



Viscous Bulk

April 13, 2012

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS PRESENTS

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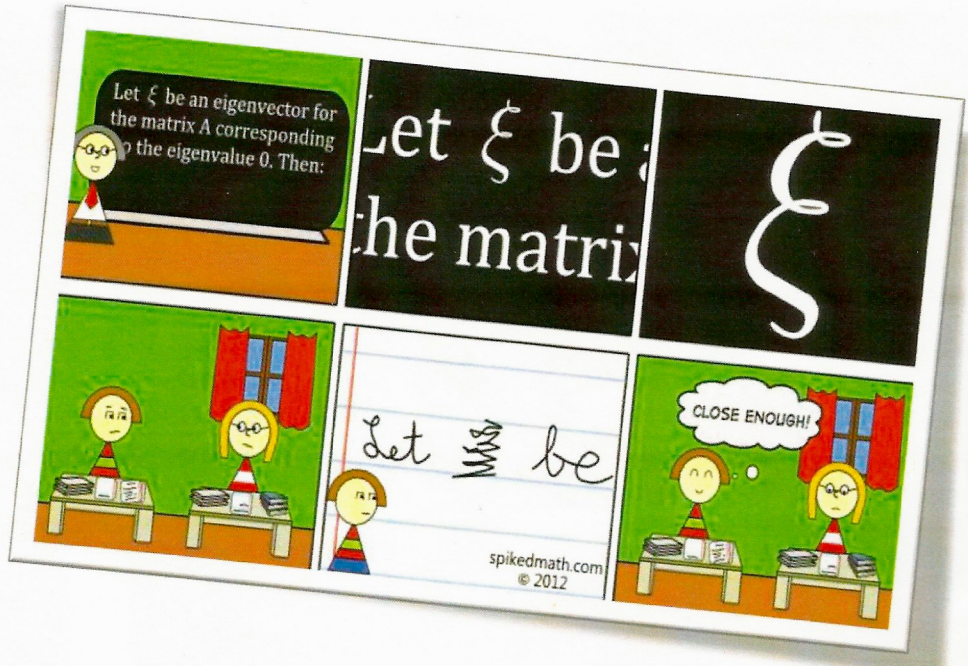
Privilege

by Lauren Miller

I recently asked one of my closest friends, who is a Filipino male, what his first impression of me was. He thought about it for a few seconds and then replied, "You seemed like the typical white girl." I have studied gender, race, and class in courses before, and discussion on my friend's observation would have explored what it meant to seem female and why he, as a Filipino person, noted my race in his initial observation. I likely would not have considered, however, what it meant to be a male and why I, as a white person, had the privilege never to have considered my race to be a notable quality upon first glance. In the past I have found it rather straight-forward to analyze the consequences an individual will inevitably face if they fall outside of the societal norm. But now that I am asked to look at these issues from the perspective of a person with privilege, as someone who has reaped unearned benefits her whole life while others have not, I find myself feeling uneasy, guilty, and ashamed of my ignorance.

After my initial discomfort, I realized that I experience privileges for reasons other than my race. I have inherent advantages as the direct result of being a white, middle-class, straight female who does not have a physical or mental disability:

1. I do not appear suspicious if walking alone at night.
2. I have several times been trusted by strangers to watch their belongings.
3. I am not expected to follow a certain faith.
4. I can freely express my opinion without having it attributed to other people of my race.



5. I will be supported if I choose to be unconventional; my individuality is encouraged.
6. I do not have to worry about finding clothes, cosmetics, or hair care products that are suited for my needs and preferences.
7. People do not question the morals of my race if I personally make a mistake.
8. I can travel to another part of the United States or another country and either see people with the same skin color as myself or be considered interesting/unique as opposed to a threat.
9. I do not have to worry about having a place to sleep at night.
10. I have never been truly hungry.
11. I can pursue activities that require a fee without having to sacrifice other amenities.
12. I am not expected to pursue a degree that will allow me to "provide" for a future family.
13. I can express my emotions in public without being judged by others.
14. I can ask for assistance physically without being considered weak.
15. I can report sexual harassment without being doubted or mocked.
16. I am assumed to be neat, polite, and well-mannered and thus find renting an apartment or securing a spot at a youth hostel less challenging.
17. Others treat me with courtesy; I have been offered jackets after expressing that I am cold.
18. I have not had my identity as a woman questioned as a result of my sexual preference.
19. I am able to get married to someone I love without leaving the state.
20. I do not have to explain or justify myself or my chosen partner's gender to anyone.
21. I do not need to plan my day so that I will be able to access/enter certain buildings.
22. People do not assume anything about my intelligence based on my physical ability.
23. If I want to do something routine, such as going from place to place, tying my shoes, taking a shower, driving a car, or staying home alone, I do not need to ask for help.
24. People do not feel uncomfortable around me.

