

NYU Biology QBIST T32 Training Program

Annual Report for Advisory Committee

Directors: David Gresham, Christine Vogel
Reporting period: Academic Year 2021/2022

Purpose

This report outlines the progress made in the Quantitative Biological Systems Training (QBIST) Program, funded by NIH T32 training grant GM132037, during the 2021-2022 academic year. The report evaluates successful components and outlines proposed improvements for the coming year. Based on this report, we request feedback from the Advisory Committee on priorities and areas of improvement for the 2022-2023 academic year.

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Report

1. Summary of program goals

The NYU Biology NIH T32 Training grant started in July 2019. The current reporting year spans September 2021 - August 2022 (Year 3). The 3 main goals of the training program as defined in the original proposal are:

1. Enable trainees to develop and apply advanced computational and data science skills to complex biomedical research questions.
2. Cultivate trainee skills in mentorship and leadership and provide opportunities for experiential learning through mentorship activities that promote an inclusive environment within the biomedical research enterprise.
3. Enable trainees to actively explore and pursue biomedical career paths outside the traditional academic trajectory.

Progress toward these goals was achieved during the reporting period through three primary activities:

- A. The QBIST Workshop, which was attended by all second year PhD students in the NYU Biology PhD program. This workshop included lectures on diversity and inclusion, career development, and responsible conduct of research. See **Appendix 1** for the 2021-2022 syllabus.
- B. Mentoring the four QBIST trainees as they secured internship positions outside academia during the summer following their second year of PhD studies.
- C. Training for all second year PhD students in mentoring with the goal of participating in one of the mentoring opportunities offered at the department (i.e. high school and undergraduate summer research programs).

Note that these goals were modified from the original proposal to reflect funding cuts and the impacts of the pandemic.

Appendix 2 describes notes for the Advisory Committee on providing feedback on this report.

2. Program Activities during the 2021-2022 academic year

During the third year of the QBIST program we successfully executed all aspects of the QBIST program. The QBIST Executive Committee selected four students from a competitive pool of applicants. The QBIST Directors worked closely with the trainees over the academic year to prepare them for an internship during the summer of 2022. This included identification of internship opportunities, preparation and refinement of trainees' resumes, writing application letters, and corresponding with contacts at the targeted institutions. Three of four trainees from the 2021-2022 cohort successfully conducted their internships. A fourth trainee deferred their internship until the summer of 2023. To assess the impact of internships we performed a post-internship survey (**Appendix 3**).

As can be seen in the answers in **Appendix 3**, the internships were overall perceived as very positive experiences that either reinforced or modified existing career plans. Trainees noted several positive aspects with respect to insights into interviewing, the inner workings of non-academic institutions, different career paths, and the diversity of career options outside academia.

We asked all second year PhD students to complete an anonymous survey and received 5 responses. The results are presented in **Appendix 4**. In comparison to 2019 (in which most PhD trainees planned to pursue a career in academia), this year's trainees were either not sure or leaning towards industry. Trainees felt that in 2020 they improved the desired quantitative skills in relevant courses. Trainees appeared largely unaware of various skill development courses offered at NYU.

All QBIST course elements received consistently high evaluations with respect to usefulness, with average scores being greater than 4 out of 5 for all but two course elements. Lectures 3 - 8 of the QBIST workshop also fulfilled the requirement for training in the *Responsible Research Conduct* as required by the National Institutes of Health. The second year of the QBIST workshop also included four new sessions on *Race and Racism in Science*. These sessions were generally perceived very well. Trainees particularly noted a session on Responsible Analysis of Data and suggested expansions on the topic.

