Natural Selections

A NEWSLETTER OF THE TRI-I COMMUNITY

FALL 2024

WORK-LIFE BALANCE

RESEARCH | REST | REPEAT

Cover illustration by Katarina Liberatore

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Work-Life Balance

As the days get shorter, weather gets colder, and deadlines loom, the students and staff of the Tri-I retreat to our labs and offices. There are experiments to be conducted, applications to be written, and jobs to be done. We find community with our colleageus and peers, sharing new scientific insights and workplace challenges. On coffee breaks, lunch dates, and walks to the duck pond, we keep each other sane. Sometimes we even manage to escape the Upper East Side to explore the city, giving our minds a chance to rest and our perspectives a chance to refresh. We’re submerged in an ocean of responsibility, pressure, and often the nagging fear that we’re not doing enough. Yet in those moments when we can lift our heads to take a breath, we realize we’re swimming, not drowning.

As the semester wraps up and the holidays approach, the staff of Natural Selections invites you to be proud of all you’ve accomplished this year. Remember to appreciate the kindness and grace you’ve extended to yourself- the days you left work early, slept in, or spent the afternoon at a coffee shop. Reflect on the habits you’ve established that prioritize your health and well-being over mere productivity, and the relationships you’ve nurtured. The effort we make to care for ourselves and one another is essential to maintaining the balance that keeps us all afloat and reminds us that life is about more than just our output.

Rockefeller Reimagines the First-Year Curriculum

By Kenny Bradley and Emily Mazur

In late August, the newest graduate student cohort arrived at Rockefeller University. But most did not set foot in a laboratory until October. Instead, they played the role of an "experimental group" in a reimagined first-year curriculum running throughout September. Prior first-year programming at Rockefeller continued until winter, running in parallel with laboratory rotations and elective coursework. This time, before starting coursework and rotations, first-year students spent their first month together in an accelerated, boot camp-style program that maintained some key elements of prior first-year programs while featuring new additions.

This year's first-year program was a departure from the historical experiences of new graduate students at Rockefeller. From its founding in 1901 as a biomedical research institute, Rockefeller historically followed an apprenticeship model, wherein graduate students directly joined the laboratories where they would complete their thesis research. It would be decades before rotations emerged to allow both students and faculty to test out different arrangements for research and personality compatibility. Recent years have seen more programs in the United States adopt a short but dense boot camp-style model, much like the one trialed by Rockefeller this September.

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Most notably, this year introduced a new course titled *Thriving in Graduate School* (abbreviated as TiGS) that integrated a medley of themes. Some meetings acted as group advising sessions on topics like choosing a rotation or thesis laboratory. Other meetings featured guest workshops by Rockefeller's Rita and Frits Markus Library staff highlighting the tools available to graduate students, as well as a lecture from Rockefeller's newest faculty member, Dr. Avi Flamholz, entitled "Quantitative Thinking in Biology." Alongside TiGS, the returning ***Experiment and Theory*** introductory course, taught this year by Tim Stearns and Sandy Simon, utilized primary literature to analyze the scientific method and prepare students to design their research questions.

As in previous years, Rockefeller faculty gave research talks describing their lab's research focus and highlighting ongoing projects, but this time with an abbreviated half-hour time limit. This encouraged faculty to distill their talks to the essence of their research questions. To complement this approach, the new curriculum put the brakes on lab rotations, at least for a short time. Students were asked to establish no more than one of their rotations in the summer before their arrival. With all faculty research talks taking place in September, this approach left students' rotation schedules open for new research directions.

The goal

Overhauling an established curriculum, planning new courses, and scheduling over fifty faculty research talks in a single month is no small logistical feat—so why do it? We spoke with Deans Andrea Morris and Tim Stearns about the motivation and philosophy behind the changes, which were implemented with input from the Rockefeller Faculty Academic Council and Student Representative Committee.

Community building and peer learning were key aims. Whereas prior cohorts interacted as a group just a few times per week, this year's first-year students spent virtually the entire month of September together. The sustained close contact without the obligations of rotations provided strong support for social bonds to form, while also creating an opportunity to build a common knowledge base among students coming from diverse academic and professional backgrounds. For those few weeks before entering the specialized spaces of rotation labs, immunologists, molecular biologists, neuroscientists, computational biologists, and more, all worked side by side, exchanging ideas and perspectives.

At the same time, the new curriculum aimed not to undermine a key feature of Rockefeller's graduate program: academic independence. While students could set up only one of their rotations before October 1, the duration and number of rotations a student completes is still an unrestricted personal choice. Under the new curriculum, students are free from first-year classes after September, leaving them free to focus fully on lab work, elective courses, and settling into their new life in New York City.

Feedback from students

Ultimately, this year's first-year class represents a real-time experiment—and no experiment is complete without collecting and analyzing the data. We spoke with first-year students to gather some early impressions of the new curriculum. Impressions were overall positive, with students reporting an easy transition to life at Rockefeller and feelings of social integration. Gabriella Reis liked that "[first-year students] were all having the same experience at the same time" during the first month on campus, and Libby Tseng felt that first-year courses and research talks "made it easy to feel like I am a part of the community." From her experiences, Cameron Chapa recommended to future first-year students to "get to know everyone in your cohort because you will undoubtedly learn valuable insights from them."

Scheduling all faculty research talks before the rotation period began was a major change intended to introduce students to the scope of research done at Rockefeller. Students largely reported that they had arrived at Rockefeller with a rough plan for their rotations. Most had formally set up one rotation, and some had spoken tentatively with other faculty as well. Overall, the faculty research talks seemed to have a limited impact on students' rotation plans, although some students reported that, by the end of September, they had a greater interest in some unexpected labs where they are considering rotating later in the academic year.

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Without lab meetings and experiments to hurry back to, students frequently spent downtime together and ate lunch as a group. As a result, many first-year students highly rated the social cohesiveness of the cohort after September's programming. Libby Tseng observed that "[the cohort is] close-knit and [spends] quite a bit of time together doing non-science activities." Students were positive about the balance struck between preparing students for research at Rockefeller and allowing them free time to explore New York City and socialize with classmates. Rohit Gokhale shared that "[the schedule] allowed me time to settle into the rhythm of grad school and the NYC life." After September's end, the Friday Lecture Series, programming by the Office for Diversity, Equity, and Inclusion, and informal social gatherings have kept many students in contact after completing first-year classes.

Looking to the future, first-year students will continue to provide feedback to the Dean's Office about their experiences, both anonymously and in group sessions. Plans are already underway to transform TiGS into an ongoing series for the broader Rockefeller student population, in response to interest from current graduate students. Future sessions aim to connect students with Rockefeller alumni, highlight post-graduation career opportunities, and address key milestones in the graduate program. Expanded programming might focus,

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for example, on steps like assembling a Faculty Advisory Committee for second-year students, or career advising for senior graduate students. The first year, after all, is only the beginning of thriving as a graduate student.

Since its founding over a century ago, Rockefeller has been no stranger to change. The redesign of its first-year graduate curriculum highlights the university's adaptability and demonstrates a commitment to helping all students—both new and senior—to thrive in their graduate studies and beyond. ■

Grassroots Lab @ Tri-I: ARTXSCIENCE

Science and art often collide.

There's an art to performing a lab technique and getting a beautiful result, and often there's a science to doing art. This is a space to show and appreciate the scientific and artistic pursuits of our community. This issue, we present photography and poetry from Nina Skiba on pages 16 and 25.

Have something you'd like to share?

A cool cell, critter, media, substrate, a painting, a craft, etc.! **Email hcanaj@rockefeller.edu** with your image for submission. Include your name, your affiliation(s) and position, and a small blurb about the image—how it was acquired and what is shown.

Rockefeller Postdocs Vote to Unionize

By Mia Haraguchi

Just before 7 p.m. on September 19, a small crowd of postdocs began gathering outside Founder's Hall. A few sported stickers proclaiming "I Voted Union Yes!" The air was warm and the nervous excitement palpable as the group began to move toward the building, where the vote count for Rockefeller's postdoc union election was about to take place. "Should we all gasp at each 'no' vote?" someone joked, drawing laughter.

Postdoctoral researchers at Rockefeller started planning their union campaign in early 2023, amid a citywide wave of postdoc unionization. Columbia postdocs won their union in 2018 and have since been joined by their peers at Mount Sinai (2022), Weill Cornell (2023), and Einstein (2024). Postdocs at NYU are currently waiting for a decision on the validity of their unit from the National Labor Relations Board (NLRB). This local upswell of union activity facilitated Rockefeller's campaign: postdocs who had helped organize strong unions at other New York City institutions provided Rockefeller's organizing committee with training and support. The union officially launched in July 2024 as the United Postdoctoral Researchers of Rockefeller-UAW (UPROR-UAW).

Having a union gives postdocs—or graduate students—a say in their working conditions.

Why are so many academic workers unionizing? Having a union gives postdocs—or graduate students—a say in their working conditions. Unions engage in collective bargaining, a process in which union representatives negotiate with the university administration to establish a contract that defines the terms of their employment, such as salary, benefits, and protections against unfair treatment. Without a union, these terms are decided unilaterally by the administration and can be changed without notice. Commonly cited motivations for unionizing include low pay, job insecurity, and insufficient support for international researchers, who make up more than half of the U.S. postdoctoral workforce in STEM fields. Other postdoc unions in New York City have won substantial increases in salary; "just cause" protections, which prevent arbitrary firing; and protections for parents and international postdocs, including extended childcare leave and reimbursements for visa-related expenses. The union representing the largest number of postdocs and graduate students in the U.S. is the United Auto Workers, or UAW. Affiliating with the UAW aids unionization efforts by giving organizers access to institutional knowledge about how to build a strong academic union, as well as resources like the UAW's legal counsel and strike fund.

Rockefeller's union timeline

After several months of internal discussion and meetings with postdoc organizers from unionized institutions in New York City, members of Rockefeller's organizing committee began speaking to postdocs in each lab to gauge union sentiment and recruit other organizers. In July 2024, UPROR-UAW launched its card drive, during which postdocs signed authorization cards to express their support for union representation. An election is triggered if 30% of workers sign cards; at Rockefeller, participation reached a supermajority of 80%. On August 5, union organizers delivered a letter to President Rick Lifton and Dean Tim Stearns, informing them of postdocs' intent to unionize, urging the administration to remain neutral and refrain from anti-union activities, and requesting to meet. This is a standard practice—if the administration is cooperative,

the timeline for holding an election, bargaining, and approving a contract is much shorter. A combative administration will delay this process but, in doing so, risks generating more support for the union.

The university confirmed receipt of the neutrality letter but did not respond to its contents. On August 15, the organizing committee filed a petition with the NLRB to hold an election, in which eligible postdocs would vote on whether to form a union—i.e., whether to be represented by UPROR-UAW in collective bargaining. Five days later, the administration reached out with a proposal: they would agree to the election, rather than challenging its legitimacy in an NLRB hearing, if the union excluded postdocs paid directly by the Howard Hughes Medical Institute (HHMI) from the bargaining unit. The postdocs in question accepted this condition, allowing the election to take place the following month.

In the weeks leading up to the election, UPROR-UAW engaged with the postdoc community through individual conversations, three town hall events, email updates, and social media posts. The union's messaging focused on how collective bargaining could make Rockefeller a more equitable place—for example, by winning new rights for international workers, securing family-friendly benefits, and providing access to neutral arbitration for cases of bullying and harassment. In parallel, the administration sent several emails and published an extensive FAQ enumerating existing benefits and resources, with particular focus on the Child and Family Center (CFC), the Postdoctoral Association (PDA), and the university's grievance procedure. Multiple emails stressed that Rockefeller implemented these resources out of care for postdocs' welfare, "not because a union told the University to do so." The FAQ warned that it was "impossible to know" whether pay and benefits would improve or worsen as a result of collective bargaining with the administration.

Union-admin dialogue

Two days before the election, a fourth town hall (technically an "information session") took place. This event was organized not by the union, but by postdocs who felt that the academic body needed to have "a bigger conversation" about unionization, said Albana Kodra, who moderated the panel alongside fellow PDA member Francesco Gianoli. Kodra noted that while the union and the administration had both been sharing information with postdocs, the two groups were not in communication with each other. (In the lead-up to the election, the university has to be careful not to be perceived as intimidating or manipulating postdocs, especially those involved in unionizing.) The purpose of this panel, then, was to create an open conversation between all three parties: union organizers, university administration, and the broader postdoc community.

Kodra and Gianoli were initially unsure whether the administration and the union would want to participate in a joint event. Each side disagreed with the other's characterization of what a union could or could not achieve,

In addition to preserving or strengthening existing benefits, a union contract can extend new protections to the most vulnerable postdocs, such as temporary visa holders, parents, and those working under abusive advisors.

and many postdoc organizers were hesitant to speak publicly against President Lifton, who was originally slated to be on the panel. Some postdocs also doubted the administration's commitment to clear communication: in September, the university began sending emails about the unionization effort from postdocunioninfo@rockefeller.edu, which was similar enough to the union's preexisting email address—info@rockefellerpostdocunion.org—to create confusion about which group was responsible for the messages. Ultimately, however, the session went ahead, thanks to a push by a handful of postdocs who felt that the postdoc community needed more information about the pros and cons of unionization before deciding how to vote.

Despite the tension leading up to it, Kodra and Gianoli described the panel as "very civil." Engagement was high: postdocs submitted over 100 questions in advance of the event, and by the end of the hour-long discussion, Carson Auditorium was standing room only. The moderators selected a subset of questions that reflected the concerns of both pro- and anti-union postdocs and spanned a range of topics, including the specific goals of the union, the administration's transparency, and the university's grievance procedures. The administration, represented by Tim Stearns (Dean of Graduate and Postgraduate Studies) and Virginia Huffman (Vice President for Human Resources), noted that the salary and benefits currently offered to Rockefeller postdocs are among the best in the city. Stearns raised the possibility that a union would "create a more adversarial relationship" between postdocs, faculty, and the administration. The panelists representing the union—Kevin Ng, Shanshan Liu, Ryan Morrill, and Stephen Thornquist—emphasized that unionizing empowers postdocs to negotiate the terms of their employment, rather than having their working conditions determined unilaterally by the university. In addition to preserving or strengthening existing benefits, a union contract can extend new protections to the most vulnerable postdocs, such as temporary visa holders, parents, and those working under abusive advisors.

What matters most to postdocs?

