



# WorthWEILL

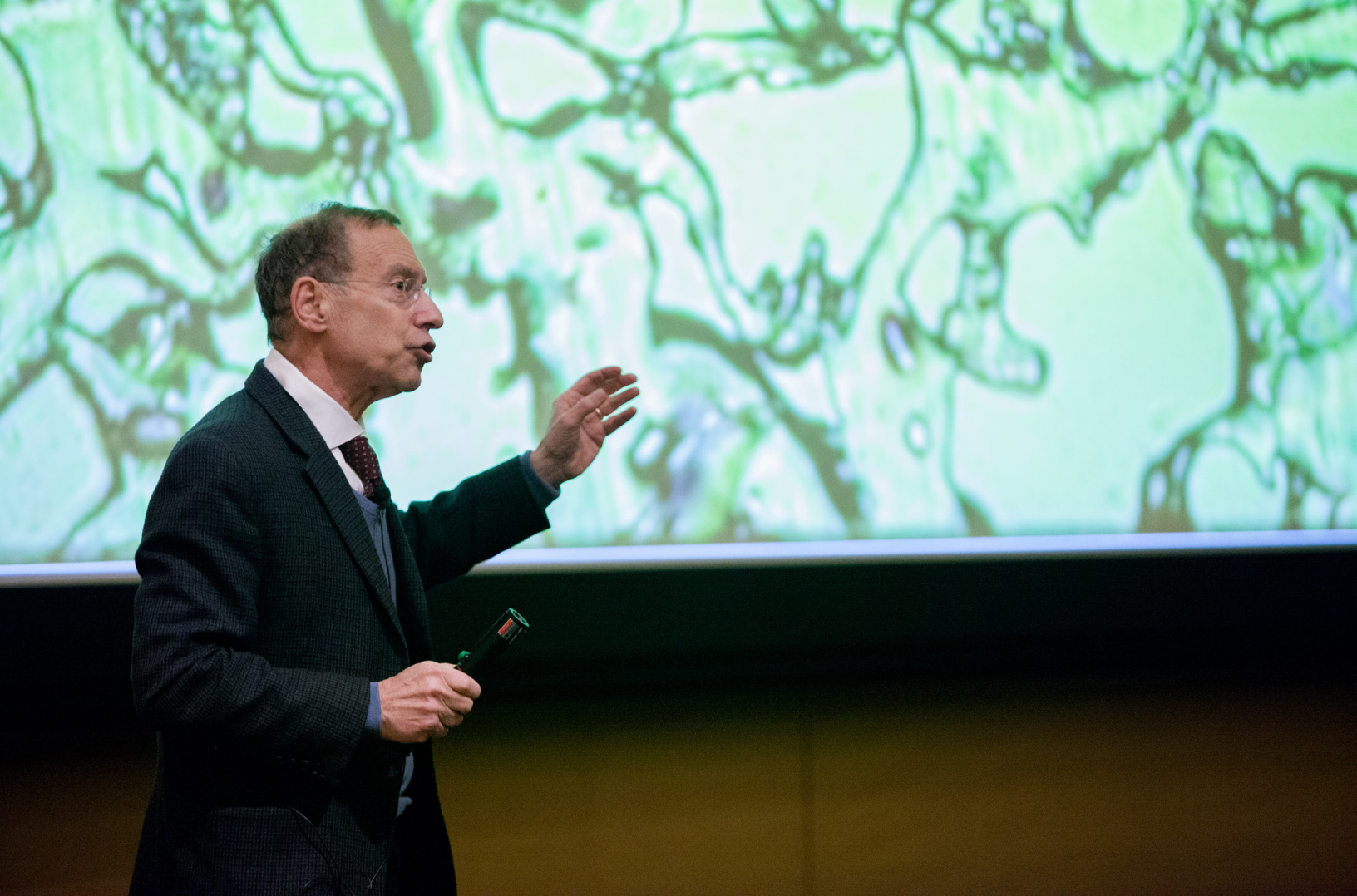
## CONGRATULATIONS CLASS OF 2018!