I experience privileges because I appear to be the cookie-cutter girl-next-door. Society expects me to be respectful, responsible, well-mannered, innocent, and trustworthy. For example, I am hardly ever checked at security gates. At football games, concerts, shopping malls, and even airports, I have watched people before and after me in line being inspected by security guards, while as soon as it is my turn, they just wave me on. I have the privilege of not seeming suspicious because I am a white, soft-featured girl. A disadvantage to this persona is that society does not expect anything exciting or remarkable from me. In fact, one of my high school friends jokingly asked me one day, "Why don't you just marry some rich guy and be a housewife? You don't really need to go to college." However, I will concede that because people don't expect me to be extraordinary, it would be difficult for me to be found disappointing. I believe it is partially due to this dispensation that I have such a strong sense of self-motivation and have always chosen a more challenging/unexpected path in life, e.g., playing the trombone, or majoring in chemical engineering.

I am privileged because I do not make people feel uncomfortable. Not only does this stem from being a white female, but also because I am straight and able. I was never excluded from sleepovers in grade school or avoided in the locker room due to my sexual preferences. I was never felt sorry for or socially eluded in the halls because of a mental or physical disability. I have been able to cultivate a healthy self-esteem because I have not been socially rejected. With this confidence, I feel like I have the tools to pursue my goals in life, while others who have the same academic qualifications and experiences may not.

The American Dream is the belief that anyone can fight their way to the top, can achieve a higher economic, political, or social standing through hard work and determination. I believe it is a result of this principle that it is so unsettling to admit that one has "unearned" advantages. We, as

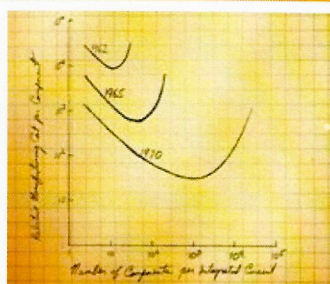
Americans, believe we have "earned" the jobs we hold, "earned" the houses we live in, and "earned" the respect that we encounter on a daily basis. Consequently, when someone asks you to reevaluate your life, considering that part of the reason you got your job might be because the color of your skin did not make your boss feel uneasy, you might be living in a nice neighborhood because of the class you were born into, or that people are kind to you because your gender or the color of your skin does not threaten them or cause them to associate you with any preconceived character flaws, a defensive and defying gut reflex is inspired. I believe this is natural as long as it leads to enlightenment. What does it mean to be an American? Why should some get invisible boosts on their way towards advancement while others must run against the wind? How long will it take to truly level the playing field until all have an equal chance of pursuing happiness?

Chemical Engineering In semi-conductor industry

by Pritha Hait

We always hear about chemical engineers working for companies like Dow, P&G, BP but have you ever wondered how we are useful in any other industry not typically known in the chemE world anymore? The semiconductor industry is one which used to recruit tons of ChemEs in the 90s as to keep up with increase in demand on production of transistors/ICs

But, we hardly know how chips work, what contributions do we make? The answer is everything! Chemical engineers, who contributed to the invention of semiconductor devices, are also routinely involved with the development of advanced



semiconductor materials and the manufacturing processes required to produce them.

One of the biggest challenges that ChemEs face is developing technology such that the Moore's law (shown above) holds. Gordon Moore predicted that the number of transistors able to be put on a microchip would double approximately every 18 months. This requires us to make breakthroughs at nanoscales.

It is predicted that this requires increase



in the number of lithography mask layers into the future. It is driven by the fact that Moore's law continues to add a very large number of transistors with each new technology. The net impact is a continued increase in litho mask layers for the foreseeable future. Additionally, new processes have been developed that require fewer processing steps allowing manufacturers to selectively place metal, silicon, or other materials only where needed to create the desired circuitry decreasing amount of material required.

Good Taste

by Doug Fung



P&G

Sour cream and onion is my favorite Pringles flavor. I am sure you have your own preferences too. If you ever travel the world and particularly in Japan, one of the interesting things to look out for are the strange Pringles flavors. Soft shelled crab, cheese dog, and kebab are not only common street foods, but also Pringles flavors.

Pringles is a snack made processed from dehydrated potatoes to give it the interesting double contour shape. The process is surprisingly relevant to chemical engineers through its papermaking roots. If you are interested I recommend looking at some of the original patents, this technology, however is not the focus of this article.

In 1968, the Procter & Gamble Company introduced the world to Pringles potato crisps (yes they are technically crisps in the United States). Nobody thought it would be valued at \$2.7 billion, the amount it sold the brand to the Kellogg Company early 2012.

It made a lot of sense why the odds were against Pringles. With the world still being fairly new to processed foods, the thought of eating dehydrated potatoes didn't seem very appealing. Up to the 1980s, the brand was still constantly on the chopping board with many managers vying for the sale of the brand.