Three issues arose repeatedly: the feasibility of paying postdocs higher salaries, the recent transfer of CFC leadership to Bright Horizons, and the effectiveness of Rockefeller's harassment reporting procedure. Some postdocs feared that salary increases would force PIs to fire staff or further strain university coffers depleted by the Archibald lawsuit. The lawsuit has not put the university in dire financial straits, Stearns clarified: "Rockefeller remains strong." He cautioned that while the administration "really [tries] to leverage the available funding...to do the best that we can for postdocs and graduate students," this funding is "not infinite," and budget-driven reductions in lab size "happen all over the place." Liu pointed out that the number of postdocs has not decreased at any unionized institution, even when pay has risen considerably. Salary might not be a focus of negotiations, Morrill added. "We, as a group,

democratically decide what our priorities are. If we poll everyone in the bargaining unit and they say, 'Actually, salary is not that important to us—the most important things to us are childcare access or grievance procedures,' that is what we will be bargaining for."

Questions about the CFC highlighted parents' dissatisfaction with the transition of the center's management from Rockefeller to Bright Horizons, an external company. Postdocs with children at the CFC characterized the administration's decision to outsource leadership as unilateral and lacking transparency; one audience member expressed frustration that parents' requests for a town hall and greater openness about the decision-making process were ignored. Huffman, who founded the CFC, acknowledged that the transition was "very tumultuous" and emphasized her commitment to maintaining a high standard of care. She also noted that the move to Bright Horizons allowed the center to resume its normal hours of operation and did not affect tuition, which is subsidized by 60% on average. In response to comments about insufficient communication, Huffman pointed to the establishment of weekly newsletters and a monthly parent group. However, many postdocs saw the university's handling of the transition as evidence that their benefits can be changed without notice—something that a union contract would protect against.

Rockefeller's grievance process was a recurring focus of the discussion. Postdocs expressed concerns that the university's system for reporting harassment is inadequate and asked why the administration has declined to hire a third-party arbiter after several requests to do so from the Rockefeller Inclusive Science Initiative (RiSI) and the PDA. Stearns explained that third-party anonymous reporting has not been implemented because "it's very difficult to act on [anonymous] complaints," but reports made to university officials are kept confidential when legally possible. Subsequent questions centered on the discrepancy between the number of harassment cases reported anonymously in a recent PDA survey and the number of Title IX cases addressed by the university, which may reflect a reluctance to use Rockefeller's reporting mechanisms. The administration suggested that the survey did not include a "clear definition" of harassment but confirmed that conversations about how to improve the reporting procedure are ongoing.

Kodra and Gianoli felt that the information session was helpful to everybody involved:

attendees who were less knowledgeable about the union got a better sense of its goals and priorities, and the administration got to hear postdocs' concerns directly, not just through a small group of union organizers. "We all want the best for everyone in the community," Gianoli said, echoing Stearns's comments during the panel, "but how to get there is the disagreement. It has to be a conversation."

Union election results

At the vote count in the Great Hall, an agent from the NLRB explained the proceedings. The ballots that had been cast over the previous two days were sealed inside two cardboard boxes. She would open them, read each ballot out loud, and display it to the room. No one spoke as she peeled the tape from the cardboard and upended the boxes, releasing a small mountain of pink paper onto the table in front of her. She shuffled the ballots, then picked one up and unfolded it.

"No." She turned the paper around to show it to everyone assembled. "Shit," someone muttered.

The Great Hall remained mostly silent as the vote count continued. Postdocs exchanged raised eyebrows across the room. Some tallied votes on their phones and conferred in urgent whispers. The university's representatives—Huffman and a lawyer—sat next to the table, their faces impassive. A steady trickle of people entered the hall, both Rockefeller postdocs and supporters from other institutions. As the pile of "yes" ballots grew, the tension eased. Members of the organizing committee smiled at each other; one person started to bounce on the balls of his feet. At 7:35, the NLRB agent placed the last ballot in its stack and consulted her colleague for the final tally.

"The count is 167 yes to 75 no, and the union has won the election."

The room erupted into clapping and cheers. As people hugged and Huffman made her way toward the door, one of Rockefeller's union organizers led the crowd in a chant:

"Who's got the power?"

"We've got the power!"

"What kind of power?"

"Union power!"

Next steps

Over the last two months, UPROR-UAW has been gearing up for bargaining. The union recently selected its bargaining committee—seven postdocs who will represent their coworkers in contract negotiations with the administration. Organizers are also conducting bargaining surveys, a process that involves interviewing members of the unit about the issues they would most like to see addressed in a first contract. Based on the results of these surveys, the bargaining committee will develop initial bargaining goals and draft proposed contract articles. Negotiations will not begin before 80% of the unit has completed a bargaining survey; this ensures that the union's bargaining priorities reflect the majority opinion among postdocs. Once Rockefeller and UPROR-UAW have reached a tentative agreement on all articles, union members will vote on whether to ratify the contract or return to negotiations.

Robust participation throughout the process keeps the bargaining committee in touch with postdocs' needs and increases the union's bargaining power.

The pace of bargaining depends on how strongly the administration contests the union's proposed articles and how often bargaining sessions can take place. At Mount Sinai, where sessions were short and infrequent, negotiations lasted fifteen months. Weill Cornell's postdoc union began bargaining at the end of March and had reached tentative agreements with the administration on twenty-four of forty-three articles as of November 12. Based on these timelines, Rockefeller union organizers expect bargaining to take about a year. Postdocs not on the bargaining committee can get involved by attending UPROR-UAW town halls and issue-specific working groups, observing bargaining sessions, and joining union actions like petitions and rallies. Robust participation throughout the process keeps the bargaining committee in touch with postdocs' needs and increases the union's bargaining power, making it easier to negotiate a strong contract.

UPROR-UAW is no longer the newest academic union in New York City. In early October, graduate student workers at Mount Sinai voted overwhelmingly to unionize, and Sinai senior researchers completed their own card drive on November 5. Although Rockefeller graduate students and senior researchers face many of the same issues that motivated UPROR-UAW's campaign, such as unpredictable increases in housing costs and a lack of support for international scholars, it remains to be seen whether union activity will prove as contagious on Rockefeller's campus as at other institutions. Scientists inside and outside the university's gates will be watching with interest as the union moves forward with collective bargaining. ■

Photos provided by UPROR-UAW and Mia Haraguchi

Science Saturday: Where Curiosity Meets Community

By Merima Šabanović

On September 28, the tenth annual Science Saturday STEM festival brought together students, educators, volunteers, and families for a day to celebrate the wonders of science. Hosted by Rockefeller University's RockEDU Science Outreach department, the festival again demonstrated how science can be a powerful connector across generations, disciplines, and communities. With over 800 attendees, the event left a lasting mark on participants from all five NYC boroughs and beyond, extending to New Jersey, Connecticut, and Massachusetts.

Science Saturday has become a hallmark of Rockefeller's commitment to public outreach.

Science Saturday has become a hallmark of Rockefeller's commitment to public outreach. The goals of Science Saturday are twofold: while the event aims to inspire and engage young learners through hands-on STEM experiences, it also serves as a valuable platform for volunteers to hone their science communication skills, build community connections, and share their passion for discovery. As Dr. Jeanne Garbarino, Executive Director of RockEDU, explains, Science Saturday is there "to provide scientists with a platform to transform their educational ideas about science into reality. There can be few opportunities to engage in outreach; this is a low-barrier-to-entry space for scientists to give it a go!" She adds, "For all of the kids who attend the event, we hope that they connect 'science' with lots of different things and lots of different kinds of people."

Learning through play

Science Saturday featured thirty-five hands-on learning stations, designed to engage attendees with activities ranging from biology to physics. The variety of stations ensured that science felt approachable and fun for children of all ages. Rockefeller University researchers showcased projects like ***Protein Party People***, where kids discovered fluorescent proteins under a microscope and crafted colorful friendship

Jeanne Garbarino is handed a critter at one of her Science Saturday stations.

bracelets based on their amino acid sequences. In the ***Brainscape***, students compared animal brains and even got to dissect a sheep's brain. The Tri-I team from MSK delighted young visitors with a mini-golf game that explored how molecules move within cells. RockEDU's stations included the popular ***Fermi Questions*** challenge, where kids estimated the number of sweets in a jar and left with candy-covered smiles.

The stations were designed to foster communication skills and present science as an accessible, everyday endeavor. Volunteers evolved their science communication skills in real time. By the end of the day, they were pros at explaining complex topics to curious kids.

Making the magic happen

Pulling off an event of this scale requires meticulous planning and coordination to ensure that every detail is in place. It's a behind-the-scenes effort months in the making, from managing volunteers to organizing supplies and working closely with partners. Garbarino highlighted, "We are very big on not having stuff feel urgent; we want our volunteers to want to come back to us. So mapping it out over approximately 14 weeks of active planning has tended to help us strike a good balance. We keep pretty zen, and I am proud of that!"

RockEDU also collaborates with Rockefeller's Development Office to plan the logistics for the day. "They are essential for making the day run so smoothly," said Dr. Jessi Hersh, RockEDU's Program Manager for Student Engagement. "They not only handle the majority of the planning, they also help a lot with fixing our mistakes. That plus the 500 emails we send leading up to the event generally make sure everything occurs smoothly."

"It's been wonderful to see how woven Science Saturday is within the NYC STEM community."

Organizing an event of this scale also requires a bit of humor. Garbarino recalls one particularly memorable moment from a past Science Saturday when they shattered a window in the facade of the Collaborative Research Center. It was an ambitious attempt to build a Rube Goldberg machine across the five floors of the CRC. But the magnet they launched went in the wrong direction and straight into the window. While it caused some panic initially, it is now part of the event's lore. "It was a paralyzing moment for all of us—part thankful that no one got hurt, and part scared that we were all getting fired!"

A festival rooted in community

The 2024 edition was the largest yet, featuring 170 volunteers—a community in itself. "The event is so well known that many individuals already plan to volunteer a year in advance," Hersh said. "About half of our volunteers are from Rockefeller, a quarter are from Tri-I or are other community members, and the rest are our community partners."

Thirteen community partners participated in the 2024 festival. There were stations by the Intrepid Museum, the NYC Department of Transportation, the Queens Botanical Garden, and Astor Apiaries, just to name a few. RockEDU's collaboration with the New York Public Library (NYPL) extended even further: NYPL gave out fifty new library cards, and a new partnership with the library is already in development. Hersh reflected on the event's impact, saying,


Lia Skarabot, a legacy volunteer, peers into a microscope.

"It's been wonderful to see how woven Science Saturday is within the NYC STEM community."

What made this year particularly special was the group of thirteen "legacy" volunteers–former Science Saturday attendees who returned, now old enough to run stations themselves. Hersh commented on this intergenerational engagement: "We take great pride in the fact that students enjoyed attending the event so much when they were in K-8 that they wanted to remain involved once they 'aged out' and reached high school. It demonstrates the impact Science Saturday has had on these students as well as just how long Science Saturday has been occurring."

Lia Skarabot, a sophomore at The Bronx High School of Science, grew up attending Science Saturday and is now a returning Science Saturday volunteer. "When I got the invite to volunteer at Science Saturday, I was ecstatic," Skarabot said. Skarabot was leading a new station on mycorrhizal networks this year, inspired by a talk that Dr. Suzanne Simard gave at Rockefeller University. "Teaching kids at Science Saturday has been very rewarding. I will never forget the wide-eyed interest on some of their faces, [...] reminding me of how I was when I was their age," Skarabot said. "Science Saturday has been an amazing experience for me, and I can't wait to do it again next year."

The power of meaningful engagement

RockEDU's backbone of success has always been about developing and nurturing genuine connections with people. "We understand that the 'spark' can be so fragile," Garbarino said. "We want to do our best to help nurture that tiny light into a bonfire of independence and resilience. It is rare that we ever tell someone 'no.' So when we have students who come to us with enthusiasm and ideas, we do our best to make it happen with them. We focus on mentorship and we focus on people. I think this is why it works."

Students from RockEDU's other educational programs, such as LAB Jumpstart and the Summer Science Research Program (SSRP), reliably return to participate in Science Saturday. "I believe our students connect deeply with the 'humanity' piece of 'science for the benefit of humanity'," Garbarino said. "They can experience what it is like to be mentored when they are with us, and I think this inspires many to want to do this as a 'paying it forward' activity."

RockEDU's backbone of success has always been about developing and nurturing genuine connections.

"The RockEDU alumni are often our most versatile volunteers," Hersh said. "They bring so much enthusiasm to the event, and their positive energy reflects RockEDU well for attendees."

One of the RockEDU Scholars shared in their volunteer reflection, "Growing up, my parents never took me to events like this, so when I saw how happy the kids were with their parents, it felt really heartwarming. I think it gave everyone a sense of pride in their work and the impact they made, even with something as simple as helping kids count pieces of tape. It's rewarding to know you're helping these kids at the start of their journey."

The future of Science Saturday: a legacy of impact

Whether it's a child discovering their passion for insects at the ANTventure station or a volunteer gaining confidence in teaching, the festival leaves an indelible mark on everyone involved. As one parent put it in the feedback form: "My daughter and I are repeat visitors. I can't believe my good fortune in discovering Science Saturday a few years ago. What a treasure: everyone was so pleasant and helpful and the grad students/fellows were so wonderful in conveying their enthusiasm for their research to the kids. My daughter looks forward to it every year and still talks about some of the things she learned."

The success of the festival isn't just measured in numbers but also in the connections it fosters. "For us, success can be a bit qualitative and linked to emotions," Garbarino said. "Did we help solidify the possibility of a scientific career for a young person? Is a kid more likely to think about science and scientists in a positive light?"

Garbarino also regards new partnerships and collaborations as a metric of success, and continues to develop and grow new relationships in NYC and beyond. "We are looking to elevate the familiarity of Rockefeller and RockEDU with our surrounding communities," she said. "We are also obsessed with NYC infrastructure so we are already developing a strategy for getting these relationships ready for next year (fingers crossed we get NYC Sanitation!)."

In collaboration with Rockefeller's Development Office, RockEDU is also working on engaging more kid-serving nonprofit communities around the city. Additionally, many teachers attending the festival are inspired to integrate what they've learned at Science Saturday into their curricula. "It's common for us to just give them all of our leftover materials for that station as a donation," Garbarino said.

