
# SELF-STUDY REPORT

Department of Biological Sciences
Lehman College, CUNY

February 27, 2024

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## 1. Lehman College

Lehman College, nestled on a serene 37-acre campus in the northwest Bronx, New York City, is the senior college of the City University of New York (CUNY), the largest urban university system in the United States. CUNY boasts a comprehensive network of 11 senior (4-year) and 7 community (2-year) colleges, educating over 47,000 students in STEM majors alone. Most of the CUNY colleges are recognized as Minority-Serving Institutions (MSI), Hispanic-Serving Institutions (HSI) or both. Lehman is both an MSI and HSI designated college, fostering a welcoming and supportive environment for its diverse student body. The School of Natural and Social Sciences, which includes the Department of Biological Sciences, enrolled 4,609 students as of Fall 2021. The college's unwavering commitment to academic excellence is reflected through its vision, mission, and values, prioritizing a nurturing and enriching learning experience for all. Fueled by the CUNY Chancellor's renewed focus on science education and experiential learning, the dedicated science faculty at Lehman College is continuously innovating. Their efforts translate into exciting opportunities for students in STEM majors, including innovative instruction, immersive research experiences and enhanced academic advisement. Lehman College is not just about individual success; it is deeply invested in uplifting the Bronx community. Its ambitious "90 x 30 Challenge" aims to award 90,000 degrees and credentials by 2030, significantly boosting educational attainment within the borough. These impactful initiatives have propelled Lehman College to new heights. According to the Equality of Opportunity Project, it ranks an impressive 3rd among public colleges/universities in the nation for improving the economic mobility of its students. Furthermore, the American Council on Education recognizes Lehman College as the top HSI in the country. Lehman College stands as a testament to the transformative power of education. Its dedication to academic excellence, commitment to diversity and inclusion, and unwavering support for its students and community solidify its position as a beacon of opportunity in the Bronx and beyond.

## Student Population

Lehman College's student body reflects the vibrant diversity of the Bronx. Over 12,000 undergraduates thrive in this welcoming environment, with 60% calling the borough home. The college proudly empowers first-generation students, with over half hailing from the Bronx and families with household incomes below $30,000. In 2018, the top-five declared undergraduate majors were: nursing, business administration, psychology, sociology, and health-services administration. The top-five declared graduate majors were: nursing, social work, counselor education, special education/early childhood, and early childhood education, showcasing Lehman's commitment to serving community needs. As of 2021, 69% of students identified as female, 48% Hispanic, and 30.3% Black/Non-Hispanic, mirroring the borough's demographics. This diverse cohort is supported by dedicated initiatives like SEEK and honors programs, ensuring everyone has the tools to succeed. Transfer students are provided with dedicated advisement which contributes to the dynamic learning environment. While retention rates have steadily increased overall, a gap remains between STEM and non-STEM/health-related fields. Lehman is actively addressing this through programs like Go, Persist, and Succeed and partnerships with CUNY Community Colleges, paving the way for a brighter future for all its students.

Since 2004, Lehman College has had a steady rise in enrollment and retention. The number of undergraduates enrolled at the college increased from 8,108 in 2004 to 12,375 in 2021. Also, the retention percentage for first-time freshmen increased from ~76% in 2004 to ~81% in 2019. Despite improvements in retention at the college level, a sharp discrepancy remains between retention in STEM versus non-STEM and health-related fields. This difference is evident from the number of degrees that were awarded by various schools relative to the increased enrollment. In 2003-2004, the School of Natural and Social Sciences awarded 190 STEM degrees and 407 non-STEM degrees. During the same period, the School of Health Sciences, Human Services, and Nursing awarded 211 health-related degrees. In 2018-2019, the School of Natural and Social Sciences school awarded 354 STEM and 1029 non-STEM degrees. During the same period, the School of Health Sciences, Human Services, and Nursing awarded 831 health-related degrees. These data indicate that the positive change was much greater for the health-related majors at 294% and for non-STEM majors at 153% than for the STEM majors at 86%. Given the increased

enrollment, it appears that retention in STEM majors is improving but continues to lag compared to retention in health-related majors.[1]