Spring is a dynamic time at WCGS with senior students readying to graduate, defending theses, and preparing for their futures. While we at WCGS are accustomed to these familiar rhythms, there persists a high level of excitement from the annual du Vigneaud symposium to the Tri-Institutional Career Day, two events that are driven by our students and trainees. Our students display an inherent generosity of spirit, evident in their involvement in the Weill Cornell Community Clinic which serves the uninsured population of New York City. Our students are also running a high school science immersion program targeting young scholars of diverse and underprivileged backgrounds from New York City. These few examples speak to the character and dedication of our trainees. Their commitment to community, sharing knowledge, showcasing research, and building networks is a testament to their pursuit of success. These qualities, fostered at WCGS, will serve them well, providing the means for their future achievements.

This academic year, Cornell University will bestow 60 doctoral and 103 masters degrees from WCGS. Our students will go forth far and wide, as professors, scientists, health professionals, and analysts. To quote Louis Pasteur, "Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world."

Our graduates will surely prove this tenet and we proudly salute them, looking forward to their greatness and inspiration.

Randi B. Silver, Ph.D.  
Associate Dean, Student Affairs



Robert S. Langer, ScD

# 38TH VINCENT du VIGNEAUD MEMORIAL RESEARCH SYMPOSIUM



**T**he 38th annual student-organized and run Vincent du Vigneaud Memorial Research Symposium was held on April 3rd. This year's symposium featured not only the work of Weill Cornell Medicine students, but a keynote address delivered by Robert Langer Dsc., the first such speaker to be invited back. "This event is great for Weill Cornell in that it provides students the opportunity to come together and showcase their research to their friends, colleagues, and classmates," said event co-chair Jaclyn Kubala. "It also demonstrates the diversity of research going on here at Weill Cornell, which is helpful for setting up collaborations and critical for success in the research field."

**N**amed for Vincent du Vigneaud, a former Weill Cornell professor and head of the Biochemistry Department who won the Nobel Prize for chemistry in 1955, the first Vincent du Vigneaud

Memorial Research Symposium was held in 1980, two years after his death. The dVRS symposium is a unique educational and networking event designed to bring together graduate students from different areas of study and from all stages of the degree process to showcase the research they have been working hard on throughout their graduate training. Additionally, presenting research findings in a professional and academic setting provides an invaluable experience that will benefit students in and outside of the classroom long after graduation.

**T**his year's event featured 76 posters and 10 oral presentations by graduate students from all doctoral programs, led by Dr. Langer's keynote address. The wide-ranging talk traced Dr. Langer's career, which began by isolating the first angiogenesis inhibitor, and then developing a polymer that enabled effective drug delivery—the same basic



system that underlies much drug delivery technology today. Dr. Langer has since received over 220 major awards, is one of the most cited individual researchers in history, and maintains the largest biomedical research lab in the world. "Dr. Langer's keynote address was what I found most exciting," Kubala said, "as his talk was both entertaining and inspiring for scientists in all stages of their careers." Students agreed. "Dr. Langer clearly stated the importance of perseverance in science," said Michael Hasson, a student in the CBM program. "It was a great talk to attend."

The many student addresses and posters that followed maintained the atmosphere of pioneering science. Talks ranged in topic from understanding the function(s) of LIS1 in glia cells by Yu

Taniguchi to off-targets in T-cell based therapies by Ron Gejman, to a novel mode of gene regulation during embryogenesis by James Bellush. Along with the speakers, there were 76 students prepared with posters, ready to explain their own research developments—an exciting window into the many innovative Weill Cornell labs. These presentations did not just inform the larger Weill Cornell community, but also provided a chance for students to get feedback. "Sharing my work actually fueled some collaboration with another lab interested in similar tools," said Allie Dananberg of the BCMB program.