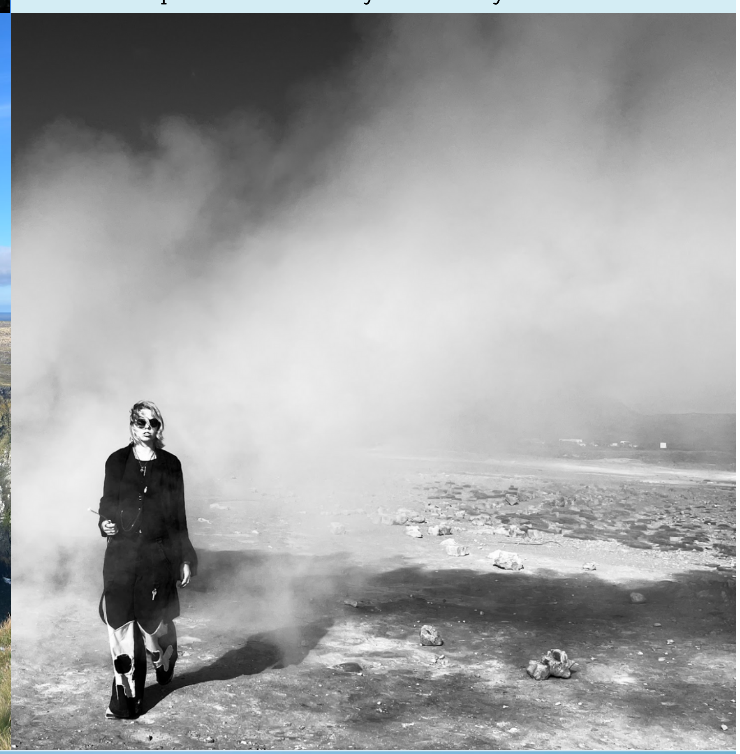
With a decade of success behind it and many more to come, Science Saturday is more than an event—it's a tradition, a spark, and a reminder that science belongs to all of us. ■

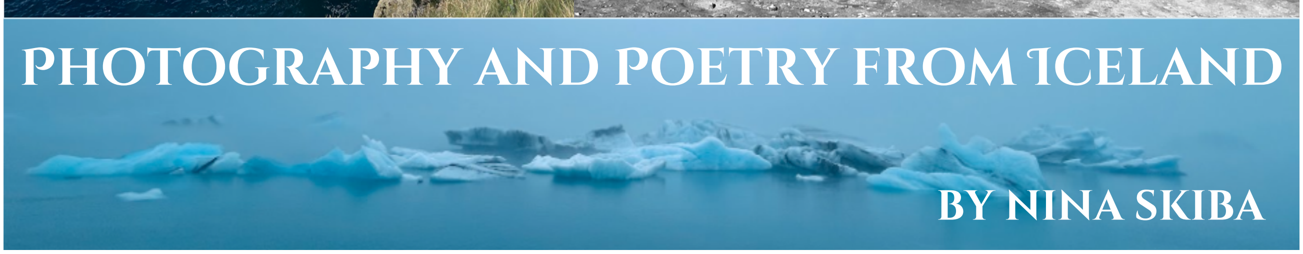
Photographs credit: copyright of Matthew Septimus

GRASSROOTS LAB @ TRI-I: ARTXSCIENCE

Collected by Hera Canaj

The never setting summer sun of the north turns golden
on the endless jagged horizon.
The alien panorama is shrouded in myths and legends
That float in the haze of smoky blue fjords, glacial mists, and steaming pools.
The season of white nights retreats before the elusive aurora,
shimmering behind hills tinted yellow and purple, speckled with moss and volcanic ash,
and eclipsed by fantastic mirages.
My skin becomes invincible to the cold freshness of this land of dreams
as I am immersed in its spirit,
which runs underground through magma, lava, and volcanic ash.
And I find myself:
a Loki emerging from hellborn smoke,
amorphous, dichromatic, and androgynous.
I choose to wander in a peaceful sunless vale of the North,
where overlapping tectonic plates freeze in time
as lakes of glacial ice lap at their feet.
An island hovers in the mist of atlantic waves,
where volcanoes breathe legends of norse gods and fantastic creatures,
the sky is limitless and every shade of gold and blue,
and a raindrop is a tear in the eye of infinity.





Avery-McCarty-McLeod experiments: The 80th anniversary of identifying DNA as the molecular basis of heredity

By Dhyey Gandhi

The simple but bold 68th Street entrance to the Rockefeller campus was erected in honor of the man who in many ways embodies the scientific and social spirit of the institute. The inscription on one of the piers guarding the entrance reads,

IN MEMORY OF
OSWALD THEODORE AVERY
1877–1955
A MEMBER OF THE FACULTY OF
THE ROCKEFELLER INSTITUTE
1913–1948
ERECTED BY GRATEFUL FRIENDS AND
COLLEAGES

and is an homage to the seminal work done over many decades by Avery and his colleagues within these gates.

“The Professor” or simply “Fess” Avery, as his friends and colleagues fondly call him, had a lot in common with the institute he called home for most of his professional life. Quoting from Rene J. Dubos’ fascinating book ***The Professor, The Institute, and DNA*** (which I have used as the primary reference for this article),

“Avery and the Institute were respectively the human and institutional expressions of the same scientific attitudes. They both emerged and developed in the atmosphere of expectancy generated by a few triumphs of scientific medicine at the end of the nineteenth century; both followed an intellectual course that led them from the study of specific diseases to large problems of theoretical biology; both became part of a culture in which laboratory scientists were regarded as members of a kind of priesthood, willing to accept social constraints for the sake of intellectual privileges.”

Therefore, learning about Avery’s story allows us to delve into the fascinating history of the Rockefeller Institute and the people who shaped it. Furthermore, the 80th anniversary of Avery’s groundbreaking 1944 paper that identified DNA as the molecular basis of heredity is the perfect opportunity to recall the amazing discoveries that originated at Rockefeller and went on to shape the course of modern biomedical research.

Illustration by Rachel Payne

Bridging medical and laboratory sciences

Over centuries, medical science has undergone many paradigm shifts. One such noteworthy transformation occurred during the latter half of the 19th century. Due to limitations in technology, early medical science was largely empirical–the observations regarding transmission and pathologies of diseases were recorded, but the underlying mechanism remained poorly understood. As a result, the medical sciences, which dealt with patient care and treatment, were considered largely disparate from the laboratory sciences, which dealt with the chemical properties of biomolecules. However, by the late 19th century, when infectious diseases were the leading cause of death in humans, scientists like Louis Pasteur, Robert Koch, and others were beginning to demonstrate that bacteria and other microorganisms are the underlying causes of these infectious diseases. This had immediate practical consequences in the prevention and control of these ailments, and, for perhaps the first time, it was evident that progress in medicine could be achieved by laboratory investigations that did not directly involve patient care. This realization began to bridge the divide between the laboratory and medical sciences.

Medical research comes to the U.S.

Across Europe, institutions dedicated to the advancement of medicine through the study of fundamental mechanisms of pathology began emerging, such as the Pasteur Institute in Paris and the Koch Institute in Berlin. Although the prospects for medical research in the United States looked bleak initially, it soon began to change around the turn of the 20th century. During the late 19th century, it was becoming increasingly common for young American physicians to spend a few months or years in Europe, familiarizing themselves with the new kind of medical science flourishing across its medical centers. Upon returning home, they brought with them the culture of research-driven medicine that they were eager to emulate. Around the same time, wealthy philanthropists were beginning to shift the emphasis from traditional individualized charities to donating towards programs for social improvement. Together, these two factors catalyzed the creation of institutions where the new model of research-based medical science could be implemented. In addition to places like the Johns Hopkins Institute, one of the main beneficiaries of this new social phenomenon was the Rockefeller Institute, funded by the immense fortune of the oil baron John D. Rockefeller, and created with the ambitious and rather broad vision of promoting any scientific investigation with bearing on health and disease.

Oswald Avery enters the scene

The story of Oswald Avery reflected this larger trend in society. He completed his medical degree at The College of Physicians and Surgeons at Columbia University in 1904. By 1907, he had transitioned from a clinical to a more laboratory-focused role, which was fitting within the increasing research consciousness of medical New York. His first research position was as the assistant director at the Hoagland Laboratory in Brooklyn, which was amongst the first wave of privately endowed medical research laboratories in the United States. Avery spent 6 years at the Hoagland Laboratory studying and researching bacteriology, where his director Benjamin White, a Yale-educated physiological chemist, indoctrinated him with the chemical mode of thinking about biological problems—an approach that greatly inspired Avery's future research.

> **"Avery and the Institute were respectively the human and institutional expressions of the same scientific attitudes."**

During his time at the Hoagland laboratory, Avery published nine papers related to tuberculosis, vaccinations, and secondary infections, catching the attention of Dr. Rufus Cole, the then-director of the Rockefeller Institute Hospital. In 1913, Cole recruited Avery to the pneumonia research program at the hospital, where in a few years, Avery was quickly promoted to the highest rank of a full Member. During his early years at Rockefeller, Avery's research style also changed markedly from the more methodical but perhaps

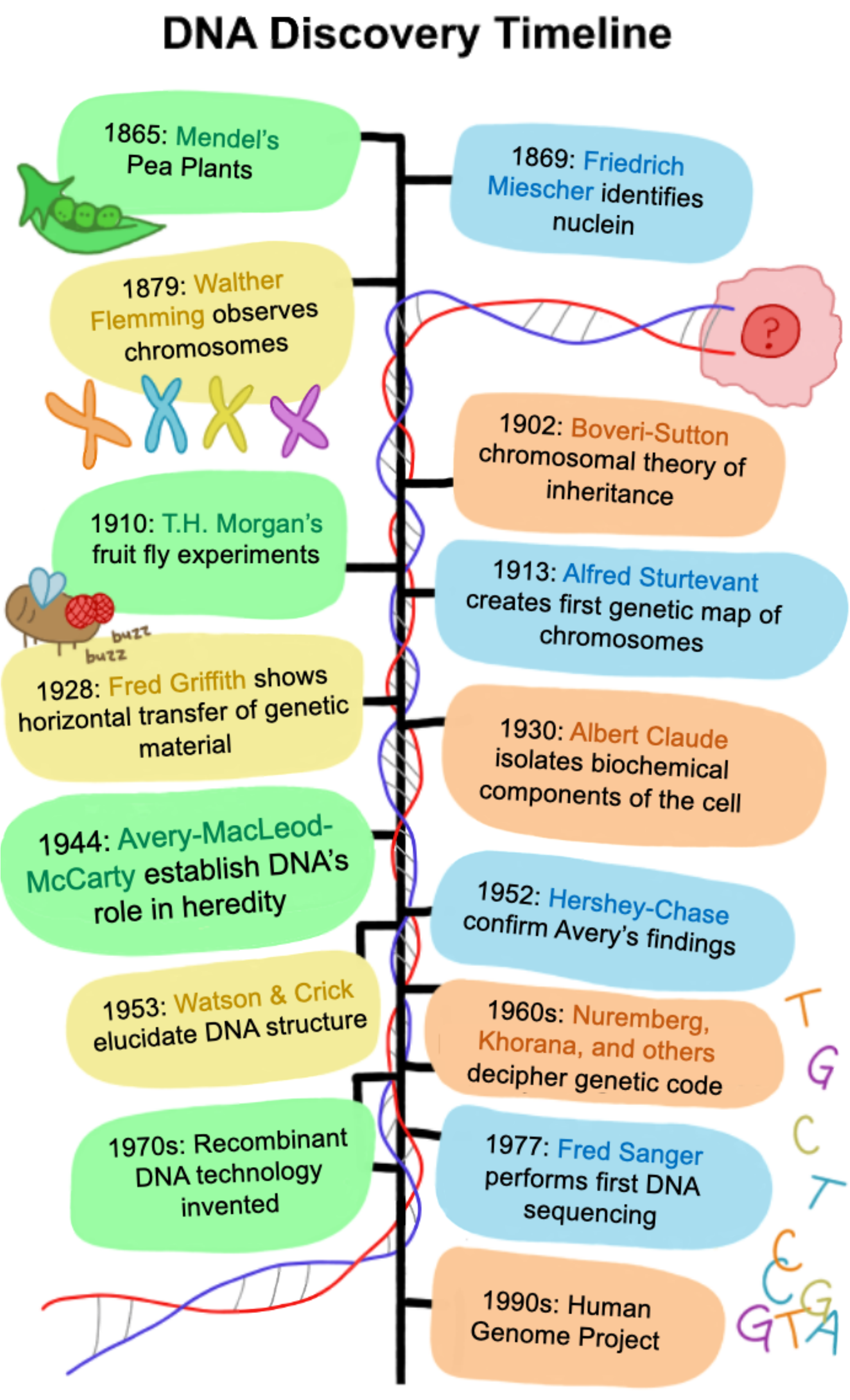


Illustration by Rachel Payne

unimaginative experiments he did during his time at the Hoagland Laboratories to a more creative but still equally thorough approach that would come to characterize much of his later work. This shift in approach was likely due to the carefully cultivated intellectual culture at the Rockefeller Institute that encouraged bold and imaginative scientific pursuits largely unencumbered with funding or logistical concerns, which fit well with Avery's innate scientific temperament. Thus began Avery's decades-long scientific journey toward fundamental problems in biological chemistry that eventually led to the landmark 1944 paper for which he is best remembered.

The DNA revolution

In the first half of the 20th century, driven by the revolutions in genetics and molecular biology, life sciences underwent a radical transformation from a largely descriptive science to an information science. The emerging interpretation was one where the information is stored in the genetic blueprint carried by each organism, and life processes are an outcome of "reading out" this blueprint. This revolution in biology was heralded by Darwin's theory of evolution and Mendel's genetics experiments, which laid the framework for thinking about heredity and information transfer. However, neither of their theories talked about the physicochemical mechanisms underlying their observations. The first inklings of the molecular substrate of heredity can be traced back to Walther Flemming who observed structures in the nucleus of cells that were stained by various dyes and thus named them "colored bodies" or chromosomes. Later Boveri and Sutton as well as T.H. Morgan observed how these chromosomes are transmitted during cell divisions and between generations, and noted that they followed all the rules outlined for the heredity "factors" proposed by Mendel's theory. In parallel, other scientists pioneered techniques to isolate different chemical components of cells based on differences in their chemical properties, leading to the isolation and characterization of several important biomolecules such as RNA, DNA, lipids, and proteins. Due to the rich biochemical diversity in the composition and properties of proteins, the scientific community was quick to nominate them as the best molecular candidates for encoding genetic information. Ultimately, this protein-based heredity dogma in the field of genetics was challenged from unlikely quarters–the seemingly disconnected field of bacterial immunology.