The 2017 survey of the Lehman freshmen conducted by the Cooperative Institutional Research Program (CIRP) suggests that the lagging retention in STEM might be due to lack of student interest in STEM but not due to their perception of college preparedness or their confidence in their abilities to succeed in STEM. The survey data show that only 25% expressed an interest in STEM majors of which 12% selected biology to become physicians or nurses. Over 97% of the 532 surveyed students reported that their average grade in high school was A or B, 78% indicated that they had 4 years of math in high school, and 81% had completed pre-calculus/trigonometry. When asked about their abilities, 66% reported that they have a major strength or somewhat strong skill in critical thinking and 79% reported high to moderate confidence in using technical science skills. When asked about problem-solving skills, 57% felt very confident. Interestingly, when asked whether they would pursue a science-related research career, 55% reported that they would or they might consider such a career. Collectively, the data suggest that freshmen enrolled at Lehman College for the first time are mostly interested in non-STEM majors but are open to considering research careers and believe they know how to think critically and to solve problems.[2]

The number of first-time freshmen at Lehman College is also rising. The college served 873 undergraduate freshmen in 2004 but enrolled 1582 for fall 2021.[3] All entering freshmen have a dedicated advising unit to support them from their first semester to their final semester. Over 80% of the incoming students are placed in the "Go, Persist, and Succeed" program to promote their success in college. The remaining 20% of students are placed in remedial (SEEK), honors (Macaulay Honors College /The Lehman Scholars Program) or accelerated programs (Accelerated College Education). During their first semester, all students participate in a full-time learning community (also known as blocks) and take the same five courses together as a cohort. Additionally, in collaboration with some of the CUNY Community Colleges, Lehman provides intensive support for its STEM students through the PTS[3] program (Pathways to Student STEM Success) to increase the number of underrepresented students who graduate with STEM degrees.[4]

[1] https://www.lehman.edu/lehman-legacy/lehman-facts.php
[2] https://www.lehman.edu/institutional-research/cirp.php
[3] https://www.lehman.edu/institutional-research/interactive-factbook.php
[4] https://lehman.edu/pathways-to-student-stem-success/#1

## Mission, Vision, and Values

Lehman College is driven by a bold vision: to graduate twice as many students and award 90,000 degrees and quality credentials by 2023. As its guiding principles, Lehman College has stated the following mission, vision, and values and has developed a strategic plan with key elements and specific goals to achieve them.

Mission: Lehman College, an urban institution, and economic and cultural catalyst in the Bronx, is a national engine for social mobility and a vibrant center of discovery and creative work, providing a transformative educational experience while advancing equity, inclusion, and social justice.

Vision**:** Lehman College will be a nationally recognized leader in educational attainment and the expansion of knowledge through innovative curriculum and pedagogy, original research, and scholarship, and enhanced digital solutions. The College will be a model of engaged citizenship and a leading force for a more just and sustainable world.

Values**:** Inspired by the life of our namesake, Herbert H. Lehman, we are committed to:

- *Social Justice***:** Advocating for human rights, honoring differences, and working towards equality and equity for all.
- *Excellence*: Pursuing innovative teaching, research, and scholarship to produce a diverse pipeline of leaders and change agents committed to novel and sustainable solutions and igniting new possibilities.
- *Ethics:* Upholding the principles of academic freedom, and demonstrating honesty, integrity, respect, and care in our interactions with others.
- *Diversity and Inclusion***:** Fostering a campus environment that respects and values diverse perspectives and identities and where all members of the Lehman community experience a sense of belonging.
- *Service:* Empowering the community through the increased engagement of faculty, staff, students, and alumni in outreach and partnerships contributing to individual achievement, economic development, and the common good.[5]

[5] https://www.lehman.cuny.edu/about/mission.php

## Lehman College Strategic Plan 2021 - 2025

Key Elements of the Plan:

- Build on the successful work of faculty and staff in producing a diverse pipeline of leaders and change agents.
- Build on the importance of both active and applied learning, centered in the liberal arts.
- Focus on educational attainment in the Bronx, a commitment to social justice, and finding innovative solutions to the challenges and opportunities in the region and beyond.
- Align with ongoing College plans and initiatives as well as CUNY strategic goals and sets Lehman apart as a catalytic institution and a national engine of inclusive excellence and upward mobility.
- Desire for a 5-year plan, that is short, and takes account of current realities (e.g., COVID-19) and the changing landscape of higher education.

Goals:

- **Goal 1:** Educate, empower, and engage students to participate in a global society and enhance career advancement.
- **Goal 2:** Enhance faculty and staff success.
- **Goal 3:** Sustain growth, vitality, and institutional effectiveness.
- **Goal 4:** Embrace the spirit of community engagement.

# 2. Department of Biological Sciences

Since the last self-study in 2013, the Department has grown in size and capacity, changed its vision and goals, revised its undergraduate and graduate curricula, and implemented a process of assessment to evaluate its programs. The Department currently includes 20 full-time faculty (9 Full Professors, including 1 about to retire; 2 Associate Professors; 3 Assistant Professors; 6 Doctoral Lecturers), ~40 part-time adjunct instructors, five college laboratory technicians and a varying number of adjunct lab techs, one assistant program coordinator, and one secretary. The department's main office is in Davis Hall. However, in 2013, the Department moved some of its classrooms and research laboratories to a new science facility that was built at Lehman College to promote collaboration among scientific disciplines and to integrate teaching with research. The state-of-the art Science Hall is home to research labs and offices of nine faculty members, CLT offices, teaching classrooms, and a rooftop research greenhouse. Davis Hall houses the Department office, teaching labs, CLT offices, space for adjunct staff, research labs and offices of the

remaining faculty, an animal facility for mice, a teaching greenhouse, and a research greenhouse. Renovated classrooms facilitate in-person as well as hybrid/HyFlex teaching modalities.

## Mission, Vision, and Goals

In 2018, the Department revised its mission, vision, and goals to align them with those of Lehman College.

Mission: To help students meet their career goals by providing opportunities for education and research that span the breadth of biological sciences at the undergraduate and master's levels.

Vision: The Department of Biological Sciences will be an academic unit within Lehman College that trains students to become knowledgeable and ethical professionals both nationally and locally (**Figures 1 and 2**, *see next page*) for the 21st century workforce, able to solve a broad range of biologically related problems that require technical, cognitive, and communication skills.

Goals***:*** To achieve its vision, the Department has adopted a new set of goals and objectives.

**Goal 1:** Students learn to apply scientific methods and knowledge for solving biological problems.

- *Objective 1*: Understand a biological problem or question and articulate its significance.
- *Objective 2*: Critically evaluate an experimental method used to solve a biological problem.
- *Objective 3*: Understand the results of a biological experiment presented in various formats.
- *Objective 4*: Use a statistical tool to answer a biological question or solve a problem.
- *Objective 5*: Use a technical tool to answer a biological question or solve a problem.
- *Objective 6*: Critically evaluate evidence and sources of information for solving a biological problem.

**Goal 2:** Students learn to effectively communicate results of a biological study to any audience.

- *Objective 1:* Create a convincing presentation of a biological research or project.
- *Objective 2:* Give a convincing oral presentation of a biological research or project.

