

# INSIGHT

SPRING SITE VISIT CONTINUED INSIDE »

## MBP students explore Bay Area Biotech Cluster

Site visits organized by the Master of Biotechnology Program are designed to provide firsthand insight into the biotechnology industry. These visits enable students to explore different aspects of various companies by touring innovative laboratory facilities and interacting directly with industry professionals.

This spring, MBP students traveled to the Bay Area Biotech Cluster, one of the largest biotechnology hubs in the country. Located near San Francisco, CA, this cluster is home to an impressive network of academic institutions, entrepreneurs, and diverse pharmaceutical and biotech companies.

Over 1,400 life sciences companies comprised of over 52,000 people contribute to the Bay Area's success, generating revenue exceeding 29 billion dollars per year.

On March 23rd, MBP students began the day at Gilead Sciences, Inc. Gilead is one of the world's largest biopharmaceutical companies, whose research focuses on discovering, developing, and commercializing new life-saving medicines. At Gilead, students interacted with industry professionals and recruiters through a series of career panels and a luncheon in addition to touring Gilead's pilot plant.

Next, students traveled to Allure Labs, a cosmetic research and de-

velopment company which formulates a wide selection of beauty products for more than 700 clients worldwide. There, students experienced an extensive tour of Allure's research and development facilities and manufacturing plant before settling in for a question and answer session with Allure's scientists and business professionals.

The evening concluded food, drinks, and fun at a mixer held at Jones, a bar in downtown San Francisco.

On March 24th, MBP students started their day at Genentech, a leader in the biotechnology industry for over 40 years. Genentech's primary focus is on discovering,



developing, manufacturing, and commercializing drugs to treat patients with serious or life-threatening medical conditions. Students delved into the history and evolution of Genentech through an in-depth presentation, followed by a career panel composed of a diverse group of scientists. Afterwards, students explored one of Genentech's largest pilot plants via a guided tour and concluded their visit by having lunch with several department managers.

Students then traveled to TerraVia, a plant-based company that focuses on food, nutrition, and specialty ingredients. Their visit began with a tour of TerraVia's laboratory and pilot plant facilities, followed by a career panel composed of TerraVia's core team. Students also experienced TerraVia's efforts to improve the nutritional content of food firsthand by tasting a variety of their specialty products and recipes.

We hope that all MBP students

who attended our spring site visit had an exciting and educational experience! We look forward to our next site visit to Boston, MA this summer. Read on for more details!

## SUMMER SITE VISIT

### MBP headed to Boston this July

**M**BP will be visiting the east coast biotech hub on July 13th and July 14th. We have plans to visit Abbvie, Amgen, Ginkgo Bio-works, and Novartis.

Abbvie combines advanced science, expertise and passion to solve serious health issues and have a remarkable impact on people's lives. With 29,000+ employees and medicines in over 170 countries, Abbvie is uniting the best of pharma and the boldness of biotech, to innovate end-to-end approaches that make a real difference in people's lives. Abbvie specializes in biopharmaceuticals, biotechnology, innovation, research and development, manufacturing, and biotherapeutics.

Amgen is committed to unlocking the potential of biology for patients suffering from serious illnesses by discovering, developing, manufacturing and delivering innovative human therapeutics. This approach begins by using tools like advanced human genetics to unravel the complexities of disease and understand the fundamentals of human biology. Amgen focuses on areas of high unmet medical need and leverages its expertise to strive for solutions that improve health outcomes and dramatically improve people's lives. A biotechnology pioneer since 1980, Amgen has grown to be one of the world's leading independent biotechnology



companies, has reached millions of patients around the world and is developing a pipeline of medicines with breakaway potential. Amgen's specialities include biologics, human therapeutics, and development of novel products.

Ginkgo BioWorks engineers new organisms to solve challenges across a range of industries from fuels to pharmaceutical production. Their biological engineers make use of an in-house pipeline of synthetic biology technologies to design, build, and test new organisms. Ginkgo BioWorks specializes in cultured ingredients and biological engineering.

Novartis is a global healthcare company based in Switzerland that provides solutions to address the evolving needs of patients worldwide. Their mission is to discover new

ways to improve and extend people's lives and their vision is to be a trusted leader in changing the practice of medicine. Their global portfolio of innovative patented medicines includes more than 50 key marketed products, many of which are among the leaders in their therapeutic areas.

We will also be hosting an alumni event on July 13th in the Boston area.