While the students took advantage of this intersection of ideas, they also competed for top distinctions in both

speaker and poster categories. One of the first-year poster winners was PBSB student Zaki Molvi, who said that "the symposium was a great opportunity to see the scientific breadth of the graduate school, practice communicating science, and gain useful feedback." This focus on presenting groundbreaking work while at the same time educating students and informing the wider community on research was lauded by many other students involved with the dVRS symposium. These were key traits of Dr. du Vigneaud, and the primary goals of the student organizers. They are already looking forward to making the 2019 du Vigneaud Memorial Research Symposium even better. ♦



### Oral Presentation Winners

**Maria Bustillo** (Jennifer Zallen Lab)

"Tension-sensitive Regulators of Cell Dynamics and Tissue Remodeling"

**Ron Gejman** (David Scheinberg Lab)

"The Fault in Our TCRs: Searching for Off-targets in T cell Receptor Based Therapies"

### Poster Presentation Winners (Yrs 2+)

**Navid Paknejad** (Richard K. Hite Lab)

"Regulation of Inositol Triphosphate Receptor by Ca<sup>2+</sup> and IP<sub>3</sub>"

**Nevin Yusufova** (Ari Melnick Lab)

"Elucidating the Role of Linker Histone Mutations in Chromatin Accessibility and Transcriptional Programming in B-cell Lymphoma"

### Poster Presentation Winners (Yr 1)

**Tom Rossetti** (Kristen Pleil Lab)

"Acute Inhibition of Aromatase Induces an Anhedonic Behavior in Male and Female Mice"

**Zaki Molve** (Yi Wang Lab)

"Monitoring Inflammatory Demyelination via Quantitative Susceptibility Mapping of Basic Protein Degradation"



**N**euroscience Graduate Program chair M. Elizabeth Ross, M.D., Ph.D., grew up in upstate New York with ambition to become a physician. Advice from her pre-med counselor led her to study chemistry at the State University of New York at Binghamton in order to set her “apart from the many biology majors applying to medical school.” Also, it was the strongest science campus in the SUNY system with low in-state tuition. However, in her junior year, lab classes sparked her interest in research. “I began to understand more about the discipline,” says Dr. Ross. “We were in the midst of an exciting revolution in molecular biology and biochemistry. It was impossible to imagine what molecular tools would become available in our lifetime, but it was clear that astonishing advances were coming soon.”

**S**he was also presented with an opportunity to pursue an honors thesis in physical biochemistry by one of her mentors, Dr. Schrier. “The experience of experimenting through junior and senior years, analyzing new data, writing and defending a thesis introduced me to the sheer pleasure of knowing something about how things work that no one else on the planet knew,” Dr. Ross recalls. Recognizing both clinical work and research as disciplines she wanted to pursue prompted her to follow both paths as a physician-scientist. “By my senior year I was wondering while interviewing at medical schools whether graduate school was more my calling,” she remembers. “It was then that Dr. Schrier informed me that there are such creatures as M.D., Ph.D.s., and suddenly I didn’t have to choose.”

**W**hile she wears many hats here at Weill Cornell, Dr. Ross shows the same commitment to mentoring students and participating in WCGS administrative committees that she does to her research. In addition to her research, Dr. Ross is also involved in the All of Us Research Program run by the National Institutes of Health (NIH).



**If you follow  
your passion,  
your driving  
force, it will  
all work out.**

**My lab's research** is all about trying to understand how genes direct the construction of the brain, arguably the most complex organ of the human body in terms of diversity of cell types, structure and network functions. Our point of entry is to examine the function of genes that — when mutated — cause neurological disorders. Think of it, if mutation of a single gene causes significant structural or functional disturbances, that gene must be of key importance to the brain. This is the perfect marriage of patient care and bench research. I have the privilege of consulting with patients and their families while investigating the genetic underpinning of their disorders. We do this all the while looking for opportunities to devise more effective diagnostics and therapeutic options for the patients who are our partners in research.

