

# MASTER OF BIOTECHNOLOGY PROGRAM

# FERMENT

OCTOBER 2015

## LAKESIDE TO RIVERSIDE: MBP TAKES STUDENTS TO CAMBRIDGE, MA



Over 100 years ago, the main industries found in Kendall Square included: soap production, distilleries, electric power plants, as well as ink, glass and hosiery factories. Today, over 80 biotechnology companies and tech firms form the occupational landscape of Cambridge, Massachusetts.

The transition wasn't accidental. During the 1960s, at the dawn of the Space Race, President John F. Kennedy saw to it that the "dirty manufacturing" companies were ousted from their Cambridge sites to make room for the mission control center for the (very new) National Aeronautical and Space Association. Of course, the trouble is NASA's mission control is in Houston, TX – a direct result of Lyndon Johnson's administration.

For the next twenty years, Kendall Square remained a largely unoccupied post-industrial desert. With real-estate at an all-time low, and the proximity

of the Massachusetts Institute of Technology, emergent technology firms and research groups found a ready-made labor pool, and a hospitable climate for their work.

While all of us at the MBP remain staunch supporters of Chicago's growing biotechnology hub, we also recognize the ample employment prospects available to students outside our own bubble. In late August of this year, Dr. Zoe Hoepfner led an expedition of 10 graduate students (and a handful of alumni) into the heart of Massachusetts' Biotechnology corridor to conduct site visits to three biotechnology companies in two days.

Students visited Myriant, a bio-based chemical production company, Dimension Therapeutics, a start-up developing liver-directed gene therapy treatments, and AbbVie's combination R&D and manufacturing site in Worcester, MA. By providing

## IN THIS ISSUE

Lakeside to Riverside

A Closer Look At Industry

The Cambridge Cohort

Advanced Alumni

Open Options: The Life of a Consultant

Sustainability and Social Good in South Africa

Event Calendar

Society

our students with a first-hand look at modern biotechnology companies, we broaden our students' conceptions of "work" and de-mystify contemporary industry expectations.

The MBP remains committed to this goal, and unlike other programs, we put our money where our mouth is. Each MBP student is eligible for up to \$750 in travel grant funding-- and an additional \$750 if the student presents at an academic or industry event. (You can't find perks like these at Johns Hopkins.)



## A CLOSER LOOK AT INDUSTRY

### Inside AbbVie's Worcester (Woo-ster) Production Plant

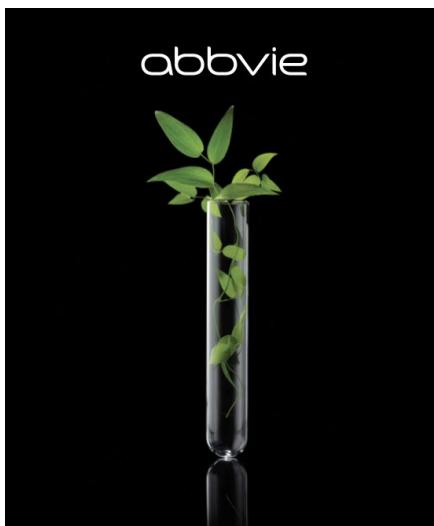
Cresting the tree-lined hill of a technology park in Worcester, MA, the view from AbbVie is peaceful. Under the guiding warmth of MBP alumn Karna Shah, our students were treated to an in-depth look at a unique facility—one that engages in R&D, manufacturing and product launching, all under the same roof.

A considerate host, Shah gave our students a tour of the facility, and coordinated not one, but two networking opportunities with senior scientists and young hires. Questions were asked, business cards were traded.

AbbVie is best known for developing Humira, the world's most widely sold drug (approved for ten indications), however as time passes, AbbVie continues its expansion into new biologic treatments. With operations in Italy, Puerto Rico, Germany, and Singapore, AbbVie needs employees with wanderlust, and a passion for good manufacturing practices.