All QBIST activities are hosted on the QBIST webpage:

<https://as.nyu.edu/content/nyu-as/as/departments/biology/academics/phd/qbist-program.html>

The **Advisory Committee** remains as originally proposed:

- Susan Anton - Professor at the NYU Department of Anthropology and Acting Dean of the Graduate School of Arts and Science
- Jan Plass - Paulette Goddard chair in Digital Media and Learning Sciences at the Steinhardt School of Culture, Education, and Human Development at NYU
- Liam Holt - Assistant Professor at the Department of Biochemistry and Molecular Pharmacology at NYU Grossman School of Medicine

In response to the **Advisory Committee's** recommendations, we implemented the following additional items:

1. We continued the new module, first introduced in year 2, to the QBIST workshop on Racism and Science which included lectures on bias in artificial intelligences and genetic determinism in university genetics courses.
2. We continued the session on Entrepreneurship and Startups presented by the NYU Entrepreneurial Institute which had received great reviews from students
3. We ensured that second year QBIST trainees were able to undertake internships following the interruptions due to COVID.

3. Planned Activities for the 2022-2023 academic year

Based on the evaluation of the QBIST workshop components, we will continue the existing workshop, including the module on *Race and Racism in Science*.

We are planning the following activities in the coming academic year.

1. The QBIST workshop with sessions as outlined in **Appendix 6**.
2. Increase awareness amongst students for existing writing workshops, such as those offered by the NYU School of Journalism on Science Communication
3. Enable exchange between past and current QBIST trainees on securing an internship and having a successful internship experience
4. Support QBIST trainees to identify and undertake internships by better use of the Wasserman Center.
5. Include sessions in the QBIST workshop from NYU Alumni who are now working outside academia.

4. Appendix 1: 2021-2022 QBIST Workshop syllabus

The Quantitative Biological Systems Training (QBIST) Workshops 2021-2022 Syllabus

Directors: David Gresham and Christine Vogel

The goals of the QBIST workshop are:

- Develop skills in science communication
- Gain exposure to the network of institutional and peer support available to NYU Biology PhD students
- Develop skills in professional and career development

The QBIST workshop is attended by all second year NYU Biology PhD students.

Note: For the 2021-2022 academic year all sessions will be held in person if possible.

Session 1: Friday October 8, 12.30-2 pm, 805 CGSB

Introduction to the QBIST Workshop
David Gresham and Christine Vogel

Special session: Friday November 5, 12.30-2 pm, 805 CGSB

Academic careers at a Liberal Arts College
Gabriel Perron (Professor, Bard College)

Session 2: Friday November 19, 12.30-2 pm, 805 CGSB

CVs and Interviewing
Kate Rockey-Harris (Director for Graduate Career Development, Wasserman Center)

Session 3: Friday December 3, 12.30-2 pm, 805 CGSB

Teamwork, Leadership, and Management
Christine Ponder (Director, Office of Research Affairs)

The following sessions are part of the Responsible Conduct in Research Training. All sessions are scheduled to be held in person 4-6pm in Meyer 636. For questions, please email Jess Holman at jh4728@nyu.edu with the subject of your email as "RCR 2022 Participant".

Thursday February 10: Ethical Considerations in Research with Animals with Lee-Ronn Paluch

Thursday February 17: Ethical Considerations in Research with Human Subjects with Scott Fisher

Thursday February 24: Responsible Data Analysis, Management & Sharing with Vicky Rampin

Thursday March 3: Skills for a Career in Research with Tony Movshon

Thursday March 10: Mentor/Trainee Responsibilities and Collaboration in Science with Chiye Aoki

Thursday March 24: Publication Practice and Peer Review with Claude Desplan

Thursday March 31: Research Misconduct and Conflicts of Interest and Commitment with Erik Schneebeck

Session 9: April 8, 1pm - 2 pm, 805 CGSB

Dee Dao, NYU Entrepreneurial Institute
Biotech Start ups

Session 10: Friday May 6, 12.30-2 pm, 805 CGSB

Mentorship and Maximizing Training Experience
Christine Ponder and Christine Vogel

The following sessions are offered through the Race and Racism in Sciences lecture series.

4:00 - 5:30pm: Presentation and speaker question and answer, on Zoom

5:30 - 6:00pm: Optional debriefing and discussion meant to create cross-department opportunities to discuss topics relevant to diversity, equity, and inclusion and to brainstorm applications of the topics within and across the sciences, on Zoom

Session 11 - Thursday April 7

Marie Bragg, School of Medicine, Population Health

With recognized research expertise on identifying and affecting environmental and social factors associated with obesity, food marketing, and health disparities, Dr. Bragg is also working with the NYU Langone medical school task force to redesign the medical school student curriculum to include coursework on racism, equity, and social determinants.