**The first motivating force** was a fascination with neurology that taught me how to localize a brain lesion through careful patient history and physical examination. I came to understand that anything that medicine can do to protect the brain will assure quality of life for an individual. One can compensate for just about any physical adversity as long as the sentient brain is intact. The second inspiration for developmental neuroscience came from the realization that if we are to fix something that is broken, it is important to know how it was assembled in the first place. My Ph.D. thesis dealt with catecholamine neurochemistry but I saw several embryologists in my Division of Neurobiology whose experiments in chick development were fascinating — transplanting notochord to lateral spinal cord to induce out-of-place motor neurons and using conditioned medium to switch the cell fate of dorsal root ganglia from noradrenergic to cholinergic neurons. But at that time, embryos were too small and their cells were too few to be able to probe in depth what molecular mechanisms were driving these phenomena. All that was changing as I finished my Neurology residency training and was getting back into the lab.

**The All of Us Research Program** is a cornerstone of the Precision Medicine Initiative launched by the NIH. Currently, the majority of healthcare is targeted to the average patient, not the individual. This can lengthen the time needed to unravel health problems, requiring months or years of trial and error to find the optimal medical treatment for that person. The All of Us Research Program aims to partner with over one million volunteers in the U.S., representing our vast population diversity to deliver the largest, richest biomedical dataset ever assembled. It collects not just samples for genetic evaluation but also for chemical biomarkers, baseline physical measurements, participant survey information, electronic health record data extraction and, in a subset of volunteers, wearable technology data collection. For researchers, this program will alleviate the enormous time and cost required to build information technologies and overcome the fragmentation of data resources challenging small and large laboratories before they can begin detailed biomedical investigations.

We are entering a new exciting era in which it will be possible to stratify patients entering clinical trials according to their predispositions and so massively accelerate the development of new treatments. Already, the ability to categorize cancers according to their acquired gene mutations rather than their organ of origin is leading to more precise chemotherapeutic decisions tailored to the individual patient. This will increasingly be expanded to the treatment of patients with neurological disorders, for example with epilepsy, or to assist in choosing the medication most likely to be effective in treating someone with major depression, or Alzheimer's Disease. It could also be helpful in the management of pain by indicating which medications are most likely to be effective or which bear the most risk for dependency in a particular patient.

My involvement in this effort is spurred by the realization that the All of Us Research Program will catalyze a paradigm shift in the future of biomedical research and healthcare delivery. We at Weill Cornell are involved in the enrollment of volunteers, but also actively participate in the planning of how these data will be made available and some of the uses to which the resource will be put in the early phases of the program. "All of Us" is an exciting effort that will help us maintain American leadership in global biomedical research.

**Work-life balance** is an impossible expectation. Life is messy and will seldom (and then only briefly) be in balance. The key to a satisfactory outcome is to focus on the task at hand and don't expect to pursue things simultaneously. When you are in the lab, focus on that. When you are with your significant other or your kids, let nothing else exist. And learn how to forgive yourself for falling short of the ideal. If you follow your passion, your driving force, it will all work out.

**In my spare time** I listen to or attempt to play music — all kinds; read non-fiction; yell at the evening news; survive on late night television satire.

**Care.  
Discover.  
Teach.**



**“From the start, the faculty here seemed really invested in helping students grow as individual scientists, and that's something that's remained true even as I near the end of my third year.”**

**ANTHONY ANTONELLI, Ph.D. Student  
Immunology & Microbial Pathogenesis Program**

New York native Anthony Antonelli grew up in Queens, moved progressively further east on Long Island over the years, and even briefly lived in Tucson, Arizona. He originally went to school for art, but ended up withdrawing from the program because he had trouble wrapping his head around “the idea that something subjective like art could be judged and graded objectively.” “Also if we’re being honest, I probably wasn’t very good,” explains Antonelli. Along the way, he has held many different jobs – from custom frame designer to HVAC mechanic, pharmacy technician, insurance adjuster and valet.