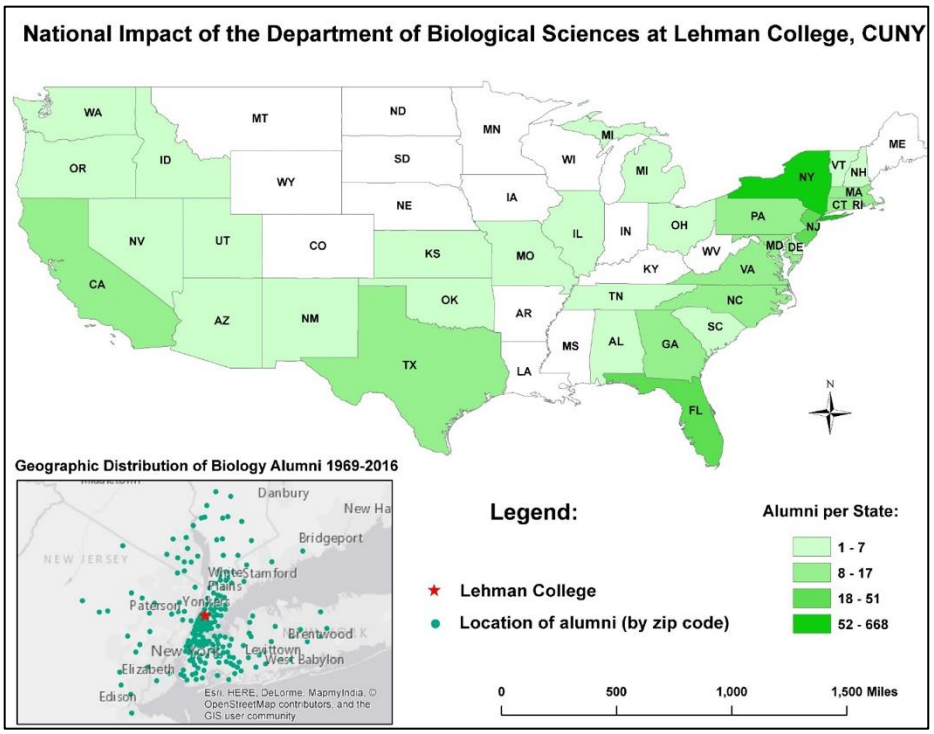



**Figure 1. Distribution Map of Biology Graduates**. This map, based on the Lehman Alumni Database, visualizes the density of alumni with biology degrees across the United States from 1969 to 2016.

**Figure 2. Biology graduates, 2019.**

3. Undergraduate Program

The Department aims to provide its future biologists with a solid background based on the substantial new information comprising modern Biology and to meet the needs of students with different career goals and scientific interests. In 2018, the Department replaced its Bachelor of Arts (BA) degree with a Bachelor of Science (BS) degree and overhauled its curriculum. The Department now offers students the opportunity to earn a BS degree in biology with a choice of four tracks or the Bachelor of Arts degree in Biology for schoolteachers (**Figure 3**, *see next page*). Students majoring in biology can pursue either a BS degree or a five-year BS-MS dual degree. The four tracks were designed to provide a variety of options for students to pursue their career goals and to create a guideline for choosing their courses (Appendix A shows the requirements for each track and Appendix B shows a map for completing the BS degree in four years).

**THE DEPARTMENT OF BIOLOGICAL SCIENCES OFFERS A VARIETY OF OPTIONS FOR UNDERGRADUATE STUDENTS TO PURSUE THEIR ACADEMIC AND CAREER GOALS.**

## Biology, B.S.

Track 1: Biomedical Sciences

Prepares students for further training in health professions (e.g. medical doctor, dentist, veterinarian, pharmacist, physician assistant, chiropractor, osteopath, and others).

Track 2: Organismic Sciences

Prepares students to become entry-level lab technicians or for graduate school training to become research scientists, professors, public health specialists, and any other professions in government or industry that requires knowledge of life sciences.

Track 3: Brain Sciences

Prepares students for graduate school training to become cognitive neuroscientists, brain science researchers, or any other professions in government or industry that requires knowledge of brain sciences.

Track 4: Bioenvironmental Sciences

Prepares students for graduate school training to become plant scientists, ecologists, environmental biologists or any other professions in government and industry that requires knowledge of environmental biology.

## Biology, B.A. – Middle and High School Education

Prepares students to teach science at middle or high school. A minor in education is required.