However, the brand continued to persist on the company portfolio and finally, a breakthrough happened. In the 1980s, flavoring was added to Pringles crisps. Flavoring made the originally bland crisps much more exciting and in turn, allowed the brand to expand to today's level.

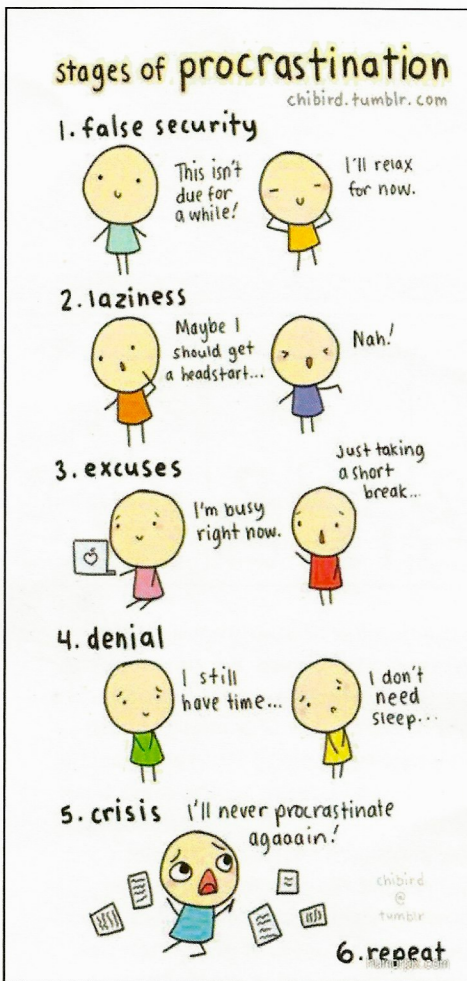
It is a very interesting story of success, because many stories of potential flops do not have a good ending. Again, it is not difficult to see why there is not always a good ending. There is a reason why flops are called flops. There is typically a structural

weakness or a lack of attention to the changing times that precedes the failure. However, sometimes it is not so obvious.

For example, New Coke is now considered a flop for the Coca-Cola Company. When it was first introduced, this was not the case. Every indication suggested that the new formula should be superior to the old one. Testing showed that consumers preferred the new taste. However, when the product finally launched, public distaste led to the company finally bringing the old Coca-Cola back.

We are all scared of flopping. Whether is a test, a project, or a job, we try our best to avoid failure. However, when a flop does happen, it is important to know that it is possible to flip a flop to success. All it takes is persistence, an innovative spirit, and knowing not to be scared of risks because of flops. Let's learn from Pringles. An observation that consumers did not like bland chips became an opportunity for Procter & Gamble to create a new consumer experience in the form of taste.

The New Coke experiment also became the centerpiece of an advertising campaign to bring back "Old Coke" and rebuild the drinks empire that is Coca-Cola. Key points to be learn is to remember not to play with a trusted recipe or create product combinations that are too extreme. Nevertheless, if all else fails, do not give up – where there is risk there is opportunity.



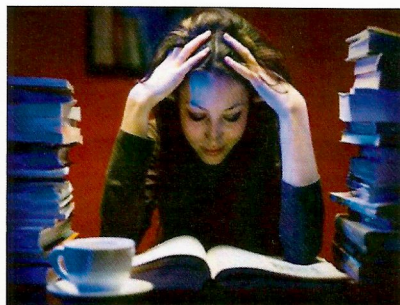
Mid-Life Crisis

by Liana Lo

How many students apply as a chemical engineering major knowing what they were getting themselves into? I certainly didn't know--I simply thought it amusing to challenge myself with the "hardest major" that also had the benefit of providing me with a high starting salary out of undergraduate studies. If I had gone with my gut, I would have chosen Industrial Engineering and Operations Research (IEOR). However, in spite of how much the thought of optimizing and organizing everything appealed to my mild OCD, I hesitated to give up studying physical sciences. And thus, for that reason, I decided on chemical engineering.

I began to seriously question my decision in my very first semester after performing much more thorough research on a chemE's typical career options. I made a huge list of reasons why I should stay in chemE and why I shouldn't. Reasons ranged from CoC's acceptance of my AP credits, courses already taken (clearly, I could not take to heart the concept of sunk costs), and future job prospects with a focus on geographic location. I heard senior students lament their imminent move to "the middle of nowhere," away from beautiful California. Being born and raised in San Francisco, I definitely empathized with them and became terrified at the thought of finding myself stuck in either a cultural wasteland or a manufacturing facility isolated from appreciable civilization.

Why am I still a chemical engineering major, let alone an AIChE officer? I have to say, a big part of it was the people. Long nights spent together working on problem sets truly bonds you with your classmates. Though my friends jokingly implored me to stay in chemE, in a more serious tone they would say to do whatever makes me happy. So, What would I have switched to? The list of possibilities includes Mechanical



Engineering, IEOR, EECS, and even Architecture. It takes a lot of courage to leave behind what you have invested one-two years in, and for better or for worse, I never quite attained that courage.