**RESEARCH**

It is not a coincidence that Antonelli studies the use of *Bacillus Calmette–Guérin* (BCG), a strain of *Mycobacterium bovis*, as an immunotherapeutic agent to treat non-muscle invasive bladder cancers after surgical resection. His interest in nostalgic science stories of the past such as the first observations of a connection between infection and tumor regression date back to William Coley and the advent of “Coley’s Toxins” right here in NYC in the late 1800s led Antonelli to his current project. BCG has been used to treat bladder cancer in humans since the 1970s, Antonelli notes, but the mechanism by which BCG induces an anti-tumor immune response and prevents tumor recurrence is still not fully characterized. Antonelli’s research focuses on understanding the effects of BCG on the T cell response, the relative importance of the immune system’s recognition of BCG antigens versus tumor neoantigens, and the role of MHC Class II antigen presentation within the tumor microenvironment by urothelial tumor cells themselves.

When Antonelli started his graduate training in 2015, he was pleased with what he found out: “I knew that my P.I., Dr. Glickman, studied *Mycobacterium tuberculosis*, but when he started telling me about a project centered on the use of



live mycobacteria as a cancer immunotherapy, I knew I had to get my hands on it. Working on this project has afforded me a fairly unique opportunity to study the crossroads between immunology, microbiology, and cancer biology — that’s had a big influence on my scientific perspective.”

**WHY WEILL CORNELL**

Antonelli was drawn to the collaborative academic atmosphere here where students become a part of this massive endeavor between laboratories and across institutions like Memorial Sloan Kettering and Hospital for Special Surgery. “It was just obvious to me from early on that if I thought of something I wanted to study and had a good idea of how I wanted to proceed, I would have the support and resources to do it here.”

**WHEN LIFE GIVES YOU LEMONS...**

As a kid, Antonelli did not see himself going to college, much less going to graduate school. “In fact, I’m the first person in my family to go to college, but that ended up being a fairly winding path for me.”

When Antonelli was 21 years old, he unexpectedly lost his best friend to cancer. This unfortunate event sparked a desire to understand what cancer is and how it does what it does. Antonelli dedicated his free time reading up on the subject and in the process confirmed his passion for science. “I pretty much knew then that I’d found what I wanted to spend the rest of my life doing,” says Antonelli. “I went back to school to study biochemistry at Stony Brook University.” After graduating with a biochemistry degree in 2012, Antonelli worked under Joshua Brody, MD, in the Lymphoma Immunotherapy Program at Icahn School of Medicine at Mount Sinai as a volunteer and then as an associate researcher for three years. By the time he joined Weill Cornell, Antonelli had already published two papers, one with first authorship.

Antonelli hopes that his work will contribute to our understanding of why BCG therapy works so well in the context of bladder cancer, and in doing so hopefully provides a foundation for eventually applying those concepts to the treatment of other types of cancer for which current therapies are lacking in efficacy.



## ICE-OTOPES

Antonelli has been the captain of the graduate school hockey team, ICE-OTOPES for the past two years. “We all spend so much of our time working meticulously in our own little worlds at our lab benches, and I think getting out there on the ice as a team gives all of us the opportunity to get our hearts pumping and apply those mental skills in a completely

different, much more physical context,” he says. The team comprises doctors, scientists, graduate and medical students from WCM, MSK and RU – this extraordinarily diverse group of individuals was featured in the USA Hockey Magazine early this year. Aside from hockey, Antonelli also plays on the Weill Cornell soccer team in the spring, and the softball team in the summer.

## ARTIST AT HEART

Outside of the lab and off the ice, Antonelli is interested in a different kind of chemistry. “I’ve been brewing beer for about 13 years now,” he says, “and have won some awards for them.” But that’s not where his creativity ends. “I spend a lot of time working on music projects. Music has been a huge part of my life since I was very young. I was given an old hand-me-down guitar as a birthday present when I was 7 years old and taught myself to play. I haven’t stopped playing since.” Even with his dedication to science through labs and graduate school, Antonelli has stayed involved in music. And rather than it being a distraction, he’s found it helpful. “I think in some ways having music as a creative outlet has had a positive influence on my creativity in the lab,” he says. “Most recently, some of my fellow grad students launched a pub-style trivia podcast called Facts Machine, and they brought me on board to write and record the music for it.” Knowing Antonelli, it’s going to be great.