Harmonizing plants across continents takes a special patience for variability, as well as robust communication skills. No matter your ambition, AbbVie values the same qualities in each employee: passion, mechanical aptitude, writing skills, and flexibility. As one senior scientist reminded us "At AbbVie, you are what your potential is, not what your degree is."

As the MBP strengthens its collaboration with AbbVie, we hope to offer more co-ops, internships and leads for our current and graduating students.



Ge Zhou and Mengqi Hu chatting with John Ponzo, Director of Manufacturing Sciences

### Start-Up Cultures in Cambridge, MA

Fueled by venture capital, and the energy of vibrant young staff, Dimension Therapeutics is poised for success in gene therapy. Self-motivated scientists will find a world of meaningful work with Dimension, and an entire company of mentors. Ying Jing, the Director Process Development assured our students, "as long as you want to learn, there are opportunities." And one MBP alumn, Mingyang Jiang, can attest to -- we met him on his fourth day working for Dimension, and already he seemed at home.

It's said that each day brings a new breakthrough, but not necessarily in your lab. Fierce competition in the race for commercialization renders Dimension, and other companies like it, a closed society.

Despite the secrecy of operations, our students received the benefit of company presentations, laboratory tours, and to close out the day, four of our travelers interviewed for internships.



*Dimension focuses on developing and delivering novel treatments that improve health and quality of life for patients with hemophilia and rare diseases associated with the liver.*

At Manus Biosynthesis, researchers take their cues from the maddest of scientists: nature. While human beings have can credit themselves with infinite innovations, ultimately we take our cues (and our lives) from the other organisms on the planet. But humanity's tendency to harvest, mine, and hunt resources to extinction induces scientists to solve a new problem: sustainability.

Biotechnologists at Manus identity useful ingredients derived from plants, the process by which plants produce these ingredients, then engineer a fermentation system that re-creates that natural process.

By using this fermentation process, scientists can produce more, using less. No cropland or irrigation required. As deforestation continues to threaten regional and worldwide ecology, rare compounds and molecules that grow in unique environments may stand a chance for survival.



*Manus Bio uses specialized fermentations to make plant-based ingredients. The fermentation process is sustainable, environmentally friendly and mimics natural processes.*



## THE CAMBRIDGE COHORT GUIDE TO INDUSTRY

Anushya Mani



Engineer

Chitra Saran



Scientific Associate

Aaron Love



Senior Research Associate

### On coming to Northwestern...

I knew I needed to specialize, and figure out what I really wanted to do with my career.

I applied to Northwestern since I wanted to study further and had an interest in Stem Cell research.

I applied to lots of programs. Loyola, Wisconsin, then I got into Northwestern, and I thought, this is awesome. It gave me options.

### On research...

I worked with Gayle Woloschak on a project with an interesting mix of biomedical devices, drug delivery, and it had cell culture work related to what we learned in the lab, so it was great.

I did my both research and internship at Aurasense. The research project developed my interest in drug delivery systems and analytical sciences.

I did my research project at Aurasense, which put me in a start-up environment -- and I thrived in it. I had a wonderful mentor, who took me under his wing, taught me to do bench research, and gave me good fundamentals.

### On job hunting...

Industry was a little scary at first. It took a couple of iterations of my resume to figure out what I needed to put on there to get everyone's attention. It took a lot of interviews to learn what to say, and how to present myself.

The things I've learned to value in Boston are connections. Never burn bridges. Networking is the most effective way to find jobs.

I shot-gunned lots of online resume collection websites from AbbVie, Merck, Novartis. The only leads that panned out were the ones where I knew someone. It's essential to network your way into positions

### On work...

The one thing I really learned—when you're talking to a client, there are some things you just do not say. I've learned what to convey, and how to convey it. I am so much better with communication for it.

I work on pre-clinical research for small molecules which is different from school curriculum because it involves pharmacology. But I still use basic concepts of enzyme kinetics I learnt at Northwestern everyday at work.