**STAY TUNED  
FOR MORE  
INFORMATION  
ABOUT OUR  
SITE VISIT TO  
BOSTON!**

## INTERNSHIP SPOTLIGHT

### Sejal Mistry '15 writes about her time at Exicure

**E**xicure creates Spherical Nucleic Acid (SNA) constructs to overcome obstacles of nucleic acid therapy through safe delivery of nucleic acids to the body. SNAs work by binding to membrane bound scavenger proteins which are then taken up by endocytosis. These constructs may be functionalized with immunomodulatory sequences used to target toll-like receptors (TLRs). TLRs, which are located on the endosome, recognize nucleic acids derived viruses.

Similarly, SNAs, which are also composed of nucleic acids, stimulate immunity by binding and activating TLRs, specifically TLR 3,7,8, and 9. By activating these receptors, pro-inflammatory cytokines and type 1 interferons are produced to help fight bacterial and viral infections.

Early preclinical studies have shown that TLRs have been useful in treating infectious and autoimmune disease, cancer, and allergic responses. One way to screen TLR stimulation is to use a colorimetric enzyme assay called Quanti-Blue. This assay determines alkaline phosphatase activity in a biological sample (e.g. supernatant from transfected HEK Blue TLR9 cells). Quanti-Blue media will change color from pink to blue in the presence of alkaline phosphatase.

The overall goal of my project is to screen different oligonucleotide sequences to see which will give a greater TLR9 response in SNA format through the Quanti Blue Assay. During this screen we will examine these sequences across a range of cell lines to determine both specificity and cross-species efficacy. We looked at different CpG 7909 LSNA lengths in human HEK TLR9 cells and we found that they performed comparably better than the standard. Eventually, the best



***“I’ve formed many close relationships and I’ve been fortunate to call the people in my lab my family.”***

compound will be used to test innate immune response in in vivo murine models.

Not only did I learn about the science, but I also learned a lot about how a biotech start-up functions. I’ve always worked in academic labs so it was a nice change to see. With this internship, I’ve formed many close relationships and I’ve been fortunate to call the people in my lab my family. Furthermore, this internship has offered me industry experience which will be useful down the line in my future career.

## BTP SPEAKERS

### ADVANCES IN BIOTECHNOLOGY COURSE

MARCH 29

#### **Hal Alper**

Associate Professor of Chemical Engineering, University of Texas

APRIL 5

#### **Latonia Harris**

Scientific Director, Janssen R&D, Johnson & Johnson

APRIL 12

#### **Johan Kers**

Program Director, Ginkgo Bioworks

APRIL 19

#### **Jared C. Lewis**

Assistant Professor of Chemistry, University of Chicago

APRIL 26

#### **Heather Pinkett**

Associate Professor of Molecular Biosciences, Northwestern

MAY 3

#### **Anne Plant**

Chief of the Biosystems and Biomaterials Division, NIST

MAY 10

#### **David Giljohann**

Chief Executive Officer, Exicure

MAY 17

#### **Steve Little**

Professor and Chair of Chemical and Petroleum Engineering; Professor of Bioengineering, Immunology, and Ophthalmology, University of Pittsburgh

MAY 24

#### **Tom Brieva**

Director of New Product Platforms, Celgene

MAY 31

#### **Stacey Finley**

Assistant Professor of Biomedical Engineering, University of Southern California

# CONGRATULATIONS, CLASS OF 2015 -2016/17!

## MBP graduates enjoy a reception at the Hilton Orrington Hotel







## TISSUE CULTURE WORKSHOP

### MBP Lab Manager facilitates hands-on tissue culture experience

Last winter, four MBP students attended the mammalian tissue culture workshop facilitated by our MBP Lab Manager, Holly Hattaway. Each participant gained hands-on experience performing different key mammalian culture techniques using adherent, 293 human embryonic kidney cells. From passaging to transfection, students were responsible for their own cell maintenance and media preparation.

Although participants started the workshop with different levels of biological knowledge, all students were able to gain the experience they needed for future research.

*“Holly was really helpful and she conducted a short cell culture workshop for us where we could work on passaging mammalian cells. This was super helpful because Holly had great insight about the techniques that we could use and I felt very comfortable and confident while working with these cells by the end of the workshop.”*

- Siddant Prabhu

*“I felt that my confidence in working with mammalian cells has grown 10x after this short training.”*

- Harshith Subramanian

## TECH COMM COURSE

### MBP students help Chicago area companies

This spring, more than a dozen MBP students are taking Technology Commercialization Practicum (MBiotech 411). In this course, students work as consultants for several Chicago area companies and help them develop strategies for pre-commercial products. The students also learn the approval pathways, reimbursement structures, and business models of medical devices and diagnostics, which are different from

those of drug products covered in the Technology Commercialization Fundamentals course in the fall 2016 quarter.

