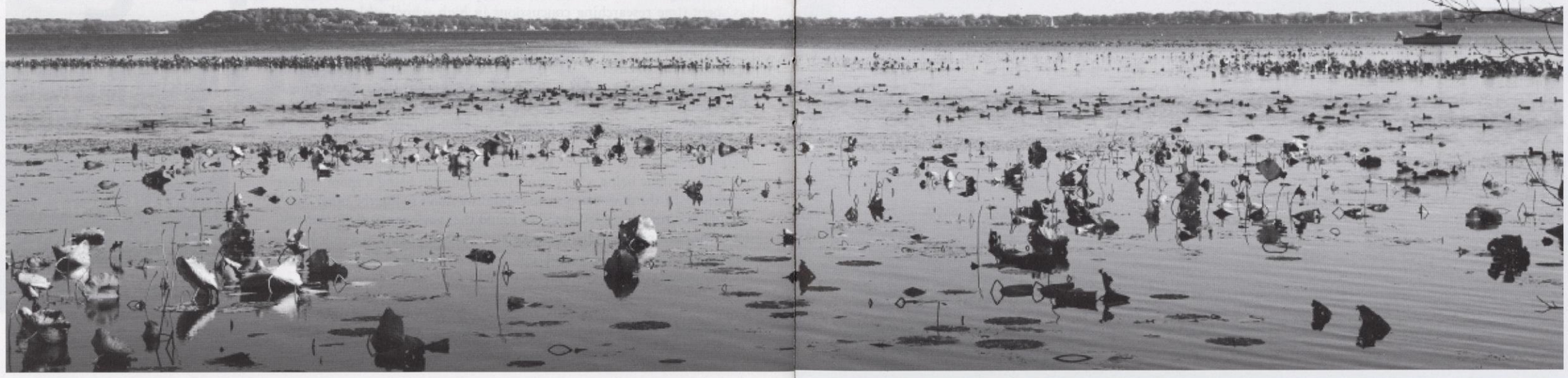
After being hit with four years of drought conditions, California legislators have taken notice. In April 2015, Governor Brown passed an executive order prioritizing water-saving goals, increasing enforcement against water waste, investing in new technologies, and streamlining the government's responses to the issues concerning the drought. Cities around California have taken measures like switching out their lawns for turf to avoid having to water their lawns. In fact, one town in California, Fort Bragg, even mandated that their restaurants use paper plates to save the water from washing dishes.

But Californians aren't the only ones who should be proactive about drought. Williams says that with climate change, extreme weather conditions become more extreme and less predictable. In the Midwest, "Our greenhouse gas rises and pollution will contribute to droughts and water scarcity in the west. It will lead the sea to rise which will have a big effect on the eastern seaboard. It will affect the duration of seasons, where species live… A lot of people will be affected all at once by climate change," says Williams. The most important thing we can do is invest in renewable energy and technologies to help take carbon dioxide out of the air. As a society, we can only last so long once our water runs out. WE

Written by: Madison Knobloch

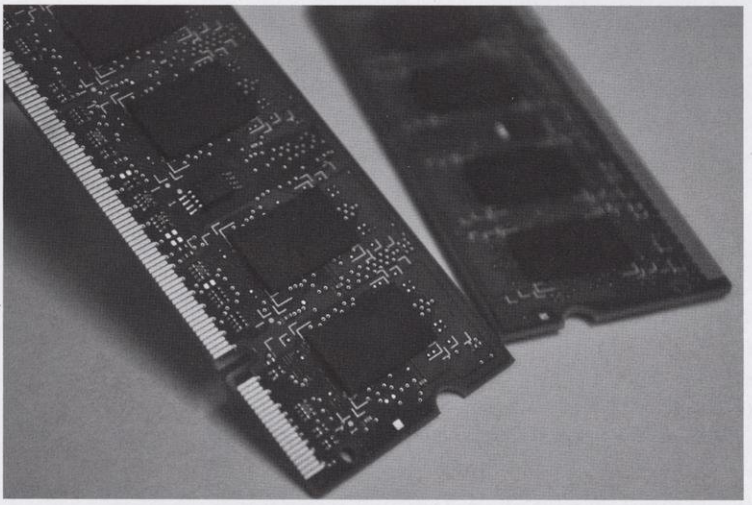
Photography by: Eowyn Liu

Design by: Jason Wan



Paper Tech

Slaying e-waste with new carbon nanofibril technology



Today, technology is so important to our existence that it is as if our smartphones were a unique organ. However, the metaphor breaks down once you look at how much e-waste (the informal name for any discarded electronic or electrical devices or their parts) we produce while compulsively upgrading the technologies we acquire. It is estimated that 50 million tons of e-waste are produced each year, and according to the Environmental Protection Agency, only 15-20% of e-waste is recycled, while the remaining electronics end up in landfills and incinerators.

The solution to this arms race of replacing old technology? Obviously, newer technologies. One proposed by a team of UW-Madison researchers, lead by Yei Hwan Jung, is biodegradable circuit boards. The team published "High-performance green flexible electronics based on biodegradable cellulose nanofibril paper" in the journal Nature, where the team highlights the detrimental effects of gallium arsenide, a non-biodegradable and toxic substance used for semiconductors, which are found in cell phones and tablets, and introduce their theory to reduce the need for these detrimental substances. The proposed solution: to reduce use for semiconductors. By creating fully formed electronic devices on a sacrificial material in a dense array format, a microscale device can be released and printed on practically any substrate. Enter biodegradable solutions: silk, paper, and synthetic polymers have been researched by others as potential substrates, however, this team specifically focused on cellulose nanofibril (CNF), a nano-structured cellulose produced by bacteria.