The key experiments that established DNA's role in heredity

During the period of 1920s-30s that came to be known as "The Golden Era of Immunology at The Rockefeller Institute," Avery and his contemporaries made key discoveries regarding bacterial metabolism, the chemical basis of virulence and immunity, and the heritable variability in these properties between different subclasses of pneumococci. While this was happening in New York, across the Atlantic an English scientist named Fred Griffith performed his now iconic experiment where he observed that when a mixture of avirulent R strain and heat-killed virulent S strain pneumococcal bacteria is injected in mice, there is a transfer of these heritable virulence-conferring chemical properties from the latter to the former. These experiments sent shockwaves across the international immunology community and were also widely discussed in Avery's department at the Rockefeller Institute. Avery's group meticulously replicated these results and even extended them to demonstrate that this transformation between different bacterial cells can occur in vitro. They further showed that this in vitro transformation could be brought about not just by whole heat-killed S cells but also with a soluble fraction produced by dissolving the S cells in sodium deoxycholate (an ionic detergent) and filtering the cellular debris; the active material could be precipitated from the filtrate with alcohol and was described as "a thick syrupy precipitate" that was "fairly stable."

Characteristic of his thorough and disciplined approach towards science, Avery spent many subsequent years trying to establish the chemical identity of this viscous precipitate that they had named the "transforming principle," perhaps because he had sensed its broader significance as the potential molecular candidate for heredity that the field of genetics was desperately hunting. In this endeavor, Avery collaborated with many of the newer members in the department amongst which two key figures were Colin MacLeod, who helped optimize the technique for extracting highly pure samples of this transformation substance, and later Maclyn McCarty who performed many chemical tests to help establish the identity of this purified transformation substance. Some of the key chemical tests performed showed that the transforming principle was stable to the action of a myriad of proteases and ribonucleases whilst only responding to enzymes previously shown to attack deoxyribonucleic acids, showing that its elemental phosphorus-nitrogen ratios closely resembled that of DNA, and roughly estimating the molecular weight of the substance being consistent with it being a long polymer. Eventually, these results were compiled in the now classic paper by Avery, MacLeod, and McCarty submitted to the *Journal of Experimental Medicine* in

While Avery himself was conservative about making such broad claims, the scientific community understood his discovery as pivotal.

November 1943 and published in 1944. The somewhat unflashy name of the article "Studies on the Chemical Nature of the Substance Inducing Transformation of Pneumococcal Types: Induction of Transformation by a

Desoxyribonucleic Acid Fraction Isolated from Pneumococcus Type III" contrasts the extraordinary findings detailed within, which for the first time implicated that DNA could be the molecular identity of the information blueprint prevalent in all life forms. While Avery himself was conservative about making such broad claims, the scientific community understood his discovery as pivotal.

The controversy

Since this discovery overturned the long-held protein-based heredity dogma, there was great resistance from the scientific community both within and outside the institute to accept these findings. Amongst the many criticisms leveled against these findings was that despite the meticulous efforts at purification, Avery's DNA sample was somehow contaminated by small amounts of some protein which was the true "transforming principle", or that there was some nucleoprotein so tightly associated with the DNA that it became chemically inseparable. Avery himself had anticipated this backlash and therefore had sent the manuscript of his paper for critical review to many of his friends and associates before submitting it for publication. Even after its publication, Avery was not one to broadcast his findings as a turning point in science, and characteristic of his personality, his response to the criticisms was to begin planning further experiments that could vindicate his results. Subsequently, many experiments done at Rockefeller and elsewhere provided additional evidence for DNA's role in the transmission of hereditary characteristics. Avery's introverted nature meant that his reactions to the happenings were rarely expressed in public, but his mood of excitement tempered with caution was evident in a letter he wrote to his brother Roy in 1943, where he recognized the broad implications of his findings, but advised him not to "shout it around" because "It's hazardous to go off half-cocked - and embarrassing to retract it later…".

Avery's findings become dogma

It is hard to estimate when this tide of opinion slowly shifted, but some 8 years later, when the Hershey-Chase experiment at the Cold Spring Harbor laboratory beautifully corroborated Avery-MacLeod-McCarty's findings, the last remaining skeptics were converted. DNA was thus incorporated into the standard genetic theory, and, in 1953, the identification of the structure of DNA by Watson and Crick with data from Rosalind Franklin ushered in an age of biology united under a few fundamental principles. This led to the coming of age of molecular biology, where the information transfer in biology was established in concrete molecular terms, compiled in what is now known as the central dogma. In turn, this paved the way for the Genomics Era, setting the stage for a time where DNA/RNA sequencing has now become a routine part of many biological experiments.

The staggering implications of these discoveries have touched every area of biology, and the ability to use a molecular language to describe essential life processes has far-reaching consequences for all of medical science. In a sense, all modern chemical genetics owes its roots to the studies in bacterial heritability done by Avery and colleagues here at the Rockefeller Institute, and it surely gives us immense pride to be a part of this great scientific legacy. ■

The Moment I Became a Scientist Was When I Realized That I Should Stay at the Table

By Fuhui Meng

I was born and raised in a remote small town in southwest China where transportation was inaccessible, and the economy was underdeveloped. People made a living by planting rice and corn or working as migrant laborers. My hometown of Baiquan, situated on a plateau, was surrounded by towering mountains with no end in sight. From a young age, I was curious about what could be found beyond those peaks, and I dreamed of one day exploring the world.

Baiquan was a place marked by traditional values, where boys were preferred over girls, early marriage and pregnancy were common, gender stereotypes were conserved, and opportunities were limited, especially for women. However, I was lucky enough because my family was a little bit different. Although I was a girl, I had access to education, a right some other girls in my hometown didn't have.

Growing up in school

As a child, I grew up with my grandparents who were ordinary farmers and had endured a challenging life. They taught me to work hard and live in the moment. My grandfather, in particular, valued education. I can remember that I only scored 17% on my first math exam, but instead of scolding me, he spent the entire summer holiday tutoring me in math. Over time, my scores improved. Whenever I did well, he encouraged me and brought me snacks, which boosted my confidence and interest in studying. Education became my refuge. When I excelled in school, I was exempt from doing household chores that other girls were assigned. No one offered unsolicited advice about my life, and I found that high scores allowed me the freedom that other girls did not have.

The call from science

In middle school, when asked what I wanted to be when I grew up, I randomly answered "scientist", like my classmates. "Scientist" was a word I heard from teachers and classmates, but I didn't truly know what it meant. Nevertheless, the seed was planted.

In high school, preparing for the college entrance exam became my entire world. When I finally took the exam, I did well enough to gain admission to a good university in a big city far from my hometown. It was my first time leaving home.

I started my college life with curiosity and excitement, but soon felt a gap between myself and my classmates. I thought that they had more knowledge than me, more experience, more talent, whereas I only knew how to study. Comparing myself to others made me feel an overwhelming sense of inferiority. In college, I joined the Mathematical Modeling Club, where I met friends who encouraged me and broadened my perspective. They often said, "If it's gold, it will shine." They reminded me that everyone's starting point in life is different–the education they get, their family background … Life experiences are so different, just go towards the direction you want to go, and eventually you will reach it, even if it is a little slower than others. "Compare yourself only to yourself," they said. That advice inspired me to focus on my own path, which soon included pursuing higher education. After all, I liked studying.

The taste of independence

After I graduated from college, my parents began to interfere more in my life, insisting that it was time to marry and start a family. This was the path women in my hometown typically followed, and girls didn't need to get higher education. Even my grandfather, who had once emphasized the importance of education, agreed with them. His encouragement had always been limited by traditional expectations of what was "good" for a girl. I was no longer the little girl who was diligent, obedient, and studied well. I was a woman now, and there were different expectations of what was "good."

I was no longer the little girl who was diligent, obedient, and studied well. I was a woman now, and there were different expectations of what was "good."

Ignoring my family's objections, I applied for a master's program. This marked the beginning of my journey in science. Under my PI's guidance, I learned how to culture cells and use mice to create models of diabetes. Gradually, I began to enjoy conducting experiments and immersing myself in research. The sense of accomplishment from solving scientific problems fueled my passion for science, and I found fulfillment in publishing research papers. I began to envision a future in academia.

Despite my accomplishments, my parents continued to push me toward a different life. They even arranged a job for me in my hometown, hoping I would return and stay close to them. But I knew I couldn't follow the path they envisioned for me. I was determined to carve out my own path, even if it meant defying their expectations. From that moment on, I made up my mind to escape from there.

Forging my own path

I decided that my destiny was in my own hands. I wanted to become stronger, more mature, and self-sufficient. I wasn't going to marry someone and rely on him to solve my problems. I understood that only I could shape my future. I knew that only I could solve my life problems, no one in this world could do it for me.

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Driven by my passion for science, I applied for a PhD. I didn't fully realize how difficult it would be, although I had heard tales of the pressure and stress that PhD students often face. Still, I chose to pursue this path over marriage. In the early years of my PhD, I was optimistic and energized by the idea of making groundbreaking discoveries. But as time went on, my progress slowed. I made little headway on my project for two years, and my initial goals of publishing in an influential journal were replaced by simpler aims of completing my project and graduating.

Completing my PhD took five years, and throughout that time, I struggled under the weight of academic pressure and family expectations. I realized that a PhD was not only intellectually demanding but also physically and emotionally exhausting.

Discovering feminism

As I sought ways to cope with my unhappiness, I stumbled upon podcasts, which introduced me to feminism. Feminism provided me with a new perspective on the world. I began reading the works of Simone de Beauvoir and Chizuko Ueno and learned about the historical struggles and achievements of women who fought for equality. Feminism helped me understand that in my own struggle, I was standing on the shoulders of women who had paved the way for me.

With my newfound understanding, I began to notice gender disparities in my lab. Of the twelve students, only four were women, and we were held to different standards than our male peers. My PI often told us female students not to work so hard, while whenever male students proposed new ideas, he encouraged them. However, when female students asked to try new methods, we were often dismissed. It became clear that women were discouraged from exploring and taking risks.

I can't say feminism is perfect, but I feel that my life would be incomplete without this perspective. Feminism has brought me a lot of freedom and liberation. It helped me understand that marriage didn't need to be my primary life goal. Instead, I focused on achieving financial and personal independence, which I realized were key to my happiness and self-fulfillment.

Now I know that I belong

After completing my PhD, I embarked on a new chapter as a scientist in the United States, grateful for the opportunities created by the women who came before me. Inspired by their legacy, I am committed to making meaningful contributions through my research. Even though science is difficult, I firmly believe that my work should leave a positive mark on the world. Ruth Bader Ginsberg once said: "Whatever you choose to do, leave tracks. That means don't do it just for yourself. You will want to leave the world a little better for your having lived." My journey, once driven solely by personal ambition, now carries a broader purpose—to stay at the table.

For female scientists, staying at the table means having a place in the scientific community, being able to make our voices heard, and having our ideas valued. It means creating a path for future generations of women, giving them more opportunities and possibilities. As I sit at the table today, I strive not only to excel in my field but also to pave the way for those who will come after me, working toward a future where women are fully included and respected in science. ■

Photos provided by Fuhui Meng

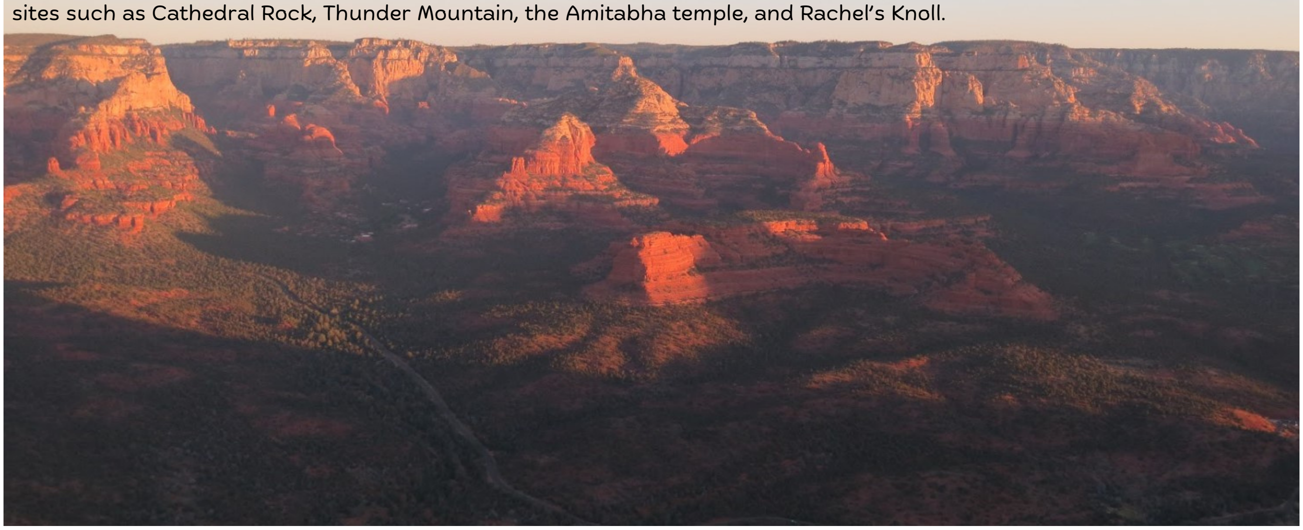
GRASSROOTS LAB @ TRI-I: ARTXSCIENCE

Collected by Hera Canaj

"Energy Vortices": The Anomalous Geology of Sedona, AZ

Photos and Blurb by Nina Skiba

The unique magnetic geology of Sedona accounts for its alien beauty and surreal atmosphere. The ancient precambrian rocks that form the foundation of the land are up to 4.6 billion years old, tinted red by high concentrations of iron oxide and interspersed with large quartz deposits. High geomagnetic activity fosters local legends of energy vortices, making the desert city a nexus of modern pilgrimage. Primordial crystalline basement rocks contain magnetic minerals such as magnetite, which have the potential to influence human sensation due to magnetite nanoparticles naturally distributed within the human body. This allows people to sense the anomalously high geomagnetic fields of Sedona, which form circular, spiraling patterns near volcanic plugs and latite formations. These intense magnetic gyres are colloquially known as energy vortexes, which are rumored to be spiritual loci of the earth. Hordes of New Age pilgrims and spiritually curious tourists flock to the vortexes of Sedona, engaging in yoga and rituals at the sites. Whether these geomagnetically charged points have a true effect on the human psyche is disputed, as local culture and pseudoscience feeds a powerful placebo effect. However, there is evidence that EEG readings of human brain waves correlate with local magnetic activity at vortex sites such as Cathedral Rock, Thunder Mountain, the Amitabha temple, and Rachel's Knoll.