I settled instead in taking IEOR classes--more than needed for a minor--in the hopes that the concepts I learn will earn me more flexibility in my career. Furthermore, in my soul searching, I spoke to as many people as I could: classmates, friends in other majors, recent graduates, GSIs, academic advisors, and older professionals well into their careers. Hearing from those who assured me that everything would be okay, those who were also freaking out, those who were lost and seemingly drifting through life, and those who had been through it all...these stories, despite not providing solid answers I so sorely wanted, calmed me in my distress. I realized how narrow-minded I had been and also that it is okay to feel some level of uncertainty in my future. On the other hand, the amount I had been worrying over something that I cannot control was unhealthy, and this definitely manifested itself in my daily habits. I took a turn for the better after my summer interning with Intel after my sophomore year. I was so relieved that working as a chemical engineer, in an Arizona desert of all places, was so much better than what I had pictured as a frosh.

It is still too early for me to judge whether I will have regrets, but in any case, I'm sure I can take control of my own future. What you major in as an undergraduate will not determine your life pathways unless you allow it to.

Things You Need to Do Before You Leave School

-by Himani Nadguda

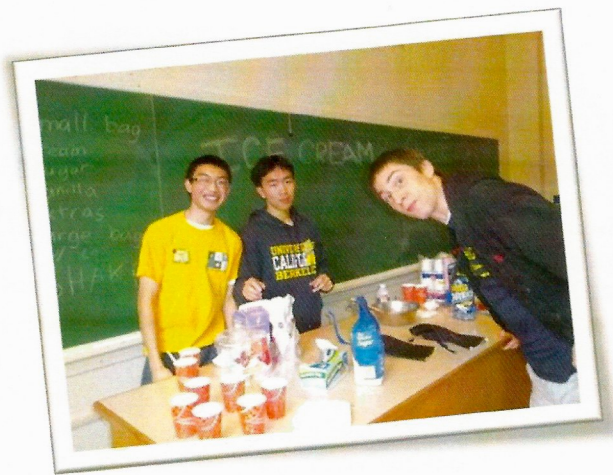
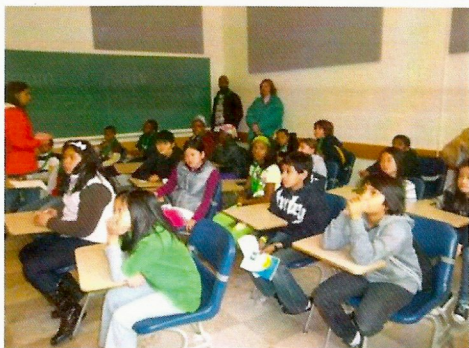
Being a chemical engineer at Cal is hard. You find yourself surrounded by mass and energy balances, problem set deadlines, and the constant need to find free food. Sometimes it is difficult to let go of the stress and enjoy the finer things in life. So here I present to you...

1. This is possibly the most important thing I have realized in college: that it is ok to relax. Whenever you feel bogged down with classes, research, or personal problems it is nice to just slow down and take a break. My favorite place to go to relax and just contemplate life is at the top of the Campanile.

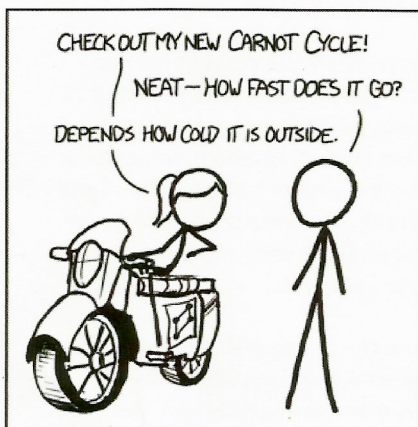
2. Explore the College of Chemistry. We attend a school with a prestigious chemical engineering program. We have top notch professors and first class research goes on at this institution. All this being said--our buildings are incredibly old and they are really fun to explore! Apparently, all these buildings (Latimer, Tan, Gilman, and Hildebrand) are all connected from some unheard-of basement level. Someone should verify this rumor and get back to me.

3. Become friends with your fellow ChemE peers. They suffer just as much as you do and misery loves company.

4. Don't take things too seriously. Although people may get on your case for not completing the weekly on time or not submitting an article for the viscous bulk on time. Just know that it's ok. The world is not going to end. It is important for you to just study for your pchem exam so you do not fail miserably.



AICHe helped little kids learn about phase changes and making ice cream with liquid nitrogen!



DID YOU KNOW??

In 2007, researchers at Berkeley created the first functional radio from a single carbon nano-tube, one-tenthousandth of the diameter of human hair.

It's a work in progress

by Caleb Alexander

It's been an interesting ride so far. Never in quite the way had I expected though, but that's what has made it fun. The people I have met and the whooping I have taken in my time here have certainly changed my outlook on life and how I interact with others.