The results of their research were positive, for they effectively established CNF as a feasible biodegradable semiconductor substrate in both digital and microwave electronics. Combining the technologies available into a large circuit with CNF substrates would help reduce the consumption of non-renewable natural resources and lessen the accumulation of e-waste.

"The proposed solution to reduce use for gallium arsenide semiconductors: creating fully formed electronic devices on an organic substrate"

Another application for the biodegradable circuit technologies is in the medical field. E-waste is also a concern in this environment, as medical equipment must be frequently updated, and medical treatment can be a resource intensive process. In order to address these issues, University of Illinois researchers, John Rogers and his team of researchers successfully created microchips that dissolved in mice after a few days. Implications of such a biodegradable circuit board would include monitoring bacterial growth after a surgery, or by delivering medicine from inside the body, then allowing the device to naturally dissolve without need for excess procedures and without any excess waste.

Already, the CNF technology created by the UW-Madison researchers appears to be working at the capacity applicable to our current technological uses. In combination with biomedical applications, the market for organic technology will surely continue to grow, and e-waste will soon be as outdated as the Motorola Razr. WE

Written by: Anastasia Montgomery

Photography by: Ciara Lotzer

Design by: James Mai

BADGERLOOP:
THE FUTURE OF TRANSPORATION

If you were to ask somebody to name a typical form of motorized transportation, the range of answers are somewhat limited. Over the last 100 years, the machines that we as humans use to power ourselves from place to place has remained pretty standard. Automobiles, boats, trains, and more recently, planes have made up the majority of travel vehicles. However, envision a form of ground-based transportation that is capable of speeds rivalling a supersonic jet and more efficient than a train or automobile. Called a hyperloop, this new concept has the attention of engineers, corporations, and tech enthusiasts around the world.

A hyperloop consists of two main components; the tube and the pod. The basic design is relatively simple. A steel tube is built that connects two destinations. Pods capable of carrying passengers or cargo would sit inside this tube on skis, which would float a tiny amount over the bottom of the tube on a bed of pressurized air. Induction motors would accelerate these pods inside in the tracks and push them to their destination.

The hyperloop concept is the brainchild of the successful entrepreneur and innovator Elon Musk. Responsible for the creation of companies such as Tesla and SpaceX, Musk has consistently pushed the boundaries of technological progress, and he's continuing this trend with the push for the development of a functional hyperloop. Initially conceived to provide an alternative to a proposed high speed rail system between San Francisco and Los Angeles, a hyperloop would theoretically allow for the mass transit of persons at a cheaper rate. While none of his companies are currently involved in the actual development of a prototype, they are laying the groundwork for those who dare to construct their own.

A means to foster this innovation was announced in the summer of 2015. SpaceX would sponsor a competition in which teams would submit designs for, and eventually build, a working hyperloop pod prototype. SpaceX would build a test track at their headquarters in California, where selected teams could test out their designs in the summer of 2016. So far hundreds of teams from all over the world have entered the competition, including one here at UW-Madison.

Aptly titled Badgerloop, this talented team of engineers is attempting to tackle one of the most ambitious competitions of our time. This project is led by the team president Tieler Calazo, a mechanical engineering senior, who summed up the goal of this endeavor. "The purpose of the project is to revolutionize transportation, and to build a vehicle that hasn't been built before." To complete this ambitious task, a large number of individuals have taken it upon themselves to assist in any way possible. "The team just kind of formed organically," says Calazo. "We came together, decided on team leaders, and registered for the competition immediately." Around 110 people are currently working on the project, and a basic organizational structure has been established. Sub-groups for the project right now include mechanical, electrical, and software systems, with each being led by someone who reports back to the project leaders on developments and progress. "The people involved with this project are amazing, and every one of them is integral to the success of this project," states Calazo.

The current focus right now for the team is coming up with an initial design for their hyperloop pod concept. "We need to figure out what methods and processes we're going to be using come competition weekend," says Calazo. The focus right now is also on being specific with their ideas and concepts, which is key according to head of industry relations for Badgerloop, Sid Smith, who is also a senior in mechanical engineering. "Specificity will be key when it comes to fundraising," says Smith. "The sooner we can complete our designs, the sooner we can come up with a budget, and the sooner we can hopefully get funded by some sort of sponsor." Although early in the design work for their process, Badgerloop is already looking forward to future competition events.

Come January of next year, Badgerloop will be required to present their "Final Design Package" to SpaceX at the Texas A&M campus. There SpaceX will examine and critique their designs. This event will also be attended by companies who will be looking for teams to sponsor and provide funds, materials, and expertise. While the reviews of their work by SpaceX engineers and professionals will be important, connecting with a sponsor will be a key goal of this event for Badgerloop. "This is why right now we're trying to get the key details of our designs hammered out as soon as possible," says Smith. Additionally, all of their information and design work will be open sourced, so every team will have access to the same information while working on their designs.

When asked about the competition come next summer and what exactly would be required of their fabricated pod, Calazo stated "the big points will be whether the pod makes it all the way through one mile long test track built by SpaceX, and also the smoothness and overall quality of the ride." The design pod that they will be required to build is different than that of the actual hyperloop concept. "The competition pod will not be meant for people. It will be more of a way to get the ideas rolling for future models of hyperloop pod prototypes."

Looking to the future, both Calazo and Smith are very excited for what is in store for the Badgerloop project and the outlook of the hyperloop concept as a whole. "We've got the brain power, and we have the faculty assistance," says Calazo. Smith was also very optimistic. "I think the most important part for any idea is you have to start somewhere, and we absolutely did that," says Smith. "We have a lot of amazing minds, and we're trying to go above and beyond what's expected of us." Look for this group to be a big player in this groundbreaking SpaceX competition, and possibly help shape the future face of transportation. WE

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