# DECIPHERING THE FINE PRINT OF DIRECT-TO-CONSUMER GENETIC TESTING PRODUCTS

BY John Benji Grigg



Courtesy of the National Library of Medicine

Direct-to-consumer (DTC) genetic testing products are now more accessible than ever and the companies behind these products have invested in extensive marketing campaigns. 23andMe, for example, spent upwards of \$10 million on a Super Bowl commercial. In it, the narrator asks you to imagine picking out a car of your choice. The catch? That car is the only car you will ever get for your entire life. How would you treat that car? The narrator then informs you that the 'car' is actually your body and 23andMe can help you learn more about it. Here, 23andMe reminds us of our own mortality and then offers a genetic test as the best way to cope.

What can you actually learn from using one of these products? Many DTC genetic testing kits offer basic genealogical analysis for individuals curious about their ancestry. These kits also offer other fun dinner-table facts such as what type of earwax you have and whether you possess the gene that makes you sneeze while looking at the sun. In more ethically questionable territory, some testing kits also offer information regarding one's inherited risk for developing certain diseases, including Parkinson's and Alzheimer's. It behooves the prospective consumer of these products to understand that they cannot unlearn their results after taking such tests.

Nevertheless, these tests do not offer a medical diagnosis for any particular disease, nor do they provide any comprehensive services for understanding the accuracy or meaning of the results. Even



23andMe's website concedes that "these reports are not intended to tell you anything about your current state of health, or to be used to make medical decisions. These carrier reports are not intended to tell you anything about your risk for developing a disease in the future or anything about the health of your fetus, or your newborn child." Thus, the marketing assertion that 23andMe makes for using their product to better understand your body has no basis in medical reality. The entire process of DTC genetic testing circumvents the authority of a medical professional to interpret an individual's genetic predisposition for disease. Furthermore, these tests do not provide any significant counseling to the individual in confronting knowledge of the results.

Given that DTC genetic testing products often retail for much less than it costs to genetically sequence an individual, how do these companies make any money? Buried within the consent agreement for most of these products is permission for the company to sell individuals' genetic information to third parties. Selling genetic data is a lucrative business model and, according to a recent report from Credence Research, these companies are expected to exceed double-digit market growth over the next decade.

Currently, pharmaceutical and biotechnology companies are paying good money to access these data sets without any compensation to the individuals themselves. Some users are well aware of this and put their trust in the company to distribute their data responsibly, but this permission is not something that is overtly emphasized by the company when the customer signs up. Beyond the sale of users' genetic data, many of these companies also share their data sets in collaborative partnerships with academic, government, and non-profit driven research groups with the intent to better understand and treat certain diseases. Customers may find satisfaction in knowing that their genetic data is, in part, going to such causes.

Nevertheless, the bottom line for DTC genetic testing companies is making a profit from selling human genetic data, not in understanding or curing disease.

What are the risks of your genetic information being bought and sold as a commodity? For one, genetic and personal privacy are major concerns as well as the potential for genetic discrimination. Although testing companies promise rigorous anonymization of consumer data prior sharing with third parties, there are ways in which your raw genetic data can be tied back to your personal identity.

In 2013, researchers at the Massachusetts Institute of Technology demonstrated that they could identify a man's last name and geographical location by using only short tandem repeats on the Y chromosome and querying publicly available recreational genetic genealogy databases. Such an approach was recently used to ascertain the location and identity of the Golden State Killer, a serial killer living under the radar for decades. While the method in this case was used to bring justice to a high-profile criminal, it has aroused public debate surrounding the ethical use and lawful regulation of consumer genetic testing services. Digitized personal information, when paired with one's genetic data, is not as anonymous as DTC genetic testing companies would lead you to believe. Without any lawful oversight, there is potential for misuse of an individual's genetic data.