Several months ago I came to the (sad) realization that what most engineers talk about is engineering and classes. I guess that is somewhat nice within engineering as a field because that is some common tie that we would all have, but it is a weak tie I say. I say this because if all one ever talks about is engineering and classes then what does that say about you as a human being? I have often been presented with the stereotype of the socially awkward engineer, and I have always felt a great distaste for it despite its relevance in my life. Approximately a month ago, I went to an engineering social, and my sole mission for the night was to not talk about engineering or classes. It was a steep order, but for the most part I accomplished my objective and learned a great deal about people. I met a guy in the fencing club, and I met others who talked about the possibility of artificial intelligence. It was nice. Now, I am trying to become more sociable so I can become a more rounded, more thinking person. As time has passed I've gained a great group of friends who I can talk to about the existential or political

questions in life and I believe I am all the better for it. I am also trying to get us to spend more time together outside of class so there is something more than our classes that bring us together. I am always a work in progress.



Upon running out of time on Professor Iglesia's first ChemE 140 midterm, I was crushed. I felt defeated and distraught, but after the initial shock of being whooped like a rented mule, I gained an appreciation for my education here. I realized that we are going to be bosses by the time we get out of Cal because we're going to be whooped (a LOT). We're going to be beaten, and we're going to take it. But we will get accustomed to it, and with diligence we will triumph with a smile on our faces because that is what we do. We take the worst from life, and with a large grin on our spunky faces ask for more! We are Chemical Engineers from UC Berkeley and we are going to be the best when we walk across that graduation stage. Aside from the numerous balances and methods Iglesia taught me, the number one thing I learned in that class was how to stay calm and focused in the midst of the highest pressure settings. That class was the first that ever made my hands shake during a test. It was the strangest thing. By the end though, I was always calm and could take on anything he served my way. I was becoming a boss. In my 141 and 150A classes (pardon my talk of classes), I still have the calm, but

now I have learned the importance of quick thinking and quicker action. I am working on it. Every year will be a challenge. Every year I am going to become better. I am always a work in progress.

Lastly, I think I have found my happiness. Originally, I decided on ChemE because I wanted to go into alternative energy resources because I liked the challenge they presented. Alas, there was no major specifically for

alternative energy resources, so I figured that ChemE would be the best way to get into the field. Since then, my reasons have changed slightly. I still want to have a future with green technology, but now I feel that ChemE is just right. It is who I am. It is who I am supposed to be. The feeling that ChemE is my path parallels the feeling I have for my belief in God. In my youth, I never would have imagined I would be where I am now, but I am happy. I have an amazing group of friends who support me and like me

for who I am. My time in AIChE has given me numerous memories with many different people. I am doing my best to meet new people. I am doing my best to have new experiences. I am doing my best to become a better person. Caleb Alexander is a work in progress. And I think your life should be one too. Thanks 😊

Places to Eat

by Yoobin Oh

As a student of UC Berkeley, you should already know that Berkeley is not only known for its stellar university but also for its variety of delicious food places all around! Berkeley is known to have few of the best restaurants in the Bay Area, from all different cultures. Starting from Italian dishes, Cheeseboard and Zachary's are popular choices. Many students and residents enjoy the savory pizza while listening to the jazz music provided by live musicians inside Cheeseboard. On the same street as Cheeseboard are Gregoire's and Crepevine. Everyone loves crême puffs but Gregoire's provides a twist: potato puffs. As weird as that sounds, these are delicious as they melt in your mouth. This is definitely a place in Berkeley that you cannot miss! Still on the same street is an event called Food Trucks every Wednesday afternoon. Part of the road is reserved for many food trucks from San Francisco that provide their own unique fusion of different cultural foods. You can find foods including Japanese-Korean fusion, Mexican fusion. Other good restaurants include Angeline's Louisiana Kitchen, Jupiter, Gypsie's and Manpuku. Moving onto desserts, the best ice cream sandwiches can be found at Creme, which is located only 5 minutes from the UC Berkeley campus. You can get delicious ice cream sandwiches for less than two dollars! Almost as good as Creme is Icis! Their

flavors change daily, but their unique and tasty flavors are liked by many. Other than the ones mentioned here, there are so many more delicious food places to visit in Berkeley and it would be a shame not to go on a food adventure to please your taste buds!

Chemical Engineering Is Like a Box of Sugar Candy

by Jed Mac

From Forest Gump, "Life was like a box of chocolates. You never know what you're gonna get." Chemical Engineering is similar in many ways.



Like a box of candy, what's inside is a surprise until the box is opened. Like a box of candy, there can be different kinds with varying textures and flavors. It is also true in what we get out of chemical engineering. It's a bittersweet lifestyle of many different pieces summing up to the wonderful surprise of the box.