Foundation Models in Medicine: Revolution or Hype?

By Suraj Rajendran

The allure of foundation models in medicine is undeniable. Foundation models are large-scale machine learning models trained on broad data at scale and designed to be adaptable to a wide range of downstream tasks. In natural language processing and computer vision, they've demonstrated remarkable capabilities. GPT-4, for instance, can generate human-like text responses, and models like CLIP can interpret and generate images based on textual descriptions. The success of these models is largely a function of the availability of massive amounts of data—text and images abundantly available on the internet. These models, built upon vast datasets and sophisticated architectures, promise to also revolutionize healthcare by predicting outcomes and personalizing treatments. But as we stand at the brink of a potential revolution, we must ponder: Are these models truly as powerful and reliable as people claim them to be, or are we being swept away by the tide of hype?

Are these models truly as powerful and reliable as people claim them to be, or are we being swept away by the tide of hype?

An observation from academic @lpachter on the social media platform X captures the doubt about this hype: "I don't understand what the term 'foundation model' means... Is it just a catch-all phrase to signal 'we did something similar to ChatGPT'?" This skepticism is healthy and necessary. It prompts us to question whether we're adopting these models for their actual utility or simply chasing the allure of cutting-edge technology.

Illustration by Sarah Foust

In recent literature, there has been a surge of interest in applying foundation models to biomedical tasks. [A study titled "Deep learning-based predictions of gene perturbation effects do not yet outperform simple linear methods"] highlighted a crucial point. Researchers benchmarked state-of-the-art foundation models, including transformer-based models and graph-based deep learning frameworks, against deliberately simplistic linear models in predicting gene perturbation effects. Surprisingly, a simple additive model outperformed a deep-learning counterpart for combinations of two gene perturbations, where only the data for individual single perturbations were available. For perturbations of genes not previously seen but potentially interpolated from biological similarity or network context, linear models performed just as well as deep-learning-based approaches.

This finding underscores a critical issue—complexity doesn't always equate to performance. While deep neural networks hold promise for representing biological systems, there's a need for critical benchmarking to direct research efforts effectively. Currently, many foundation models are not compared against simpler models or previous benchmarks, making it difficult to assess their true value. By systematically evaluating these models against established baselines, researchers can determine whether the added complexity offers a significant advantage or if more straightforward methods are good enough.

Dr. Fei Wang, Professor of Health Informatics in the Department of Population Health Sciences at Weill Cornell Medicine, emphasized that while the promise of foundation models is enticing, their success in medicine is limited by data availability and quality. "We see the models improving the larger they are in the general domain," he noted. "But in biomedicine, we lack the scale and accessibility of data." The application of foundation models in medicine involves a lot of complexities. Clinical data is inherently different from general domain data.

Complexity doesn't always equate to performance.

It is sensitive, heterogeneous, and often siloed due to privacy concerns. Unlike the freely available data on the web, medical data requires stringent ethical considerations before being utilized. Generating the requisite volume of high-quality multimodal medical data (combination of images, genomics, text, etc.) is not only costly but also demands significant expertise and time.

From a philosophical standpoint, this raises questions about our approach to innovation. Are we attempting to force-fit a solution simply because it's the latest trend? The hype around foundation models may, in part, stem from their success in other domains, leading us to believe they can serve as a silver bullet for complex medical problems. But medicine is not merely another data-rich field; it is a deeply intricate system where lives are at stake.

The success of such models hinges on three critical factors:

1. **Data Scale and Quality**: Unlike general text or image data, medical data is not only scarce and often messy but also fraught with inconsistencies and riddled with missing data.

2. **Benchmarking and Evaluation**: There is a lack of standardized benchmarks in medical AI. As Professor Wang mentioned, without rigorous comparisons to strong baselines, it's difficult to ascertain the true performance of foundation models.

3. **Interpretability**: The "black box" nature of deep learning models poses a significant barrier for interpretation in medicine. Clinicians need to understand the rationale behind predictions to trust and act upon them. Regulatory and Ethical Considerations: Deploying AI models in clinical settings requires compliance with stringent patient privacy and data security regulations, adding layers of complexity to the development and deployment of these models.

Dr. Quaid Morris, a professor at Memorial Sloan Kettering Institute, proposed that the true potential of foundation models in medicine lies in their ability to serve as powerful feature extractors. "At their best," he suggested, "foundation models should be an interface for medical records, providing robust features for training extractors and predictors." Rather than focusing on end-to-end clinical applications, these models could excel in downstream research tasks.

However, he also cautioned about technical challenges. “The drawback of foundation models is that they’re just too big,” he noted. Training and deploying such models require specialized hardware and significant computational resources, which can be a barrier for many academic institutions. Moreover, in some cases, simpler models or industry solutions might be more practical.

It’s worth considering the concept of the “technological imperative” or the idea that if we can develop a technology, we should, and we must find ways to use it. This mindset can lead us to prioritize innovation over necessity, potentially diverting resources from more pressing needs.

Dr. Olivier Elemento, Director of the Caryl and Israel Englander Institute for Precision Medicine, highlighted that while foundation models may show promise in research settings, there’s a significant gap in utility when it comes to clinical application. Retrospective datasets used in studies are often clean and curated, which is far from the reality of clinical environments. He emphasized the need for randomized controlled trials to validate these models in real-world settings, much like any new drug or treatment. There’s a broader societal dimension to this discussion. The excitement around foundation models is part of a larger narrative about AI’s potential to transform industries. However, history teaches us that technological revolutions often come with unintended consequences. In the early days of genomics, there was immense optimism that sequencing the human genome would unlock cures for countless diseases. While it has led to significant advancements, the reality was more complex. Similarly, foundation models may not be the panacea for all medical challenges. It’s worth considering the concept of the “technological imperative” or the idea that if we can develop a technology, we should, and we must find ways to use it. This mindset can lead us to prioritize innovation over necessity, potentially diverting resources from more pressing needs.

In medicine, the ultimate goal is to improve patient outcomes. Every new tool or model should be evaluated through this lens. Are we enhancing care? Are we addressing unmet medical needs? Are we doing so ethically and sustainably? The intersection of AI and medicine is a journey of exploration. It is a path that requires both ambition and humility, innovation and caution. By grounding ourselves in rigorous science and ethical principles, we can navigate this landscape thoughtfully, ensuring that advancements truly serve the betterment of human health. ■

ChatGPT is Changing the Way We Do Science

By Giacomo Glotzer

I started relying on ChatGPT in 2022, when my PI bought a premium account for the lab. I had used the free version in the past, but for $20 a month we gained early access to the latest models and never had to wait for server availability. It didn't take very long for me to realize that this $20 was well spent. I was an undergraduate student working in a dry lab, so using ChatGPT to help write and debug code significantly increased my productivity. When my code threw an error, ChatGPT would translate the confusing error message into concise recommendations. When I wanted to write a function to do a series of matrix manipulations, I no longer had to draw out the linear algebra by hand. And when it came time to plot, I could avoid googling for the umpteenth time how to change the size of my x-axis font or adjust the space between subplots. As a lab, we estimated that ChatGPT saved us 25% of our time. With ten lab members working forty-hour weeks, that $20 generated roughly 400 hours of work each month. ChatGPT and other large language models (LLMs) are forms of generative AI that predict the next word in a sequence. When trained on vast amounts of text data—most of which is sourced from the internet—LLMs can answer questions, engage in conversation, and generate various types of content. Since 2022, the LLM market has expanded dramatically, with competition from companies like Anthropic and DeepMind spurring a technological arms race that continues to broaden the range of LLM applications available to consumers.

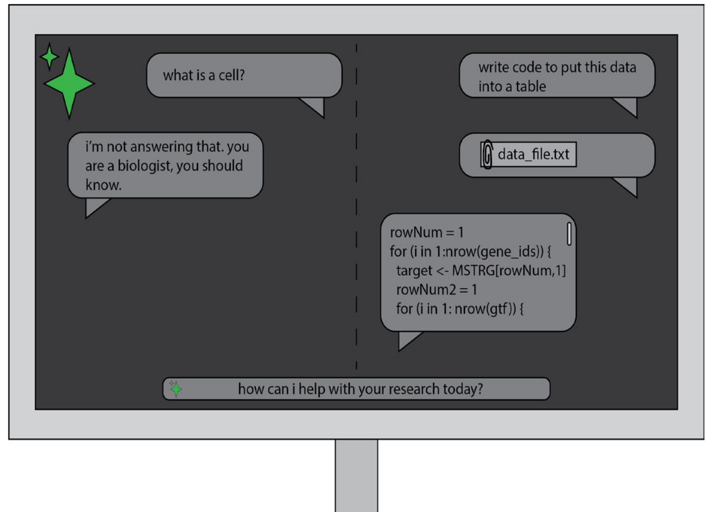


Illustration by Sarah Foust

The Kronauer lab here at Rockefeller shares a premium account, and I witness my colleagues using it frequently. Many things are easier with ChatGPT, like plotting data and formatting figures, installing Python packages that have poor online documentation,

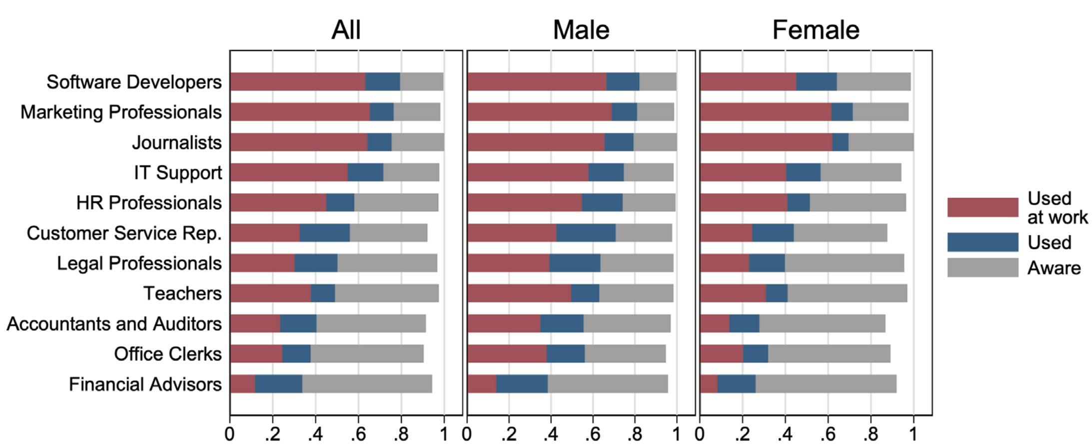


Figure 1. *Proportion of surveyed workers that use ChatGPT at home and at work, split by occupation and gender (n = 100,000). Source: [Humlum et al., 2024](#).*

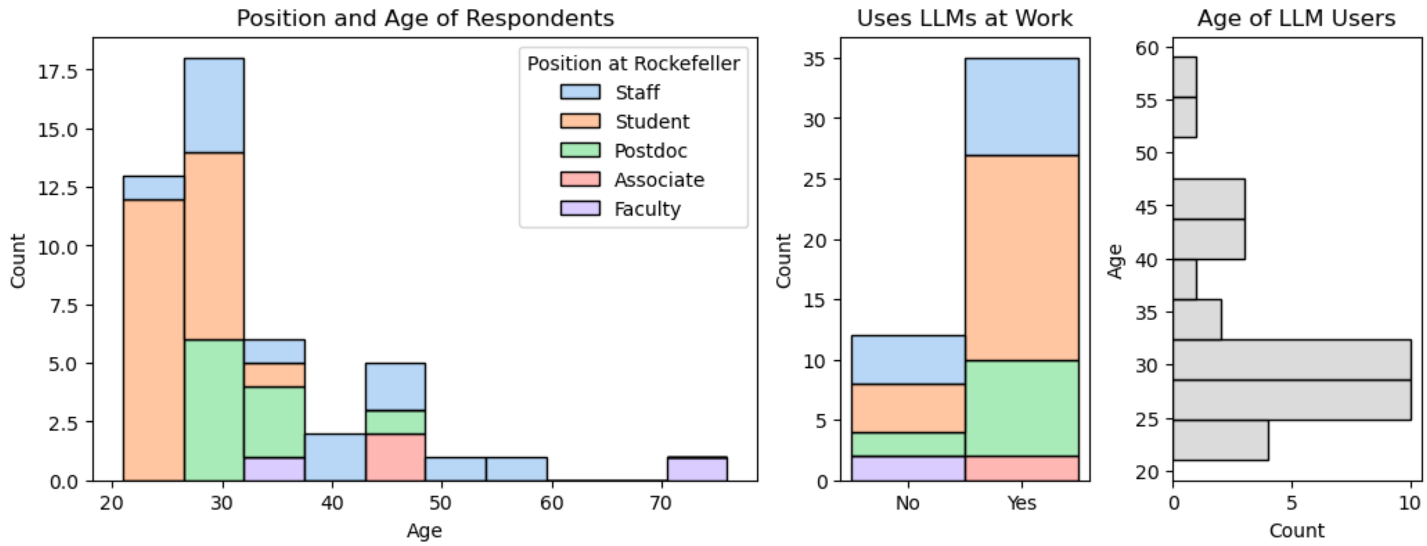


__Figure 2.__ Left: Histogram of respondent age colored by position at Rockefeller (n = 47). Middle: LLM usage frequency colored by position. Right: Histogram of LLM user age.

summarizing a messy note from a seminar or conference, or editing an abstract.

I sometimes worry about providing ChatGPT information about my experimental results, as the model can learn from user data. These days, I almost exclusively use the "Temporary Chat" feature, which promises that the chat history will be deleted and never used to train future models.

I'm not here to proselytize using ChatGPT at work. Nonetheless, tools like ChatGPT are fundamentally changing the pace of work, including what we do at Rockefeller. Because of this, I think they merit serious consideration.

Tools like ChatGPT are fundamentally changing the pace of work, including what we do at Rockefeller.

LLMs like ChatGPT are so new that the literature is sparse, but a recent publication from the University of Chicago that surveyed 100,000 workers in Denmark showed astoundingly high usage rates, with significant variation across employment sectors. Over half of the workers surveyed had used ChatGPT; of this fraction, 72% had used it at work **(Fig. 1)**. According to the study, this rapid uptake has been largely driven by "the individual decisions of workers to start using [ChatGPT], with many employers playing a passive or regressive role."