Session 12 - Thursday April 14

Meredith Broussard, Journalism

Author of Coded Bias and Artificial Unintelligence, Broussard - a software developer and journalist - identifies fundamental limits to what we can (and should) do with technology. She explores the fallout of the discovery that facial recognition does not identify dark-skinned faces accurately and pushes for legislation to govern against bias in the algorithms that impact us all.

Session 13 - Thursday April 28

Jacob Faber, Sociology

Probing spatial inequality, Dr. Faber identifies how the distribution of people by race and class interacts with political, social, and ecological systems to create and sustain economic disparities. His scholarship highlights the rapidly-changing roles of numerous institutional actors (e.g. mortgage lenders, real estate agents, check cashing outlets, and police officers) in facilitating the reproduction of racial and spatial inequality.

Session 14 - Thursday May 5

Matthew Rockman, Biology

Dr. Rockman studies how and why individuals differ from one another, questions with long-fraught histories in his research fields of evolutionary biology and genetics. These disciplines have struggled with genetic determinism, population essentialism, and teleological explanation, all of which contribute to a dark history of eugenics and racism. Rockman discusses how these problems arise from flawed but entrenched disciplinary metaphors, and he outlines efforts to reform our evolution and genetics curricula to avoid harmful misconceptions.

5. Appendix 2: Notes on the role of the Advisory Committee

From grant proposal:

Advisory committee assessment criteria

On the basis of the annual report, and discussion with QBIST program trainees, the QBIST program advisory committee will provide critical assessment of the extent to which:

- Program faculty foster the integration of quantitative and traditional biological sciences
- Program faculty are engaged in activities that promote trainee career development
- Program faculty are promoting the adoption of best practices in scientific rigor, reproducibility, and responsible conduct of research
- Trainee/mentor relationships are serving the best interest of the trainee

Protocol for Responding to Advisory Committee Critique

The QBIST program advisory committee will provide a written summary of their assessment of the program that will include suggested strategies for addressing any issues that they have identified. The annual report from the QBIST program advisory committee will be reviewed and discussed by the entire QBIST program executive committee at their annual meeting. Subsequent annual reports by the QBIST program directors will explicitly address issues outlined in the annual report. To promote transparency, the annual QBIST program advisory committee report will be posted on the QBIST web portal.

6. Appendix 3: Results of the QBIST internship survey

Please describe the logistics of your internship: online/in person, when, for how long, where, your responsibilities.

- "My internship was under the mentorship of Dr. Ronan O'Malley at the DOE Joint Genome Institute (Part of the Lawrence National Laboratory). There were several online meetings with him and his staff before a two week visit in Berkeley CA. The visit involved some wet-lab work, where I received training for Pac-Bio library preparation and sequencing. The data will be sent to me so I can remotely work with one of staff scientists to learn to process long sequencing reads. I also received tours of the production portion of JGI from Dr. Yuko Yoshinaga (sample intake/prep/storage) and Dr. Chris Daum (sample sequencing and data processing), so I could learn more how the industry aspect of the lab works. I worked with many staff scientists to learn about their research and day-to-day responsibilities.
- This summer, I also spent three weeks in person at the Cold Spring Harbor Laboratory for the Frontiers and Techniques in Plant Science Course, which involved hands on training in many wet lab techniques for plant science that I have never used before (agrobacterium infiltration to study biomarkers and introduce artificial genetic circuits to tobacco leaves, single cell sequencing [10X Genomics], and leaf lipid isolation and quantification). The course instructors flew in a different speaker each day, many from government and industry jobs, to discuss their research and careers. I learned a lot about non-academic careers as well as the goals of industry and how they differ from standard basic academic research. This course was also an incredible networking opportunity to gain face-time with plant biologists from diverse career paths. "
- I was looking for a remote computational biology internship to get exposure to different types of data analysis, research questions, and biotechnology industry experience.