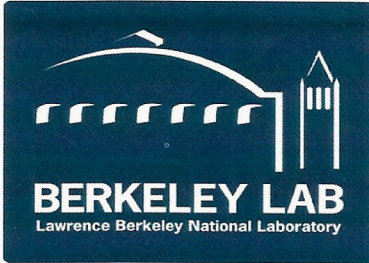
Chemical engineering is more like sugar candy rather than chocolate

because from the same 3 ingredients, a large assortment of candy can come from it. Sugar candy is essentially just sugar, corn syrup and water cooked in a kettle (BSTR). But from this mixture, everything from hard candy canes to chewy taffy is made. This is like chemical engineering more than any other engineering. P-chem, o-chem, biology, materials, electrical engineering, and those are just the required classes not including our electives. We probably take the most range of classes just to graduate, so we have a broad and versatile background. Chemical engineering degree gives us the opportunity to work in many fields of engineering. We also go into many non-engineering fields for our technical expertise, like consulting, business, management, law, research, or teaching. Chemical engineering candy has so much variety there is always a flavor we are sure to enjoy.

All the chemical engineering students I have come to know, and even those who left chemical engineering, their stories are all very different and very unique. They are more than the sum of their classes, research, internships, and jobs. Like how each piece of candy can contribute to being sweet or tangy, the box as a whole more than that, it's a delicious gift. It's a gift for the world on what we can do as chemical engineers to take all that we know and make it more enjoyable.

Controversy over Development of LBNL's Synthetic Biology Secondary Research Facility

by Christopher Laurel



University of California announced that it has identified the Richmond Field Station as its preferred site for the proposed consolidation of its biosciences programs for Berkeley Lab. The UC-owned site presents the best opportunity to solve the Lab's pressing space problems while allowing for long-term growth and maintaining the 80-year tradition of close cooperation with the UC Berkeley Campus. With this identification of a preferred site, the University will now move ahead with developing environmental impact studies and with the process of seeking final approval from the US Department of Energy for the project.

But amidst all the excitement, some questions remain unanswered, most notably: exactly what kind of research will take place at the lab? The new LBNL campus will join existing federal labs throughout the East Bay, including the Joint Bioenergy Institute (JBEI) and the Energy Biosciences Institute (EBI), and will focus on biosciences and biofuel production. But it will also house a once-obscure field of lab research that is fast becoming the latest green science craze: synthetic biology. And that has some people worried.

Dubbed "extreme genetic engineering" by critics like Jim Thomas of the Action Group on Erosion, Technology and Concentration, an international watchdog group that researches the effects of emerging technologies, synthetic biology is the design and construction of novel biological entities. Despite opposition to development,

LBNL officials stated that it is important for the public to be cognizant of what synthetic biologists do and not be misguided down by extreme ideas of virus outbreaks.

LBNL's secondary facility may lead to the production of new kinds of DNA, enzymes, cells and even artificial life forms. It promises to allow scientists to do things like create new, more efficient ways to generate biofuels from sugar or engineer microbes to act like microscopic chemical or pharmaceutical factories. As Representative George Miller, D-Martinez states, "The next generation of scientific discoveries and economic growth will be right here. This is as exciting as it can possibly be."

How to Give a Good Interview?

by Angela Tsao

To give a good interview is to sell yourself to the interviewer. First impression is very important in this situation. In order to make the interviewer remember you, you need to present yourself in your own personal professional way. Also, it is not only about how you do during the interview, but also how you prepare before and follow up after the interview.

Before you have an interview, there are several steps you need to keep in mind. First, do some research on the company, the interviewer, and the position you are applying to. It is suggested to ask some insightful questions or mention interesting facts about the company, such as certain technologies, products, or services. Second, review your resume, and brainstorm your past experiences, obstacles, and achievements related to the position's qualifications. Third, conduct a few mock interviews in front of a mirror, friends, family, or available professionals.

Right when you meet the interviewer, do not forget to give a firm hand shake, have eye contact, and greet the interviewer using his or her name. Do not forget to smile and show your confidence. Think about how to sell the

best side of yourself to the interviewer from the way you behave and speak during the interview. If during the interview, you feel like you are heading nowhere with your answer and boring the interviewer, end it with your accomplishment, and follow up with a personal experience related to one of the position's qualifications to save yourself. Usually during the interview, the interviewer always wants to know how much you know about the company. Find some interesting facts that will lighten up the interview's atmosphere and you will find yourself less tense as a result. A good answer to an interview question includes a situation, the actions taken, and the results/achievements.

When the interview ends, remember to thank the interviewer with a firm hand shake, a smile, and confidence. Do not show your feelings until you are at home. Remember to follow up after the interview to make sure the interviewer remembers you within two days at most. A good way to follow up after the interview is to ask an insightful question. Another good way to follow up after the interview is to bring up something interesting that was discussed during the interview, and make a promise to the interviewer that you will find out more in detail about it and e-mail him or her later. A better way to follow up after the interview is to create an opportunity during the interview for the interviewer to ask you to e-mail him or her afterwards.