Once your genetic information is sold on the market there are few laws in the United States that restrict what companies are actually allowed to do with it. One of the few consumer protection laws currently in place is the Genetic Information Nondiscrimination Act (GINA), a law passed by congress in 2009. GINA is designed to protect people from genetic discrimination when seeking health insurance or employment. However, it does little to protect against genetic discrimination when applying for other forms of insurance such as life, disability, or long-term care. It remains to be seen whether the government will expand—or even

continue to enforce—GINA in protecting individuals from genetic discrimination in the future. Given the current erosion of consumer protection laws in the United States, there is good reason to be pessimistic about the enforcement of GINA in years to come.

In some cases, genetic testing companies explicitly promise not to distribute or sell a customer's genetic information without the customer's specific consent. Helix, for instance, is one of the few companies that guarantees this. Helix has pioneered a business model in which customers first have their genomes sequenced by the company, then select specific third parties who are allowed access to their data. For example, Helix has a direct partnership with National Geographic's Genographic ancestry research group. For individuals interested in their genetic ancestry, Helix is arguably the safest approach to sharing your genetic data without fear of it being provided to any other party besides that of Nat Geo's non-profit research group.

While genetic testing products are readily available and do have the potential to revolutionize personal medicine in the future, prospective consumers must understand the implications of using these products. At best, DTC genetic testing products offer individuals the chance to learn more about their unique ancestry. At worst, these products pose a serious risk in misleading an individual about their likelihood for developing certain diseases and also in permanently exposing an individual to genetic discrimination.

If you have a concern about your predisposition for a particular disease, please seek the advice and counseling of a medical professional, not a DTC genetic testing company whose only obligation is to its shareholders. And if you're genuinely curious about your ancestry, seek out companies with strict policies for safeguarding your genetic information—and read the fine print carefully. ♦

**B**ruce A. Sullenger, Ph.D. '91, cannot remember a time when science was not in his life. From an early age, his parents nurtured a love for science and discovery even helping him build a DNA structure from scratch when he was in high school.

Choosing to train as a scientist came easily to him as he was confident that Weill Cornell Medicine and MSKCC would provide him with the rigorous and cutting-edge biological sciences training he was seeking. Dr. Sullenger entered Weill Cornell Medicine in 1986, trained in the immunology lab of Elie Gilboa, Ph.D. at Memorial Sloan Kettering and completed his graduate degree in molecular biology in 1991.

To learn more about RNA viruses and their role in the emerging AIDS epidemic, Dr. Sullenger completed a postdoctoral fellowship with Nobel Laureate Tom Cech, Ph.D. at University of Colorado Boulder. In 1994, he joined the Department of Surgery at Duke University to research the use of RNA agents for the treatment of disease, where his career continues to thrive. Dr. Sullenger is also one of the founders of Regado Biosciences Inc., a biopharmaceutical company engaged in the creation and development of anticoagulant technology.

He now serves as the Joseph and Dorothy Beard Professor in the Department of Surgery with joint appointments in the Department of Pharmacology and Cancer Biology and Department of Genetics at Duke University Medical Center. As the Senior Strategist for Translation at the Duke Innovation & Entrepreneurship Initiative, Dr. Sullenger has the unique opportunity of mentoring undergraduate students (and soon to be graduate students) on transforming ideas into practice in an entrepreneurial spirit.



### **Please tell me about yourself and what inspired you to be a scientist?**

I grew up in the Midwest in a suburb of Dayton Ohio. From my earliest days I was surrounded by and interested in science because my father, Don Sullenger, is an x-ray crystallographer and Cornell PhD. Therefore, I learned early in life about molecules and their structures and became particularly interested in the DNA double helix. My father and mother helped nurture this passion by even helping me build a DNA structure from the ground up when I was in high school back in the early 1980s. I became particularly interested in biomedical research when one of my best friends and one of my aunts died from cancer. Consequently, when considering where to go for graduate school the combination of Weill Cornell and Sloan Kettering were the perfect combination for me.