Mine is a small company of only 24 or 25 people, so I wear a lot of hats. But I have flexibility to engage in both industrial-style development research, and tangential, academic-style side projects.

## ADVANCED ALUMNI

When people found out about Patrick Shanley's ambitions to explore the medical device design field, they told him he'd have to move. "Everyone told me there's basically no medical device business in Chicago. You'd have to go to California, San Diego, or Boston, that there was nothing in the Midwest. I say, that's not true." Shanley certainly lives up to his claim, working diligently on the south side of Chicago in the University Technology Park, a growing hub for high-tech innovation.

At Advanced Cooling Therapy, a medical device company, Shanley serves as the Director of Quality Management—a title that sums up some (though not all) of his many responsibilities within the five-person company. Shanley describes the start-up culture he thrives in: "Basically, no one knows anything. At most jobs, there's someone in charge of you that teaches you how to do your job. Here you don't have that. You have to figure things out yourself."

On a table in the office, Shanley laid out a sample of the product currently being marketed by his company: a simple silicone tube that can be filled with water. Designed to be inserted through the esophagus, the looped tube connects to a machine that pumps temperature controlled water through the loop.

Designed by a physician who was dissatisfied by other methods of body temperature control, the Esophageal Cooling Device (ECD) can be administered with a lower risk of

infection than a femoral catheter. A large volume of research indicates how lowering the body temperature a few degrees can increase survival rates during cardiac arrests, strokes, and other brain trauma. Naturally, a debate surrounds what constitutes the "appropriate" temperature for desired results.

Shanley identifies the main hurdle for his company, and others like it: "The trouble with new devices, is that no one wants to be the first to use it. So we bring in key opinion-leaders in the field to start using our devices, with the expectation that they will publish the results of their work in scientific papers." Results concerning the ECD have already been published in *The American Journal of Emergency Medicine*, *BMC Anesthesiology*, and the *Journal Cardiovascular Medicine*.

About a year ago, the ECD earned its CE mark, and continues to be distributed in Europe, Australia, Canada, and the United States. Although Japan represents the second-largest medical device market, they've established a complex regulatory pathway making it difficult, if not impossible for foreign companies to gain a foothold in the market.

On any given day, Shanley manages design, verification testing, validation testing, handles all regulatory concerns, and directly contributes to the direction of the company by participating in board meetings. "You don't get that at bigger companies," he said. Able to explore a bevy of interests, Shanley's love for start-up culture runs in the family—in the late nineties, his uncle started his own medical

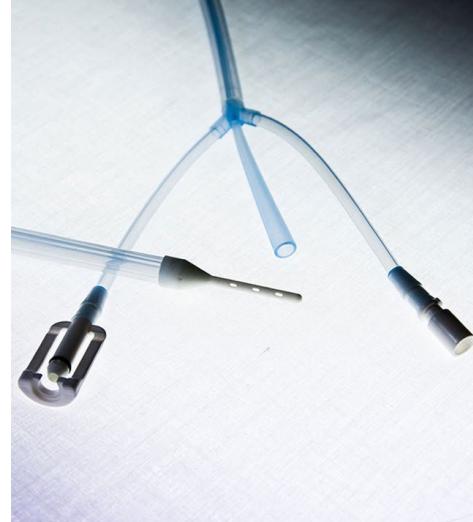
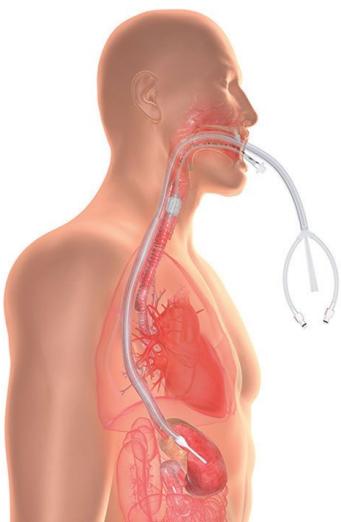
device company out of his garage (and eventually sold it to Johnson & Johnson for a tidy sum).