Final deliverables will include target product profiles, sale forecast models, and strategic go/no-go development decisions presented to the companies in both written commercialization plan document and in a brief oral presentation.

Technology Commercialization Practicum is being taught by Eric

Benson, a professional with 15+ years of experience in corporate finance, product planning, business strategy, and business development and licensing. Eric graduated from Vanderbilt University with a degree in Biomedical Engineering and an MBA from the University of Chicago. He has been teaching Technology Commercialization Fundamentals to MBP students for a number of years, but this is his first time teaching the Practicum.



## SOUTH AFRICA IMMERSION INTERNSHIP

### MBP students pursue Sustainability & Global Health Biotechnologies certificate

The Sustainability & Global Health Biotechnologies (SGHB) certificate prepares students for careers deploying biotechnology to address healthcare access and sustainability challenges in low and middle income countries (LMIC). The certificate consists of three components: course work, research and an immersion internship.

Through the certificate, students will learn to work in a cross-cultural, multidisciplinary team of scientists, clinicians, and business associates. A three-month immersion internship in Cape Town, South Africa gives students the opportunity to learn and apply a skill set for evaluating the commercial viability and societal impact of technologies.

The internship provides students with first-hand experience in identifying opportunities in global health and sustainability with collaborators at the University of Cape Town (UCT).

During the internship, students evaluate new technologies in tuberculosis diagnosis and mine waste bioremediation and determine the economic, health, environmental, and societal changes associated with implementing the new technology. Facilitated by the UCT faculty, students visit work sites (clinics and mine waste sites), interview stakeholders (doctors, nurses, patients, environmental engineers, and regulatory agencies), perform background literature research, and

as necessary, measure key parameters experimentally.

The students quantitatively estimate the economic, environmental, and social impacts of identified problems and will evaluate several novel innovations that rely on biotechnology.

The MBP students who participated in the 2016 immersion internship are pictured above.

**READ ON  
TO LEARN ABOUT  
OUR STUDENTS'  
EXPERIENCES IN  
SOUTH AFRICA!**

## JEANNE LAVERGNE '15



When most people think “biotechnology,” sustainable technologies aren’t usually the first thing which springs to mind. Often we group biotechnology in with “pharmaceuticals” or “healthcare,” but breaking the word down to its base roots illustrates how this definition is too narrow: “bio-” as in life sciences, and “technology” as in applied sciences. The Northwestern University Master of Biotechnology Program (MBP) offers a certificate program in Sustainability and Global Health Biotechnologies (SGHB). This certificate program encourages its participants to explore the intersectionality between different scientific ways of thinking and to seek ways to apply these scientific and engineering processes towards efforts which might help improve quality of life in a greater variety of ways. In partnership with the University of Cape Town, MBP students participating in the SGH program are given the opportunity to tackle real-world issues head-on using those processes.

While working alongside the men and women of the University of Cape Town’s Centre for Bioprocess Engineering Research (CeBER), I had the opportunity to apply life sciences towards an effort which might help improve quality of life in a way that pharmaceuticals alone cannot. The project itself was a multi-headed beast—a hydra of wasted mineral wealth, contaminated surface waters, and unexplored water sources which all stemmed from the core issue of pyrite-laden coal mine waste. Aqueous waste from coal mines often is highly acidic and contains within it trace amounts of coal and other minerals. This waste is extremely harmful to surface waters when waste is allowed make contact with them through runoff, leaching, or direct contact. At the same time, the acid, coal, and trace minerals all could be sold for increased profit provided they can be effectively extracted from the waste. Those trace minerals, including pyrite, can be used to make further mineral goods such as the common wastewater flocculant Ferrous Sulfate—a key component in wastewater treatment methods which could help open up an alternative water source to needy regions and improve public health through increased water cleanliness.

Under the guidance of the talented and brilliant Dr. A. Kotsiopoulos, and using the engineering skills gained from the MBP, I was able to design and project costs for pilot plants incorporating systems of both pressure-leach reactors and bioreactors which might have been used to recover acid and synthesize Ferrous Sulfate from the offending coal waste stream. Imagine taking pollution and turning it not only into a source of revenue, but a means by which water’s cleanliness can be improved. The impact to the local population would be astounding! In fact, borne on the curiosity as to how such a technology might improve local life, I adapted the global health assessment technique of quality-adjusted-life-years analysis to the problem of insufficient and/or low-quality water supply in communities local to one South African coal-mining site. The potential gain in years of quality life for those communities was staggering. Technoeconomic analyses demonstrated that the processes I proposed would likely be too costly for construction in the near future, but the fact that such a feat is even theoretically possible holds great promise. I am proud to have contributed what I could to the work being done at CeBER, and look with great anticipation towards what advancements they might make next.