### **Can you please tell me about your current research?**

My research program focuses upon learning about RNA molecules and using that understanding to develop novel approaches to treat disease. We have generated RNA-based inhibitors to a number of clinically relevant proteins involved in blood coagulation and have translated one of them into a number of clinical studies in patients with heart disease. We

have also created a second therapeutic agent that we hope to translate into first in human studies in the setting of stroke soon. In addition, we have also created new RNA-based agents to selectively deliver chemotherapeutic agents to cancer cells. A third area of research that we have explored for over 20 years is the use of RNA-guided endonucleases, such as the group I ribozyme and CRISPR-Cas9, to edit RNA or DNA for therapeutic purposes. Finally and most recently, we have been working upon targeting extracellular nucleic acid-containing debris to limit inflammation and thrombosis using nucleic acid binding polymers and a novel approach we termed nucleic acid scavenging.

### **What inspired you to get into this field of research?**

I was always very interested in cancer and biomedical research from my early years. I became particularly interested in RNA because during my training in NYC at Weill Cornell in the mid to late 1980s, HIV was emerging as a major health threat. Thus, I became interested in RNA viruses and also interested in developing novel gene therapy based approaches to try to combat HIV while in graduate school. However, I felt that I did not know much about RNA biochemistry so I decided to move to Tom Cech's lab in Boulder Colorado to learn about RNA molecules. That led to a lifelong interest in RNA therapeutics. I joined the Department





**I often point out that unlike me, my two roommates in Lasdon Hall at WCM did not take the academic career path with one becoming a very successful Wall Street analyst and the other a very successful patent attorney. I think that all three of us have led very fulfilling lives and that the graduate school training we each received at WCM was vital for this result.**



of Surgery at Duke with the goal of investing and translating RNA agents for treatment of disease broadly speaking.

**Besides wearing many hats at Duke, you are also the Editor-in-Chief for the Society's journal Nucleic Acid Therapeutics and the founder of Regado Biosciences Inc. How do you juggle your time?**

That is a real challenge. The most important thing is to have colleagues and staff that can help you extend your time. I have been fortunate to have such a team around me.

**Innovation and Entrepreneurship are big buzzwords. Describe your work with Duke I&E. What does this mean for students today and for the future of medical science graduate education? Would your career trajectory have changed if WCM had offered these programs in the late 1980's? And lastly, what are the challenges facing you today as a scientist and an entrepreneur? Do your students face the same?**

All graduate students face the challenge that there are not enough academic positions for all of them and that we need to train them for a variety of careers including ones in the private sector. Duke I&E is an effort to provide undergraduate students and starting next year also graduate students with additional skills to help them navigate the new job world more effectively. I would have welcomed the opportunity to participate in such a program at WCM as I am sure that it would have helped me make fewer mistakes in the entrepreneurial endeavors I have pursued.

**Do you have any advice for grad students who want to pursue a non-traditional science career?**

I have trained over 50 graduate students and postdocs and about half of them have pursued an academic career while the other half have pursued a career in the private sector in pharma/biotech, business etc. My advice to all of them is to follow what you are passionate about as each of these paths can be rewarding. I often point out that unlike me, my two roommates in Lasdon Hall at WCM did not take the academic career path with one becoming a very successful Wall Street analyst and the other a very successful patent attorney. I think that all three of us have led very fulfilling lives and that the graduate school training we each received at WCM was vital for this result. That said, I believe that each of us had to obtain additional training in entrepreneurship, banking or law to complement what we learned in graduate school. I am glad to see that many institutions, including Duke and WCM, are starting to recognize that we need to help students obtain some of the additional skills required to pursue such alternative careers paths during graduate school. We are not totally there yet, but are moving in the right direction.

**What do you like to do in your spare time?**

I enjoy exercising and following college sports; here at Duke, basketball is obviously king. I also enjoy spending time and traveling with my wife, Rachel Rempel — another WCM alum, as well as my two beautiful daughters. We also have an abundance of pets.

# Care. Discover. Teach.

**Contributors:** Sharon Fox (p. 10-11), Scott Kulm (p. 2-3)  
**dVRS Photographs:** Meredith Wright & Edwin Pratt (p. 2-3)  
**Editor-in-Chief:** Chrissie Kong

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1300 York Avenue  
New York, New York  
212.736.6565

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