Overall, just remember to be confident, and do not feel nervous. If you did not get the job, there is always another interview for another company, which you can find and be more prepared for.



Research v/s internships

by Nicholas Brady

I have been fortunate enough to experience both research here at Cal as well as an international research internship experience. Last year I was looking for a research lab to work in because I wanted to see if that was something I wanted to pursue. I was having trouble getting up a project though. I was talking to a graduate student in the Groves lab but that did not work out. Then during winter break, the AIChE weekly came out and there was a post about need for undergraduate researchers in the Radke lab. Professor Radke was my chemical engineering 140 teacher and as most people know, he was a very interesting person to be around so I was excited. I followed the instructions in the weekly, sent in my resume, got an interview, and bam! I was working in the Radke lab. I still work in the Radke lab and it has been a wonderful experience. The project I work on is tremendously interesting, and the people I work with are always fun to be around. I am still debating whether research is something I want to continue after earning my degree. It is definitely a worthwhile experience, especially if in the process you learn that research is just not for you, or if you absolutely love it.

Last semester as well I was looking for something to do over the summer. The previous summer I had stayed in Berkeley and took classes, which was enjoyable, but I was looking for something more exciting for the next summer and perhaps something I could put on my resume. So there was an email that came out from the University describing a new program called the Cal Energy Corp. The program sent students all over the world to conduct various energy related research and programs. I was fortunate enough to be accepted into the program and I was sent to Taipei, Taiwan where I had an amazing time. The research experience was phenomenal and I learned to apply much of what I had been taught in class, and the experiences I had outside of

work were just spectacular. I made connections with researchers abroad who I still keep in contact with and I plan on applying to the program again this year and hope to make it back to Taiwan. Also just a few weeks ago I was required to make a presentation of my research in a poster session and I met some more interesting people from programs like the Energy Biosciences Institute and Ramamoorthy Ramesh from the U.S. Department of Energy.

My advice to students looking for internships and research is to look far and wide and apply to anything you might be interested in because you never know what wonderful experiences could be ahead of you.

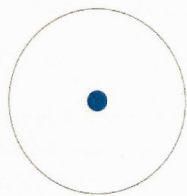


The illustrated guide to a Ph.D.

Imagine a circle that contains all of the human knowledge:

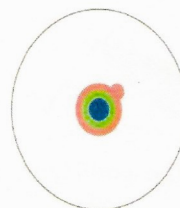


By the time you finish elementary school, you know a little:

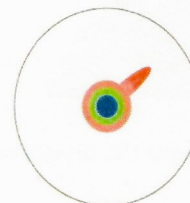


By the time you finish high school, you know a bit more:

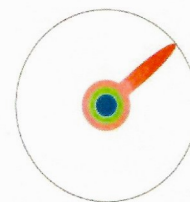
With a bachelor's degree, you gain speciality:



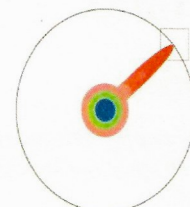
A master's degree that specializes:



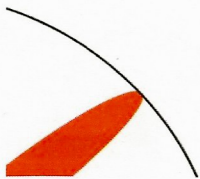
Reading research papers takes you to the edge of knowledge:



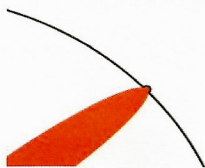
Once you are there, you focus:



You push at the boundary for a few years:



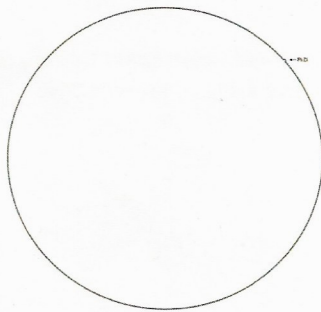
Until one day, the boundary gives away:



Ofcourse, the world looks different now:



So, don't get the bigger picture:



Keep pushing!

Beyond LBNL

by Brad Windsor

An overview of energy-related nationally-funded research locations across the nation

The US Department of Energy will spend 11.6 billion dollars this year on 21 laboratories. Lawrence Berkeley National Laboratory will account for about 560 million of that, but much more will be spread across the US to pay for particle accelerator programs, biofuel research, studies of fossil fuel and nuclear energy strategies, and other

technologies. An extra 111 million is to be spent on materials sciences, including 4.8 million more will go into battery and fuel storage research. Research programs in chemical transformations, photochemistry and biochemistry, and nanoscale technology are each getting raises on the order of 6-11 million this year.

What all this means is jobs: many of these laboratories are already huge, and expansions are scheduled in ChemE-related fields. Following is a sampling of these National Labs, along with research highlights at each.