***“This balance of exploration, excitement, and engineering made this collaboration the highlight of my engineering career thus far, and I can only expect more great things to come.”***

The MBP partnership with CeBER was a fantastic way to explore the global culture of scientific research and the unique culture of our host country of South Africa. On those days when we had some reprise from our dedicated work at the university, my fellow MBP students and I explored the Western Cape and Cape Town. Living side-by-side with French volunteers, German medical students, and a local artist made international discourse a part of daily life. From Green Market Square and Bo Kaap in the heart of the city of Cape Town, to the further-flung Aquila Game Reserve and even the Cape of Good Hope, there were so many things to see and do. One evening might be spent at an Afrikaburn artists’ exhibition, the next cage-diving spare inches away from Great White Sharks, and the following day working at the university once more. This balance of exploration, excitement, and engineering made this collaboration the highlight of my engineering career thus far, and I can only expect more great things to come.



Photograph by Bettina Wunderlich.

## BETTINA WUNDERLICH '15



In order to fulfill the Sustainability and Global Health Biotechnologies certificate, MBP students spend a quarter at the University of Cape Town in South Africa. Just the opportunity of experiencing a new culture is invaluable, but above that we were given the chance to do research on a different field that is extremely applicable to where we were located.

I did my research on the cost-effectiveness of point-of-care diagnostics for tuberculosis, a disease that is endemic there and that affects many lives, while here in the US few people have even heard of it. Additionally, I was fortunate enough to visit a township clinic and health center, where a lot of TB and HIV data is obtained from. It was a great opportunity to not only delve into a disease that is so devastating in various parts of the world, but also have the chance to experience what it's like to live in the midst of it.

Additionally, Cape Town is a wonderful city that offers so many activities for every type of person; amazing hikes, beautiful beaches, and great food and wine. It was a great experience and I hope I get the chance to go back there!

***“It was a great experience and I hope I get the chance to go back!”***

# KENNETH WANG '15



Cape Town is a truly stunning destination. Overlooking Cape Town is Table Mountain, a towering wall of earth flanked by Devil's Peak to the east, and Lion's Head from the west. Further south, the nearby Simon's Town provided access to South Africa's local penguins, and the Cape of Good Hope, while Muizenberg, Gansbaai, and Camps Bay offer refuge to those looking to escape into beach climates and sunny weather. For the adventurous, Cape Town offers it all. It was almost surreal, an opportunity to study and work on internship, while also exploring all of the amazing adventure that Cape Town had to offer. We made lifelong friends, and I wouldn't trade the experience for anything.

***“We made lifelong friends, and I wouldn't trade the experience for anything.”***

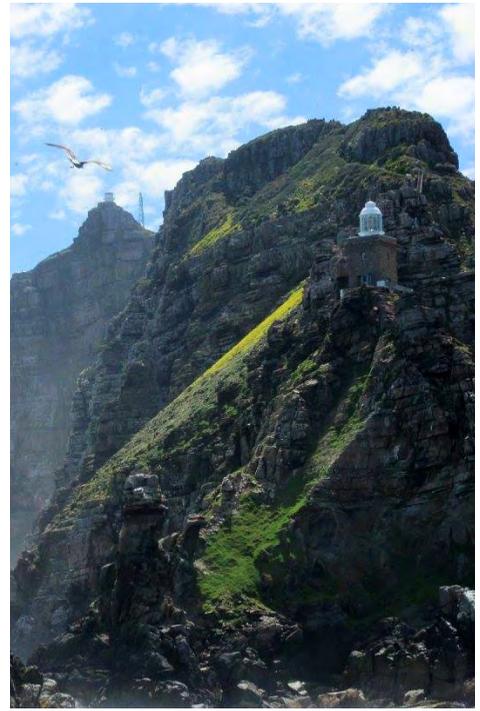


Photographs by Kenneth Wang.

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# MBP MIXER

FRIDAY, OCTOBER 27

**JOIN US FOR AN EVENING OF  
FOOD, DRINKS, AND FUN**

The Mezzanine  
Smylie Brothers Brewing Company  
1615 Oak Avenue, Evanston IL 60201