Though Shanley's inventiveness has found a home with Advanced Cooling, the MBP nurtured his aptitude for mechanical design, and connected him to a research preceptor searching for an engineering mind. "I loved my research project," he said, "It was in bio-inspired tactile sensing. The whole project was based on rat whiskers." Shanley explains that rats use their whiskers to perceive their environment, to detect shape, size and distance. "We were trying to take that system and make a mechanical version of it. The product would look like a brush, something you could swipe across something and gather sensory data."

By the time Shanley was brought into the project, a PhD student had developed a computer model, but the idea still needed prototyping. "I had to turn it into hardware. Which was... fun." A typical graduate school project, it was an idea in search of an application, and in all likelihood, Shanley's project is resting on a shelf somewhere, waiting for the next aspiring engineer.

Shanley explored many roads that might lead him to the med-tech sphere, but the MBP turned out to be the most expedient path to his career goals. "I wasn't as interested in the core bioprocess engineering curriculum, but I saw how much room there was to customize the program, make it what you want. Between the electives, research projects, internships, there was freedom to explore. You can use the MBP program to go wherever you want."

And that includes Chicago.



Right: Advanced Cooling Therapy "Warehouse". Top: Esophageal Cooling Device (ECD) in and outside of the body.

## OPEN OPTIONS: THE LIFE OF A DELOITTE CONSULTANT



Oliver Weisser ('14)

Science came naturally to Oliver Weisser. From a young age, he enjoyed the benefits of dedicated teachers and a small classroom setting. Learn by doing – isn't that the old adage? Weisser appreciated the way science allowed him to connect the dots and experiment, rather than simply reading a concept from a textbook. "It allowed me to learn first-hand, and made the experience of understanding more satisfying." As early as 10th grade, Weisser was staying after school with his friends to make a GEL "just because we could."

Today, Weisser brings his hands-on nature to Deloitte, a firm employing consultants in twenty industry sectors in over 150 countries. As a technology analyst, he's gained a tremendous amount of exposure to the who's who of Boston-area biotechnology firms. From his position, he takes the sort of high level perspective of the industry one rarely sees from the bench. "I get to see a large swath of the business and its cross-functional nature. I identify patterns and analyze how an organization works as a whole."

But it's not always easy. "As a consultant, you're never really at home anywhere." The segmented nature of the work offers variety, and "teaches you to be extra diligent, to do your homework and be prepared," but it can quickly become draining. Switching from company to company, project to project, team to team, presents unique challenges. "I basically interview for a new job every 2 or 3 months. Timing becomes critical as one project closes out, and another needs to take its place." But as his network grows, so do his ambitions to explore entrepreneurship.

After a few years of consulting, Weisser plans to pursue an MBA. "I realize it's ambitious to say that you want to start your own company, but I want to explore the linkages between business and science, and to be that person who can speak both languages. Maybe that means a start-up, or something else." So long as problem-solving remains the order of the day, Weisser will pursue his interests in commercialization of technology, working hard to identify the inherent value of emergent biotechnologies.

## SUSTAINABILITY & SOCIAL GOOD IN SOUTH AFRICA

Sustainability isn't a buzzword. It's a pragmatic approach to problem-solving. At the McCormick School of Engineering, scientific research isn't merely ponderous and academic, it's active and practical, meeting the contemporary challenges of global health head-on. Those in the biotech field are particularly well-positioned to deploy cell-based biotechnologies to limited income nations.

Successful cell "manufacturing" amounts to engineering the first cell, then adding sugar and water. Unlike a medical device that must be manufactured correctly thousands of times, the engineer only has to get it right once. In Keith Tyo's lab, MBP students develop yeasts into diagnostic tools for disease. Students learn to program the receptors in yeast that sense their environment, to detect proteins or peptides or other indicators of infection.