Please describe what you learned from it that helped you in your career planning. Which aspects of your internship helped you confirm (or change) your current career goal?

- Before the internship I strictly thought I wanted to work in Academia. There are a few aspects of industry that now interest me, such as the increase in funding/resources. Those I worked with also seemed to have a slightly better work/life balance compared to academics, which was definitely something important to consider.
- From looking from internships, I learned that many companies had few spots but many qualified applicants. Interns that were offered positions were most likely those that worked on exactly the same technique or topic as the advertised project. It does not seem to me that internship hiring is reflective to staff hiring. ie) Staff hiring is more holistic whereas intern hiring is based on their current PhD thesis topic and skillset.
- What was the most surprising aspect about your internship? (It is OK if they are several.)
- "I did find it interesting that many of the staff scientists I met don't do ""hypothesis-based research"", instead their jobs were strictly focused on methods development and improvement (RnD) for the production side of the lab. JGI receives tens of thousands of samples a year for sequencing from around the world and some people work just to process and sequence those. I was also surprised that so much of the process is automated. All of the samples they receive are barcoded and processed by sample sorting-robots (supervised by the staff scientists), and many of the sequencing

protocols are fully automated with pipetting robots. As cool as it was to see the robots and watch them work, I do think it would get sort of bland not doing the lab work by hand. The scientists also mentioned that for many samples, the robots actually generate low quality libraries as they cannot completely make up for decisions a scientist would make during library prep (pipetting out the last drops of ethanol after washing DNA-ligated beads, re-pipetting if bubbles appear in the reaction, etc). I was also surprised that one can work with the lab for essentially "no cost", if they write a grant to the lab and it is accepted. They would just be responsible for preparing the DNA or RNA and mailing it to JGI. This is much more open source and publicly available/accessible than I assumed it would be.

- There was also a very different workplace "culture." While I am sure I cannot make blanket statements about all of industry, this lab in particular was much more professional than most academic labs I have been in. Office spaces were fully separate from the lab work space, and cubicle areas were entirely silent the entire time. There were no personal conversations between staff in the offices or lab. The lab was also much much more strict about security and safety. Everyone is required to wear full PPE (Long pants, Lab Coat, Goggles) at all times if entering in the lab, even if they aren't doing lab work, which seemed sort of excessive to me. In terms of security, there was a guard to scan badges at the entrance of the facility which was unexpected. "

Which aspects of your internship experience could have gone better? How could they have been better (constructive ideas)?

- "I think the goals of QBIST (learning about non-academic careers etc) are incredibly useful, and I am so glad that I did this. However, in my opinion, 4-6 weeks is sort of a long time for a visit if that is the main goal of the internship. I was able to fit in many tours, meetings, and wet-lab work, spanning most aspects of this large operation at JGI within two weeks with time to spare, so I am not sure how much more could have been done if it had lasted 4-6 weeks. The PI also mentioned that 4 weeks would be sort of a long visit if the internship wasn't meant to be research based. It may be more realistic to expect shorter trips in the future, though I am sure it varies depending on the particular internships, and I am sure others could easily be 4-6 weeks. I was at first disappointed that my visit was cut short to two weeks, but it was plenty of time to get a thorough introduction to how things work at JGI and meet a majority of the JGI staff affiliated with Ronan's research program.
- I am sure this was my mistake, and I likely missed this info somewhere, but I was not aware that the internship was meant to stay near the tri-state area. It made funding some of the travel tricky and more of a hassle than expected, so re-emphasizing what resources are available for travel would be helpful for future QBIST trainees in planning realistic/feasible internships. "
- I learned that internships applications should have occurred in earlier in December/January. February is already too late.

Overall, what would your advice be to the next generation of QBIST trainees about the internship experience?