Another survey of 1,018 materials scientists in industry R&D found that AI-assisted research resulted in 39% more patent filings and a doubling of research output from top scientists. I figured that the prevalence of ChatGPT was not unique to my lab. To find out more, I collected anonymous survey responses from forty-seven students, postdocs, faculty, staff, and research associates at Rockefeller, of varying ages **(Fig. 2)**.

Rockefeller survey results

75% of respondents reported using LLMs at work. Of these people, 57% rely on LLMs for increased productivity or efficiency and 66% anticipate their use to increase over the next year. The sheer ubiquity of LLM usage, especially among older scientists, was striking. Neither age nor position was predictive of the frequency of LLM use, though that could change with a larger sample size. Interested in the specific use cases of LLMs, I surveyed the frequency with which respondents use LLMs for work-related tasks **(Fig. 3)**.

Only 15% of respondents claimed that they never used LLMs for any of these tasks. The most popular use cases were "general knowledge (instead of Google)," followed by "code (writing or debugging)" and "email composition."

When asked if there are other use cases beyond those described, one participant emphasized the utility of "translating text into English and revising the grammar and style of text written by non-native speakers." I neglected to include this use case in the survey, but I can imagine that ChatGPT is excellent for translating documents, emails, or even academic papers. Other scientists claimed to use LLMs to write protocols and design primers. I have found ChatGPT useful for optimizing simple protocols like RT-PCR, but I also remember arguing with ChatGPT over a stoichiometry mistake it refused to admit to making.

As scientists, we are trained to scrutinize new discoveries as well as new tools. However, it appears that LLMs have managed to slither their way into the everyday scientific toolkit without much resistance or cause for alarm. I am grateful for the utility of LLMs but am also aware that LLMs were not available to me during the bulk of my education, when they may have interfered with seminal learning milestones. When I consider the dangers of LLMs in research, several questions come to mind. Does reliance on these tools make us lazier scientists? Does it make our science more error-prone? A minority (21%) of survey respondents were completely untroubled about the use of LLMs in research. No one brought up apocalyptic visions of Skynet or Hal 9000, but many respondents provided commentary on what concerns them. Some shared my belief that LLMs interfere with the learning process, such as one student who said, "Copy-and-pasting the code is way less conducive to my learning than the slower process of figuring it out from first principles." Others were more concerned with "misinformation," "data privacy," and "regression to the mean." One student said, "My philosophy with AI is 'trust but verify.' I worry that many people take output from LLMs

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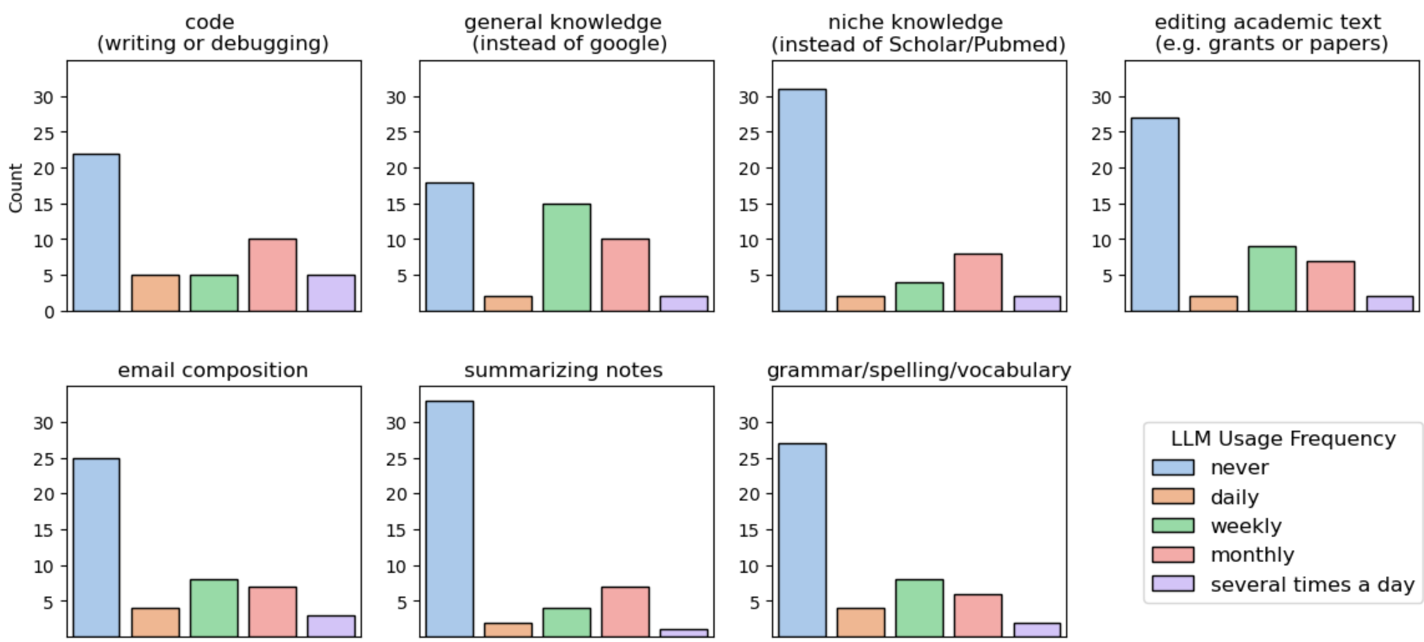


Figure 3. *Histograms of seven LLM use cases colored by usage frequency (n = 47).*

at face value and leave out that verification." When asked about the situations in which LLMs provide inaccurate or inadequate answers, the most frequent complaints were about niche knowledge (n = 15) and inaccurate citations (n = 5). I have heard many people dismiss LLMs altogether for providing inaccurate citations, though competitors of ChatGPT like Perplexity AI and Notebook LM have attempted to remedy this flaw by providing references (DOI links) with each output.

Integrating LLMs into research

Whereas scientists frequently cite tools like AlphaFold, citing or even acknowledging the use of LLMs remains unconventional. When asked whether LLMs should be cited, 64% of respondents responded in the affirmative, while 10% claimed it depends on the use case. "At [this] point LLMs are a modern Google. One doesn't cite Google," said one adamant participant. Citing LLMs is "paradoxical," said another scientist. When I use ChatGPT to edit text that I already drafted or use Copilot to speed up my coding, I still feel ownership over the intellectual property. So should I cite it? Springer Nature declares that LLMs do not qualify as authors but should be referenced in the methods section for any "AI assisted copy editing."

My data reflects a small sample size (forty-seven of roughly 2,000 Rockefeller employees) and may be prone to sampling bias, but it reflects the emerging ubiquity of LLMs in our everyday research activities. Many respondents demonstrated an encouraging awareness of the limitations and dangers of LLMs, recognizing that ChatGPT is primarily trained on data sourced from the internet, which is not immune to misinformation or disinformation.

Rockefeller could do more to educate us scientists on how to use these transformative tools responsibly.

Cornell has disseminated guidelines on the best practices for integrating AI into research activities, but Rockefeller could do more to educate us scientists on how to use these transformative tools responsibly. For now, it is up to every individual to decide for themselves how they see LLMs fitting into their daily tasks. As scientists, we must be vigilant about separating fact from fiction. When we succumb to the ease of ChatGPT, we must not blindly accept it to the detriment of our scientific rigor. ■

An Underprepared Graduate Student's Guide to Meeting With Your Advisor

By Sofia Avritzer

Meeting with your grad school advisor is a stressful situation at the best of times. It can be anxiety-inducing even when we have spent the week preparing, have slides lined up, and are caught up with all the latest papers. But, often, it's not the best of times. Often, it is the worst of times: your latest experiments have all failed; you've been away for the last few weeks and haven't had time to prepare; the most recent season of your favorite show came out on Netflix and you spent the weekend binge-watching instead of making slides. Whatever the reason might be, sooner or later in your graduate school career, you will probably find yourself in a meeting with your advisor for which you are wholly unprepared. In this quick guide, we provide a roadmap for surviving a 60-minute meeting with your advisor when you have absolutely nothing useful to say.

0–15 minutes. As you walk into the meeting, remind your PI of some kind of mundane administrative task they forgot to do. Maybe it's booking a room for a lab meeting, maybe it's finishing to list the collaborators on a grant you two are working on. Whatever the task may be, suggest you should really get it out of the way before you start talking science. Preferably, this task might involve logging into an account your advisor has forgotten the password to. Help them recover the password. Help them perform the task. Talk about how annoying it is that these tasks always get in the way of science. You should be 10-15 minutes into your meeting slot time by the end of this process. Well done!

15–30 min. At this point in the meeting you will have to start talking about science. A good place to start is by recapping your project. Your whole project. From the very beginning. Remind them of how you even came up with the project idea. Walk them through all the different directions you've explored. Make sure to point out your PI's invaluable contribution to the current state of the project at least a couple times. Bonus points if you find a way to bring up your rotation project in the lab. The important thing at this point of the meeting is to have fun with it and take the most meandering path possible to what you are currently working on.

30–47 min. You have successfully arrived at the halfway mark of your meeting. At this point you will inevitably have to show some form of data. The trick is, it doesn't have to be new data necessarily, just data. Acceptable things that fit this category include old data plotted with a slightly different axis, summary diagrams with a new color scheme, or possibly even a plot you prepared and had the foresight not to show at a previous meeting. This is also a good moment to bring up how a competitor lab might be quantifying things in a different, and, naturally, much worse way. This comment will inevitably trigger a long diatribe from your PI. Sit back and enjoy the minutes-long break.

47–50 min. As you get closer to the 60-minute mark, you might start to notice a lull in the conversation. A good way of counteracting this is to pitch your advisor an idea they suggested to you a few months ago, but forgot about. It will be the best idea they hear all day!

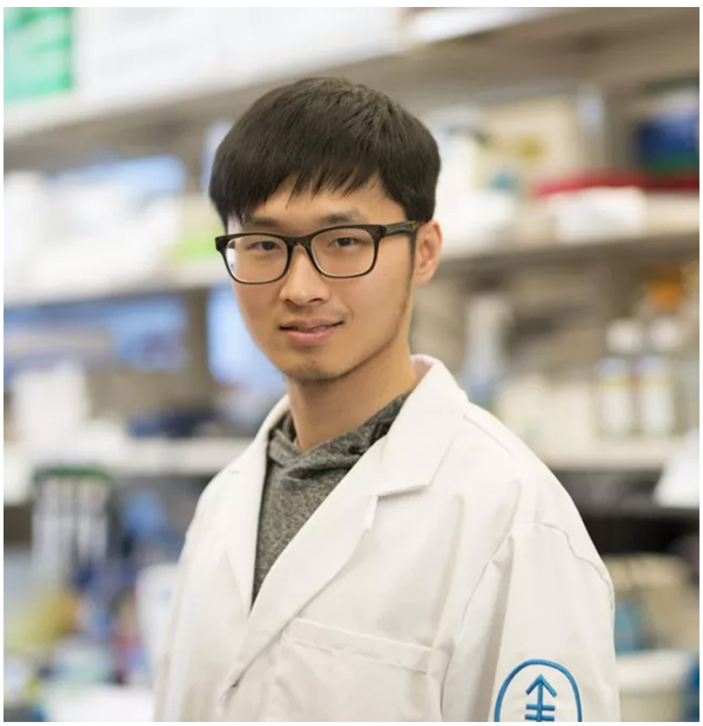
50–60 min. You've reached the finish line. This is the perfect moment to relax and plan an ambitious list of future experiments. When estimating how many experiments you can do between this meeting and the next, the best thing you can do is ask your PI how long they think these experiments will take. How long could it take to make a new mouse line? A day? This is also a good moment to promise your PI you will finally do that experiment they have asked you for five times, but that you know you will never actually get around to.

Congratulations! You have successfully survived this meeting. As you leave your PI's office, promise yourself you will be much more prepared for next week's meeting. Or at least, you hope so... If not, you can always refer back to this list. ■

Interview With Hsuan-an Chen

By Nina Skiba

Hsuan-an (Sean) Chen is a joint postdoctoral researcher at Rockefeller University and Memorial Sloan Kettering Cancer Center. He is currently working in the Charles M. Rice Lab, a lab focusing on virology and infectious disease, at Rockefeller University. He provides an expert cancer biology perspective on the pathology caused by the chronic Hepatitis C Virus (HCV), a liver-tropic virus that causes chronic damage and inflammation and ultimately culminates in the development of liver cancer. Of note, chronic HCV infection is one of the most common causes of liver cancer in the US.



Current projects in the Rice Lab

In the Rice lab, Chen is studying how chronic viral infection may lead to liver cancer development. He uses a virus called Norway Rat hepacivirus (NrHV), a close relative to HCV, that infects the laboratory mouse model. Chen is trying to understand the molecular mechanisms of how the hepatocytes transform into cancer cells in the context of chronic infection, as the details of this development remain unclear. Moreover, while HCV is already curable by Direct-acting antiviral agents (DAA), the limited accessibility of such drugs to patients, as well as the fact that cured patients can still get a later onset of liver cancer, underscores the unmet need to have a deeper understanding of the connection between HCV and cancer development.

In the Rice lab, Chen is studying how chronic viral infection may lead to liver cancer development.

Chen worked on liver cancer during his PhD, but previously focused on oncogenes activation and tumor suppressor loss, a more well-known and well-studied cause for liver cancer. In contrast, in chronic HCV-infected liver cancer patients, the cause of tumor development is still uncertain. The crosspath between virology and cancer biology makes this project particularly exciting as this is a largely unexplored field.

Viral epigenetic effects on liver cancer

People speculate that there is a viral epigenetic effect; that said, there are no obvious indicators for that. Testing the epigenetic hypothesis is problematic from the perspective of limited resources, as patients with tumors all have individual factors beyond laboratory control. HCV is a virus that only exists naturally in humans, and can take 20 years to progress from HCV infection to late-stage liver cancer. Thus, it's difficult to pinpoint the drivers in the progression of the condition from virus to tumor. Small animal models where we can precisely manipulate individual factors are necessary. "If you have a mouse model, you could try to tease out the origin of the cancer, figure out when it starts, where it comes from, and how it transforms liver tissue to tumors. This is where the NrHV mouse model comes into play because it closely mimics the pathology of HCV human patients. We can now manipulate intervention and track the development of the tumor, carrying out mechanistic studies to nail down the underlying causes of tumorigenesis," Chen explained.