This summer, Kevin Rui and Ihsan Pramanda each took summer internships at the University of Cape Town in South Africa—an opportunity offered through the Sustainability and Global Health Biotechnologies (SGHB) Certificate offered through the MBP. Of course, we called it a "summer"

internship, but South Africa's position in the southern hemisphere made for a chilly reception.

When Ferment talked to Rui and Pramanda both last spring, each expressed excitement about both the opportunity to travel, and the chance to put their skills to use in the service of others. Although Rui's research interests remain in cancer biology, he has an impressive resume of volunteering experiences and has traveled to dozens of countries in search of "a brighter tomorrow." When Pramanda heard of the internship in South Africa, he was surprised no one

else had expressed interest. Each wanted the chance to work with people from around the world.

With a choice of working with Professor Jonathan Blackburn in tuberculosis diagnosis or Professor Sue Harrison in bioremediation, both students employed their expertise in cell manipulation to bring solutions to at-risk populations. They also learned to adapt to new educational environments. Rui was frank in his offer of advice: "Have a clear idea about what you want to do and achieve. Find the problem by yourself, then solve it by yourself."



Left: Kevin Rui ('15) Right: Ihsan Pramanda ('15)

# NEW LAB SUPPLIER

October 1, the new ThermoFisher lab stockroom opens its doors on the ground floor of Tech. (Just down the hall from our own teaching lab).



## SOCIETY

### Good Chemistry

This summer, MBP alumni Rommel Morales and Kathryn Keifer, announced their engagement over Facebook:



Morales('14) and Keifer ('14)

*In 2012, Kathryn and I ran into each other in the winding hallways of Tech. We both were clearly lost and undoubtedly late. But somehow, we managed to find our way to the same classroom and the same MBP orientation.*

*From there, we spent more and more time together - from working on bioprocessing homework until dawn, to keeping each other company while running experiments late into the night. Fast forward 3 years, and we're ecstatic to find ourselves engaged!*

*It's crazy to remember all that we've been through together, which led to this joyous occasion. What's even more amazing that it started from something as simple as the MBP orientation.*

### Romancing the Cohort

More recently, Masood Qader also announced his engagement on the ubiquitous social networking website, but with the distinctly wry tone we've come to expect from the second-year student.

# CHICAGO SCIENCE EVENTS

## MBP EVENTS

OCTOBER 15

### Site Visit : Lanza Tech

2:30pm-5:30pm

*Illinois Tech Park*

A \$25 Travel Deposit is Required for this Trip

## BIOTECHNOLOGY TRAINING PROGRAM (BTP) SEMINARS

OCTOBER 14

### Jennifer Holmgren

CEO LanzaTech

NOVEMBER 4

### John Aunins

Executive V.P. Seres Therapeutics

NOVEMBER 18

### Dave Russell

Director of Technology Prospecting  
Monsanto

DECEMBER 2

### Dean Pettit

Chief Scientific Officer Just.  
Biotherapeutics For All

OCTOBER 8

### Model Poster Session

10:30am-12:30pm

Parkes Hall 122

OCTOBER 17

### Intern Panel

Nevin's Pub

## (ISC) ILLINOIS SCIENCE COUNCIL

OCTOBER 24

### Science Cocktail Party

8pm-11pm *DIRTT Environmental Solutions - Green Learning Center, 325 N. Wells Street*

OCTOBER 28

### Science & Cinema: Wall-E

7pm *Music Box Theatre 3733 N. Southport Avenue*

DECEMBER 10

### "Thing Explainer"

Randall Munroe, XKCD creator  
6pm-8pm *1871 222 W. Merchandise Mart Plaza, 12th Floor*



A 21st Century Answer to Engagement Announcements

## FOLLOW, LIKE, SHARE, CONNECT

Our program is a word-of-mouth phenomenon. If you tell someone this program is great, then someone else is going to hear this program is great.



SHARE YOUR FAILURES,  
VICTORIES, DISCOVERIES, AND  
INSIGHTS WITH FERMENT.