- "I think it is good to be clear to whomever you plan on working with about the goals of QBIST. It may be obvious if people are interning with publishing companies or entities like that, but it may be nebulous/confusing for internships with research-based companies. I was not very clear initially, and we initially spent a great deal of time planning a 4-6 week research project. After talking more about the goals of QBIST with Ronan, he realized that just doing wet lab was not the point, and we ended up replanning the whole thing right before. I was lucky that he was very flexible and ok with setting

up fairly last-minute meetings with his scientists and replanning a smaller research portion, but it was definitely sort of a last minute burden to put on him.

- This also may seem obvious, but planning a long visit is not a trivial task. We spent a lot of time planning internship content for ""late summer"" but when it came to midsummer, we realized we didn't actually plan ahead as to when this internship would actually happen. We could only find 2 weeks that he could host me at LBL, as many of his staff scientists were gone for the end of summer and many of the production heads were also only there for those two weeks. It ended up working out fine for me, but I think I got lucky, as he was able to pack a lot into those two weeks. In the future, if internship content for a long trip is planned, then choosing a specific month ahead of time (at least during the spring before) is a good idea to make sure there is time for everything to actually happen.
- Also if you plan on working in a lab space, make sure you set aside a few days for the required safety/security training.
- Lastly, remember that based on the timing of the internship, this is happening soon after the NYU thesis proposal. Trying to plan this internship while trying to prepare the thesis proposal exam was difficult, as I did not plan ahead well for either. This is another reason why planning it much earlier in the spring is very important. "
- For a biotech internships, apply for in December. February is too late.

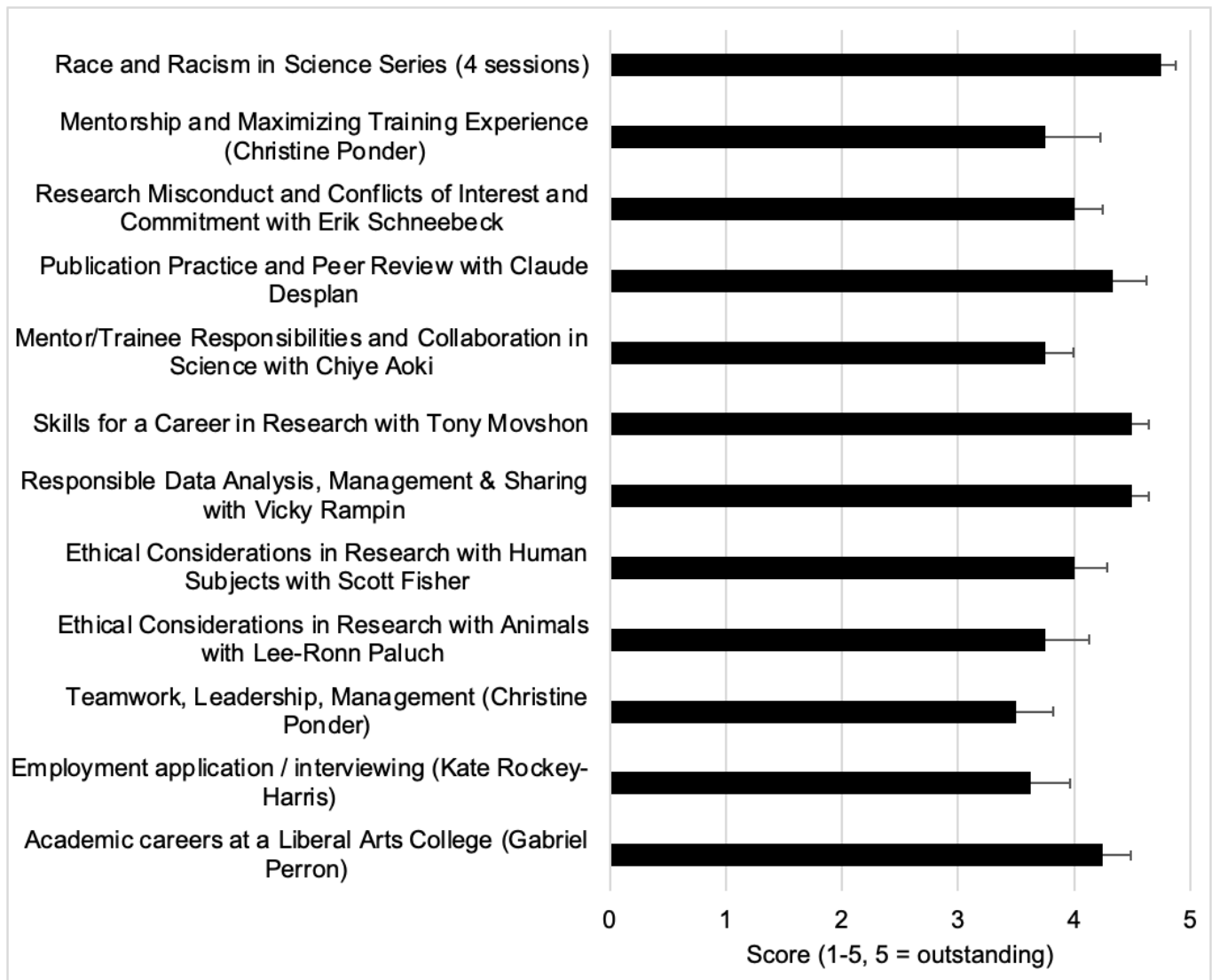
7. Appendix 4: Results of the QBIST workshop