Challenges in the Rice Lab

There are a lot of challenges in this particular project, namely the time it takes for patients to develop cancer, which can take around 20 years. This issue is more or less the same case in mice, where it takes 1.5 years for cancer to develop. "Time is the biggest challenge. If you have aggressive liver cancer models that only last 3-4 months only, you may begin to question how closely it resembles HCV-associated liver cancer patients that take 20 years," Chen said. However, it does offer some reassurance to have a genomically close animal model at the expense of having to wait longer than a simulated model that takes merely months. Chen had other ideas for solutions: "One thing I would do to expedite the process would be to introduce artificial oncogenes. We're trying to find at what point those oncogenes actually speed up the tumorigenesis process. Nevertheless, everything still takes at least a year."

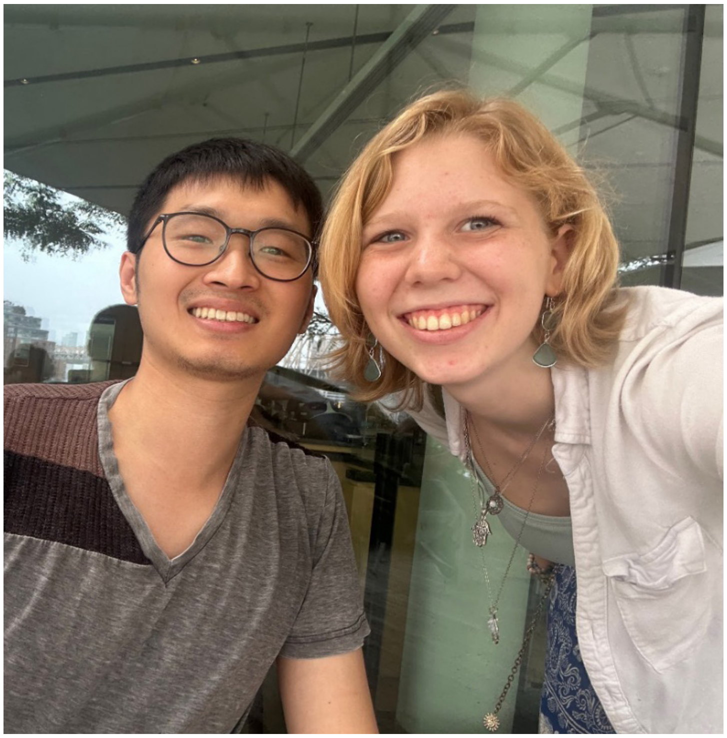
Equity concerns also figure largely in HCV research. There is a new effort to cure viral infection by making antiviral drugs more available and affordable, especially because many HCV patients are of lower socioeconomic status. Additionally, curing a chronic HCV infection does not guarantee lower risk for liver cancer. "Even if patients receive antiviral drugs to stop the infection, it doesn't always stave off the later onset of liver cancer. Even in the absence of viral infection they may still develop liver cancer in some cases. People are still trying to figure out the missing link and what will be the solution to this. Therefore, although there are antiviral HCV drugs on the market, we may still need a second line of treatment to apply in combination and prevent the cancer from setting in."

Career reflections

Chen has a unique perspective, coming from a cancer biology background and joining virology. He has called his work in the Rice Lab "one of the most exciting projects." There is an appeal to having many fronts to explore. Coming from a cancer background where there are many overlapping interests and everyone has to find their niche in a very cancer-focused lab, the direction of research is narrower. In a virology lab, in which Chen is one of few cancer experts, he has a much broader range of study and exploration, facilitated by interacting and communicating with other scientists from a different area of expertise. It is these creative interactions that generate original ideas that can shape the new direction of projects. It opens many opportunities. This is the benefit of interdisciplinary research. A drawback of this, however, is when expert feedback is necessary but hard to come by. "Thankfully I am still collaborating with my previous lab and getting feedback from them. If you know what you're going to do, a big lab [Rice Lab has 40 members] is a place where you can use your creativity to explore science in an interdisciplinary context."

Chen has a unique perspective, coming from a cancer biology background and joining virology.

Chen also pitched that studying virology is a refreshing way to gain insight into the overall evolution of cancer. In virology, there are chronic infections that hijack the immune system like cancer cells that exploit the body's environment. Tumors exploit previously beneficial resources and manipulate the faculties of the body to be harmful, creating a sort of "wound that will never heal." When asked about how he was inspired to find his niche in cancer biology, Chen answered, “I came from a pharmacy background and spent most of my time studying drugs already invented in undergrad. However, I’m more excited about discovering something new and that’s why I landed on cancer research eventually. As cancer is one of the most flexible and ever-evolving diseases, there is no way to run out of questions. It intrigued me how cancer has been a major research focus for 5 or 6 decades without a universal cure being discovered.” This raised the question of whether the seemingly infinite progress possible in studying cancer is more demoralizing or inspiring to Chen. “Well you will never lose a job as a cancer biologist,” Chen chuckled. “What keeps you studying cancer also keeps you curious; you’re always finding something new. It’s almost a dream job of mine; to push scientific fronts relevant to human medicine.”



What inspires Chen

Chen took a minute to try to come up with a single volume or work of art that translated to scientific curiosity. “As a teenager I read a lot of Scientific American. It was inspiring to see so many new scientific enterprises and the sheer expanse of options in science, even though I was not particularly interested in biology as a teenager. With those articles, I expanded my horizons and saw the opportunity in science. It made me wonder how many amazing things there are to discover. I had a subscription for 6-7 years in high school and undergrad and it’s one of the reasons I got into science.” The range of different types of science - biology, chemistry, physics… - that was featured in the journal particularly inspired Chen. “You never really know when something you read randomly might be useful in your own research.”

Chen joined the Tri-I for his PhD, coming from Taiwan nine years ago. “I think I’m lucky enough to be in this tri-institute area where you bump into professional scientists from every field, creating so much intellectual overlap. This is probably the best sort of place to do science; where you can find almost all different kinds of research.” With MSK being a sort of cancer guru, while neuroscience, immunology, and virology are based at Rockefeller, all you have to do is reach out, communicate, and collaborate. Chen values this institutional collaboration.

“This is probably the best sort of place to do science; where you can find almost all different kinds of research.”

It’s much harder to have a versatile approach while staying within one institution. Chen hopes to maintain the collaboration between the Tri-I systems as he forges ahead in oncological virology research. ■

Photos provided by Hsuan-an Chen and Nina Skiba

Introducing the Multitalented Jazz Weisman

By Sofia Avritzer

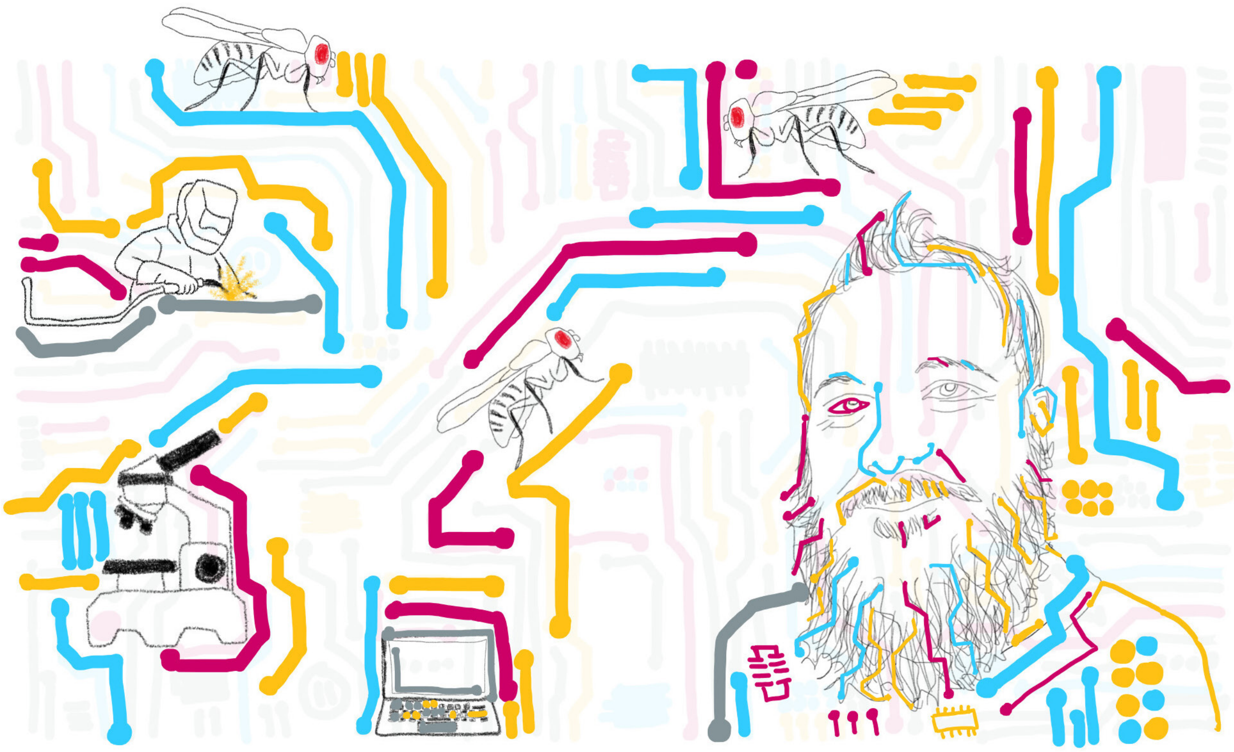


Illustration by Marina Schernthanner

Jazz Weisman's desk is in the far-right corner of Gaby Maimon's lab at Rockefeller University, located on the third floor of Flexner Hall. You can recognize his desk based on the myriad of seemingly unrelated items on display: a series of intricate circuit boards and half-assembled custom electronics, a 3D-printed iPhone charging station, a cheat sheet for a Python data visualization library, and a 3' by 2' rustic cherry slab destined to become a kitchen counter. The only thing tying all of these unrelated objects together is that Jazz made them.

Jazz currently works as a hardware engineer at the Maimon Lab where he helps graduate students and postdocs design and build any custom equipment they might need for their projects. This equipment can be anything from a 3D-printed filter holder for a microscope to a custom temperature control system that heats fruit flies as they walk on tiny air-supported foam balls. "My job is basically just [to] help people build stuff so they can do their projects," Jazz said. If you can name it, Jazz can build it.

Jazz's friendly smile greets everyone who comes to his corner of the lab from beneath a big beard.

If you can name it, Jazz can build it.

At 6' 1'' tall, he can always be found wearing cargo shorts and flip-flops, even in the dead of winter, and t-shirts with science-themed puns. Before becoming the Maimon lab's hardware engineer, Jazz was a graduate student in the lab. For his thesis, he wanted to look at what fruit flies do over the course of multiple days or even weeks. He was specifically interested in how they move around in the world—or, as scientists

Photo by Sofia Avritzer

would call it, navigate. There had been multiple prior studies in the Maimon Lab, as well as other labs, on different navigational behaviors of flies over the timescale of minutes or even a few hours. No one had, however, looked at them for longer than that. This was largely because of a technical issue: no one really knew how to keep the flies alive for longer than a few hours while monitoring these behaviors.

To study navigation, scientists often fix flies in place by gluing them to little metal pins and by allowing them to explore virtual environments projected on LED screens by crawling on tiny, air-supported balls. These set-ups are very useful because scientists can design specific virtual environments for animals to move around in, but they come with a big downside: the fly can't eat or drink while glued in place, so they desiccate and starve within hours. So, how can someone study what flies do over several days if you can't even keep them alive for that long? The answer Jazz came up with, in typical Jazz fashion, was to build something. He designed an entirely new system that allowed flies to be automatically fed while walking in virtual reality environments, keeping the animals alive overnight. The system even included automatic notifications that would appear in Jazz's email every few hours with a snapshot of each fly, so he could check if they were still alive, and a randomly selected Shakespeare quote, to add a little whimsy. "Once I got one that was Help me, Cassius, or I sink! " says Jazz, "and the fly was about to die, so I did need to save it."

With this brand-new rig, Jazz discovered that flies walk in a consistent direction for days or, in some cases, even weeks. The specific direction they chose to walk in varied between flies, but a single fly seemed to choose its favorite orientation and stick with it. "The fact that flies can even do something consistently for so long was very surprising to us," says Jazz. This behavior suggests that there could be memories in the flies' brains that also last that long – something most researchers did not previously think would exist in fruit flies.

At this point you might be wondering: where did Jazz even learn how to build all these things?

Jazz Weisman grew up in Corvallis, a small university town in western Oregon. As a kid, he was interested in "building and designing stuff," but wasn't quite sure what that meant career-wise. His plan was to take a few years between high school and college to figure that out. The opportunity to do exactly that presented itself to Jazz the summer before his junior year of high school when he went to Burning Man with his dad. Late one night, a few days before the main event started, Jazz was walking around the festival and ran into a group of people trying, and failing, to set up a plywood dome. He immediately offered to help and proceeded to spend the next several hours with his newfound friends assembling the structure. The group, very grateful for Jazz's help, invited him to join them for the next week while they built an exhibit of 40-feet tall figurative art sculptures. At the end of the week of working together, Jazz had a job offer and a plan for what to do once he graduated.

During his time as a PhD student, Jazz quickly realized that he enjoyed working on other people's projects much more than on his own.

Through this serendipitous Burning Man connection, at 17 years old, Jazz moved to San Francisco to work with a production company that built art sculptures for music festivals. Throughout his two years with the company, Jazz learned practical building skills like welding and building electronic circuit boards. From there, he went to work for a company that set up lighting for parties and concerts. Then he started working for a company that customized early electric cars to improve their battery life. In between those jobs, he was hired to sail a boat from Mexico to San Francisco.

Four years and several jobs later, in his early twenties, Jazz decided he was now ready to go to college. "I always assumed that eventually I would go to college," he said, "but when I left high school, I really didn't know what I wanted to do." After years of working various engineering and construction jobs, Jazz now had a much better sense of what he wanted to do with his life.

"I love engineering, [but] most people who are engineers have jobs that don't appeal to me," Jazz said. "Sometimes you're just overseeing the assembly of some giant thing. It's like, okay, you're building the giant thing, but you're not actually soldering on anything." He wanted to find a field of engineering with small enough projects that you still had a lot of creative control over the final product and a more direct relationship with the person for whom the product was designed. All the jobs that seemed to fit this description required a PhD in some scientific field. This led him to pursue a science undergraduate degree at Reed College, where he did several years of research in biochemistry.