ARGONNE NATIONAL LAB

This lab is essentially to the University of Chicago what LBNL is to Berkeley. One of the major programs here is the Center for Nanoscale Materials, which focuses on nanobio interfaces, nanocatalysis, and nanophotonics, or controlling optical energy by combining microscopic materials. A recent highlight of this division: a fluid with nanoparticles that conducts heat 15 percent more efficiently than conventional heat-transfer fluids.

LOS ALAMOS NATIONAL LAB

The bad news: this laboratory near Albuquerque, NM will lay off 11% of its staff this spring. The good news: most of those job closings are related specifically to the postponement of the building of a national plutonium facility. Los Alamos will still top the charts with about 1.9 billion in funding. Every summer, a mix of grad students and post-docs gather here for a two week course ahead of the International q-bio Conference, which focuses on cellular information processing and modeling cell regulation. Other Lab Highlights: new light-emitting carbon nanotubes are able to track and detect the motion of single molecules in water.

PACIFIC NORTHWEST NATIONAL LAB

This lab is in the state of Washington. Chemical and Molecular Sciences, Biological Systems Science, Chemical Engineering, and Applied Materials Science and Engineering make up four of its "Ten Core Capabilities". Lab

Highlights: The Chemical and Biological Process Development Group is studying how to use "filamentous fungi" to convert biomass into biofuels and other high value chemicals.

SAVANNAH RIVER NATIONAL LAB

Although it is one of the smaller national laboratories, this facility in Georgia boasts a 60,000 sq. ft. research center for hydrogen technology. Here, hydrogen research focuses on transportation, production, the role of impurities in hydrogen energy processes, and the creation of legal standards surrounding the hydrogen economy.

There are still seventeen other nationally run laboratories around the nation, and each has its own set of special projects. Most laboratory websites has a "careers" section, under which undergraduate internships will be posted during the winter or early spring. Get an early start, though. Some positions require proof of US citizenship, or ask for a security clearance, which can be obtained by the average person, but requires several references and takes time to arrange. Another way to get involved is to apply higher up to the Science Undergraduate Laboratory Internships (SULI) program, which is run through the Department of Energy. Finally, the contact emails for the head of each laboratory research department are usually found on the department's main page.

The Idea Factory: Become a Brewer

by Hilary Zheng

If you like beer, have you ever thought of taking a job at a brewery? Most college experiences at least share one thing in common: quantity over quality (in terms of drinking.) But do you actually appreciate good beer and have your own interpretations of beer and its culture?

My aunt is German, so she always complains about the lack of truly good beer in the America. But soon I realize she also complains about the dearth in flavor regardless whether it

involves beer, bread or cheese. I also remember my aunt introducing me to Valencia Wheat in a local brewery in San Francisco. It had Belgian yeast suspended in the bottom with smooth mouthfeel provided by the classic nitrogen pour. It is still endlessly fascinating to me. Fortunately, I haven't been to Germany yet and my father enjoys Anchor Steam so I could steal it from the fridge. Unlike my aunt whose standard goes too extreme, I believe good beer doesn't necessarily have a standard, because there is no limit in terms of imagination for brewers to create new flavors.

Working as a brewer with chemical engineering background, you will find out how intensely creative science and engineering could be. You probably have to put away your tie, trade your suits for boots, walk out of your work cubicle, and go through the brewing process. The job won't be terribly boring compared to mechanical engineers whose duty is to install and clean tanks. Not being biased, many successful brewers are actually not engineers. I have seen writers, lawyers, actors, or ever home-brewers become brewers running popular

brewpubs in the bay area. That says, strong motivation comes first before ideas and knowledge. The joy of working as a brewer is to consistently invent a new flavor. Brewers hoard useful ingredients, from common ingredients such as roasted barleys, spice, hops to flavored ingredients with vanilla beans, orange peel, espresso coffee, etc. And through careful, methodical testing and process controlling, brewers will make their new inventions tasty, or previous inventions tastier.

I happened to visit a workshop on my friend's birthday party in a popular brewpub only two blocks from the San Francisco Giants baseball park. The brewmaster let me try his hand-roasted barleys. It tasted even better than popcorns. And I was told that the color difference between dark beer and light beer mainly depends on how much you roast the barleys. The brewmaster reminded me of the most famous inventor at the turn of the twentieth inventors is that they are both very experimental. The difference is also clear, Edison's invention was about what, and not about how — "I can century, Thomas Edison. The similarity between brewers and always hire



mathematicians, "Edison said, "but they can't hire me." ¹ Brewers, however, have to understand the brewing process fairly well because not only the recipes, but the rest of process including mashing, boiling, fermenting, conditioning, filtering and packaging are also important. ²

Working for a brewery will be a different experience from working for other engineering companies. Breweries capture the essence of a city, because they are local gathering places. Places to exchange ideas. Places for families and friends come together. Place for celebrating the culture of making unique, hand crafted beer that defines the taste of the cities in the America.

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