Career goals:

Industry (40%) - Academia (60%)

Workshop modules:

Scores of 1-5 for general usefulness of the module (5 = outstanding)



Suggestions for future workshop:

- Types of careers in Science writing

- Brown bag lunches with people who currently work in other sectors (Industry, NonProfit, SciComm, Government).
- More training/tips on how to be a effective leader, mentor, and manager (of people and labs)-- a Q&A panel of people who work in other sectors may be one component. Other components can be workshops with coaches.
- Different workshop modules

6. Appendix 5: QBIST Workshop 2022-2023 syllabus

The Quantitative Biological Systems Training (QBIST) Workshops 2022-2023 Syllabus

Directors: Christine Vogel and David Gresham

The goals of the QBIST workshop are:

- Develop skills in science communication
- Gain exposure to the network of institutional and peer support available to NYU Biology PhD students
- Develop skills in professional and career development

The QBIST workshop is attended by all second year NYU Biology PhD students.

Note: For the 2021-2022 academic year all sessions will be held in person if possible.

Friday September 23, 12.30-2 pm, BIO-CHEM-WAV 540 CONF

Introduction to the QBIST Workshop
Christine Vogel and David Gresham

Friday September 30, 12.30-2 pm, BIO-CHEM-WAV 540 CONF

Science and Outreach
Grace Avecilla (BioBus)

Friday October 7, 12.30-2 pm, BIO-CHEM-WAV 540 CONF

Teamwork, Leadership, and Management
Christine Ponder (Director, Office of Research Affairs)

Friday October 14, 1pm - 2 pm, BIO-CHEM-WAV 540 CONF

Dee Dao, NYU Entrepreneurial Institute
Biotech Startups

Friday October 21, 12.30-2 pm, BIO-CHEM-WAV 540 CONF

Mentorship and Maximizing Training Experience
Christine Ponder

Friday October 28, 12.30-2 pm, BIO-CHEM-WAV 540 CONF

CVs and Interviewing
Marlene Brito

*The following sessions are part of the Responsible Conduct in Research Training. All sessions are scheduled to be held in Spring 2023 at a time to be determined. **The training is mandatory for all 2nd year students.** Information to follow – last year’s website:*

<https://as.nyu.edu/departments/cns/events/EventDescriptions/RCR.html>

Thursday: Ethical Considerations in Research with Animals with Lee-Ronn Paluch

Thursday: Ethical Considerations in Research with Human Subjects with Scott Fisher

Thursday: Responsible Data Analysis, Management & Sharing with Vicky Rampin

Thursday: Skills for a Career in Research with Tony Movshon

Thursday: Mentor/Trainee Responsibilities and Collaboration in Science with Chiye Aoki

Thursday: Publication Practice and Peer Review with Claude Desplan

Thursday1: Research Misconduct and Conflicts of Interest and Commitment with Erik Schneebeck

Race and Racism in Science (if held)