After college, he was accepted to Rockefeller University's PhD program, where he initially intended to study something related to chemical biology. This plan quickly changed when he saw a talk from Gaby Maimon in his first semester of graduate school. Gaby spoke about the fly like a little computer, trying to understand how its neurons might act as circuits performing computations. This approach appealed to Jazz. It analogized brains to the electronic circuits he was used to studying. "Plus," he said, "they were building all this really cool fly-sized stuff, which looked like tons of fun."

During his time as a PhD student, however, Jazz quickly realized that he enjoyed working on other people's projects much more than on his own. "I think the biggest difficulty for me with a PhD was figuring out what I was going to do on my own project," he said. "[That's] just not a mode I work that well in. I've always worked much better with people than alone." Jazz's new post, as the lab hardware engineer, is the opposite of this kind of solitary work. An average project Jazz works on in the lab usually starts with a lab mate showing up to his desk with a conundrum. They have an experiment they want to do, but the equipment they need to run the experiment doesn't exist, something about their current setup is inconvenient, or a part of their rig is malfunctioning. Invariably, Jazz will have the answer. Sometimes it's a design for a brand-new behavior set-up, which he will help build from scratch. Other times, it's a clever little device that solves the inconvenience. Occasionally, it's a couple of hours of his day trying to figure out why code crashes every time someone tries to run an experiment.

Sometimes, the person he is helping isn't even from the Maimon lab. Jazz has assisted on the assembly of a tiny head-mounted mouse microphone for the Jarvis lab to record mouse vocalizations. He has set up one of his custom heating systems for the Vosshall lab to study mosquito heat attraction. He has shared his designs for a mini-projector system with the Ruta lab so they can study fruit fly visual courtship behaviors. If you attend a neuroscience talk at Rockefeller, chances are there will be some acknowledgment of Jazz Weisman at the end of the presentation.

His hardware engineer job gives Jazz creative control over the final product, the chance to work on problems that he finds intellectually engaging, the ability to build the things he designs, and the opportunity to interact with the person who is going to use his product. "I get to do science," he said, "I get to work with people. I get to build stuff." Exactly everything he imagined he wanted out of an engineering job. "What I'm gonna be doing 10 years from now, I still can't tell you." For now, if you want to build something for your experiments, Jazz is your guy. ■

First-Year Exploration

By Shenni Liang

Photo by Shenni Liang

My life in New York City began on August 26 at two points on York Avenue: the Faculty House and the Zuckerman Research Center at MSK. There, I joined Dr. Christina Leslie for my first rotation. In her lab, I have been working on methodologies to process exciting spatial transcriptomics datasets. This data modality provides perspectives into cellular expression at a much higher resolution. Soon I realized that there was much more to the Upper East Side than digging into medical research, so I began exploring my surroundings. Finding great food spots became my go-to Friday activity. I fell in love with the thick slice of Grandma Pizza at Famiglia, the creamy banana-scented pudding from Magnolia, and the chocolate fondue—with flaming marshmallows—at Max Brenner Chocolate Bar Restaurant. These experiences were even more special when shared with my amazing first-year student cohort!

I've also started taking little retreats for "photosynthesis and cellular respiration"—yes, I'm a human plant. Before sunset, I sometimes walk along Riverside to absorb the warm sunlight and enjoy the serene green views of Roosevelt Island. It feels oddly familiar, reminding me of the Bund in Shanghai, where I grew up. In the evenings, I usually go to yoga sessions at 1300 York Avenue. I learn to focus on breathing mindfully while watching my fellow PhD and Medical School students do handstands "effortlessly."

As the research adventure progresses and my regular routines solidify, I hope to establish a work-life balance between the research and fun times. Juggling all the tasks, seminars, and courses wasn't easy at first, but I believe I can master it step by step. Along the way, I will continue to enrich my life with exhilarating NYC experiences.

NYC Study Spots to Explore!

By Cecilia Cuddy

New York City is a behemoth of a city to tour for any amount of time, so moving and living in the city for the first time is simultaneously exciting and overwhelming. The amazing skyscrapers, bustling traffic, the chaos of Times Square, the fast New Yorker walking pace, and a massive park in the middle of our concrete jungle. These descriptors barely begin to capture the energy and diversity of New York. Rockefeller University's location on the Upper East Side shows you a fraction of what New York City has to offer you.

As a native New Yorker, I have spent my life exploring this city I call home. I have many tricks and secrets that I want to share as you discover more of New York City. In this issue, I will reveal all the best study spots around town. There are so many incredible libraries at Rockefeller University, from the Cohn Library to the Rita & Frits Markus Library. As incredible as those two places are for research and studying, there are many well-known and hidden study spots throughout NYC that you should definitely check out!

New York Public Library (NYPL): One of the most well-known study spots and an iconic piece of architecture in the city, the Stephen A. Schwarzman Building (aka The Main Branch) is a spectacular place to conduct research, study any topic of interest, and check out relevant books and documents for any research you are conducting or writing. Their catalog has over six million items in its circulation, many study spaces for people of all ages, and they offer free career preparation! Another great titbit about NYPL is that you can read any new book for casual reading without having to buy many hard copies! Keep your eye out not only for new books but also for classes and events that they offer, from getting started in genealogy research to computer basics. You should come not only to check out any materials you need for your research but to also marvel at the gorgeous study spaces inside!

New-York Historical Society: The Patricia D. Klingenstein Library is one of the oldest and most distinguished research libraries in New York City. Though it is not a library known for scientific catalogs and documents, it is still a beautiful study spot. I highly recommend you visit their Center for Women's History for exhibits related to the impact of American women in history, and the DiMenna Children's History Museum, a space for families to connect with history through interactive displays and many ongoing programs. Check online for upcoming events, as they often host film screenings, talks with prominent authors on their recent

New-York Historical Society: Abraham Lincoln at the doorstep is always a nice welcome and a great spot to take pictures!

Illustration by Marina Schernthanner

publications, and my personal favorite, the Pets at the City events (these events allow you to bring your dog while inside their museum!). While it is currently under construction, it is a study spot worth visiting when it opens again!

While many people think libraries are the quintessential study spots, other people might find the background noise of a charming café the better place to focus. While Starbucks is a popular choice for coffee and studying, here are some more unique alternatives for you to try out.

Think Coffee: This is my favorite since it has lots of tables and is not too noisy or hectic. The two spots with free Wi-Fi are the Mercer Street and West 13th locations. Though most of the locations are a bit far out, it is definitely at least worth going for their amazing coffee selection as well as their fresh eats, which include vegan options!

CitizenM New York Bowery Hotel: Another spot that I highly recommend to those willing to seriously invest in a high-quality studying atmosphere is CitizenM Bowery. As part of the New York Bowery Hotel, it is an incredible study spot that is open 24/7. It stands out from traditional libraries and cafes with its modern aesthetic and cozy atmosphere. However, it is not available to the public. To get access, you must either stay at the hotel or buy a day pass for $25, or $15 if you become a member. Membership additionally gives you a 35% discount on food and the bar. Still, I would recommend studying there even once just for the chance to use such an incredible co-working space!

Housing Works Bookstore Café: This is the ultimate dreamy and cozy study spot for book nerds in NYC. They have the best second-hand book collection I have ever seen. Housing Works Bookstore is a not-for-profit bookstore, with the majority of its proceeds going to the Housing Works Charity. Another fun fact is that many Swifties will recognize that the bookstore was featured in Taylor Swift's All Too Well music video. The best time to go is either weekday mornings or after 4 pm when crowds have tapered off. Upstairs is usually free of café buzz, lending itself as the perfect spot to study. I could not recommend this study spot more!

Greenacre Park: If you are looking for an outdoor studying experience, Greenacre Park is my first recommendation. While you can certainly study in Central Park or Carl Schultz Park, Greenacre Park is known for its dramatic 25-foot-high waterfall that was constructed from granite blocks. The park has many areas of seating out in the sun with movable tables and chairs as well as a lovely café to grab a quick drink and bite. Walls of ivy and colorful flowers create an enclosed yet still garden-like setting.

The Commons: If you are looking for a shared workspace where you can study and collaborate with your peers, this would be my first choice. Located on the Upper East Side in the Yorkville Building, The Commons aims to offer a free collaborative co-working space for people. They have many open spaces and private offices on multiple floors for people to get together and study. They also have many amenities such as a functioning kitchen, height-adjustable desks, fast internet, soundproof phone booths, and many membership options. This is the best spot for group study sessions! There are so many more spots to study throughout the city, and I've named only a handful to explore.

I hope this selection will inspire you to continue exploring all of the hidden secrets and activities in our wonderful city. ■

Greenacre Park: Studying at one of the tables while watching and listening to the waterfall is so relaxing!

Photos by Cecilia Cuddy

Pets of Tri-I, Pet Sematary 3: Mr. Inky Rises

By Audrey Goldfarb

This fall I had the pleasure of interviewing Sir S. T. Inkerton, also known as Mr. Inky. He is an intimidatingly independent kitty with a soft spot for his owner, Yagmur Konuk, a research assistant in the de Lange lab at Rockefeller. Mr. Inky was rescued from St. Michael's Cemetery in June and has since made a remarkable recovery, thanks to lots of love, rest, and wet food. He now lives a charmed life on the Upper East Side, with plenty of treats and toys, and a very patient Yagmur.

Audrey Goldfarb: How did you and Yagmur meet?

Sir S. T. Inkerton: Well, there were these humans who ABDUCTED me from my cemetery. I was in a very rough shape. Once they started to give me food regularly, I decided they might not be so bad. My human came to visit one day, and I hid from her quite skillfully. I knew she was a contender when she succeeded in tricking me to come out from under the bed.

AG: How do you like Yagmur as a roommate? Do you have any notes for improvement?

STInk: I mean… I like her. That's why I hide around every corner just to scare her. She doesn't seem to like it as much as the ghosts in my old abode – the cemetery.

She seems to think I must like her because I follow her everywhere but in truth I do it because she has no claws and cannot even

groom herself – how is she going to protect herself? I've been trying to teach her by showing it to her by biting her hands but to no avail. Food service, although a little unreliable on protein prep days, is good. We were doing good until she decided to kidnap me and take me to this place called the W.E.T... I thought I was in for a yummy time :(Turns out it is V.E.T.

AG: What are your favorite games?

STInk: It's got to be scaring humans or the disappearing peacock feather. I still don't know where that feather goes. Sigh. AND TRADER JOE'S BAGS. TRADER JOE'S BAGS.

AG: How do you pass the time while Yagmur is at work?

STInk: Work? I thought it was called nap time.

AG: Are you an introvert or an extrovert?

STInk: I like to think of it more as a measure of whether they are worth my attention. Hanging outs and pets are reserved for only those who have earned my respect.

AG: Are you an early bird or a night owl?

STInk: I prefer to be all – human seems to be neither. She refuses my attempts to play at 2 am or 6 am. When is she ever awake? During the nap hours (9 am-6 pm)? She is quite weird.

AG: I love your ear tag. Where did you get it done?

STInk: Well, it was those humans again with the abducting and their V.E.T.s (Very Evil Technicians) I quite like it now. Gives me an edge, you know?

AG: Do you have any other piercings or tattoos?

STInk: The white spot on my chest that human is obsessed with is actually a tattoo. I can't find the heart to tell her.

AG: If you had a superpower, what would it be?

STInk: The ability to open those awful food bags. My repeated attempts so far have been unsuccessful.

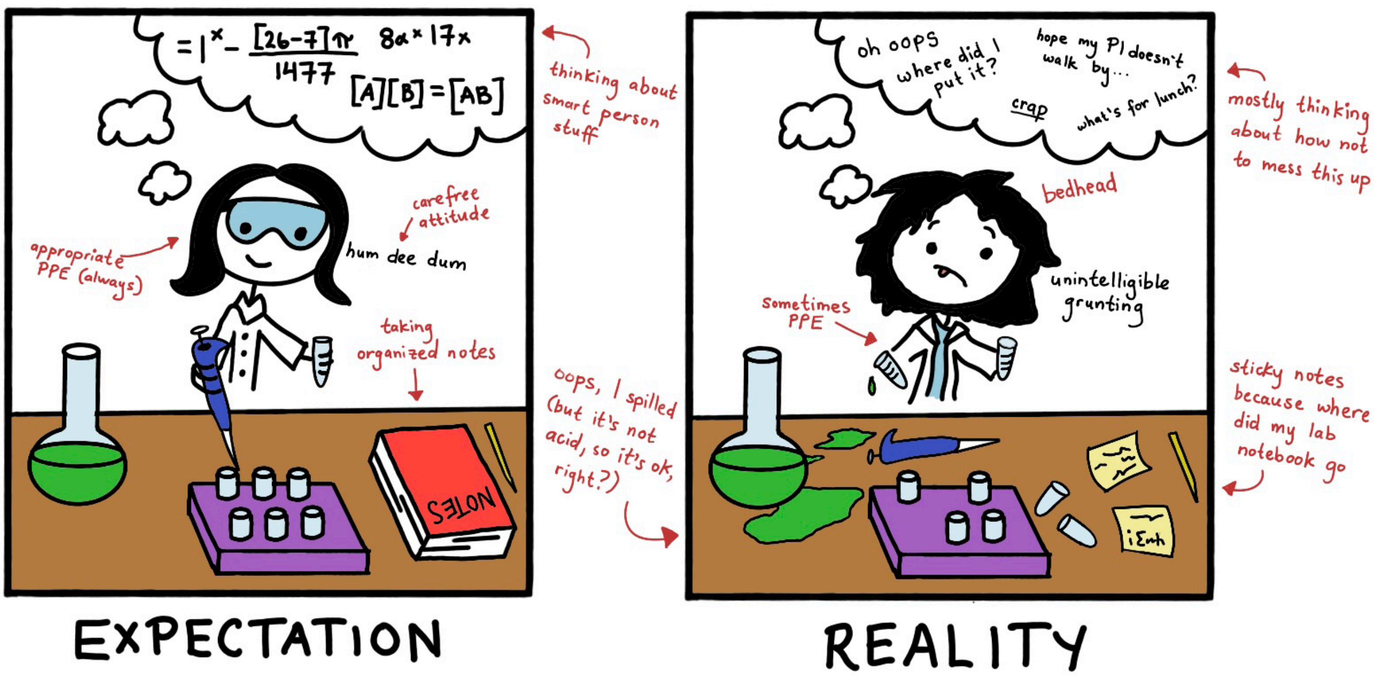
AG: How do you unwind at the end of a long day?

STInk: My human tries to do this thing called reading. So, I love to help her out by sitting on the bad ones. I know a good paper when I see one. ■

Photos provided by Yagmur Konuk

DOING AN EXPERIMENT

BY RACHEL PAYNE



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