## Biology, B.S./M.S. Dual Degree

A 5-year dual program for eligible students to earn both a Bachelor of Science and a Master of Science degree. Students are guided by a faculty committee to complete a research thesis.

**Figure 3. Biology degree programs and tracks.**

## Enrollment

Since the last self-study in 2013, the enrollment for biology undergraduates has risen steadily, but the increase became more evident after 2018 when the new BS degree was offered, and the new curriculum was implemented (**Figure 4**).

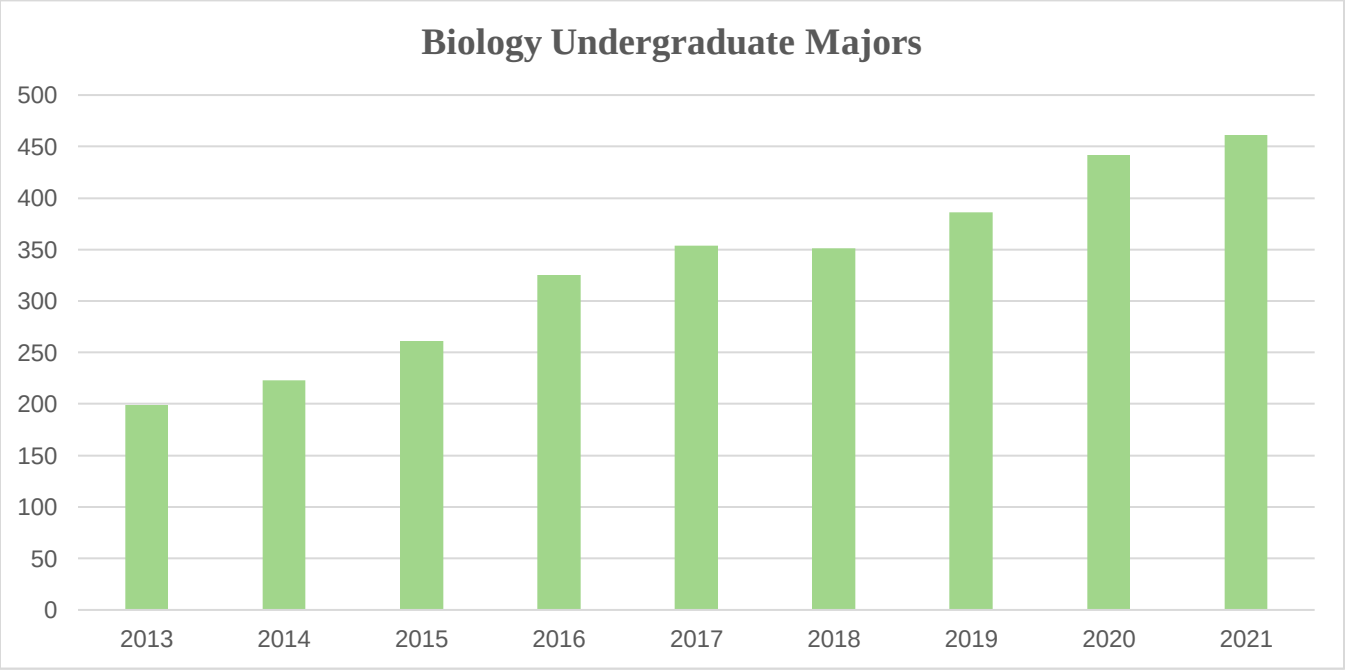



**Figure 4. Number of Biology Undergraduate Majors, 2013-2021.**

The increase in enrollment is significant when the number of declared biology majors is compared to other STEM majors in the School of Natural and Social Sciences (**Figure 5**, *see next page*). Both Biology and Computer Science departments have had a steady rise in the number of declared majors since 2018 and a sharp increase in numbers since 2013.

As of 2021, biology was the sixth most popular major at Lehman (**Figure 6**, *see next page*). Whereas in 2013, biology and computer science were significantly behind the top five majors, in 2021, they were slightly trailing behind Health Science Administration and Sociology.

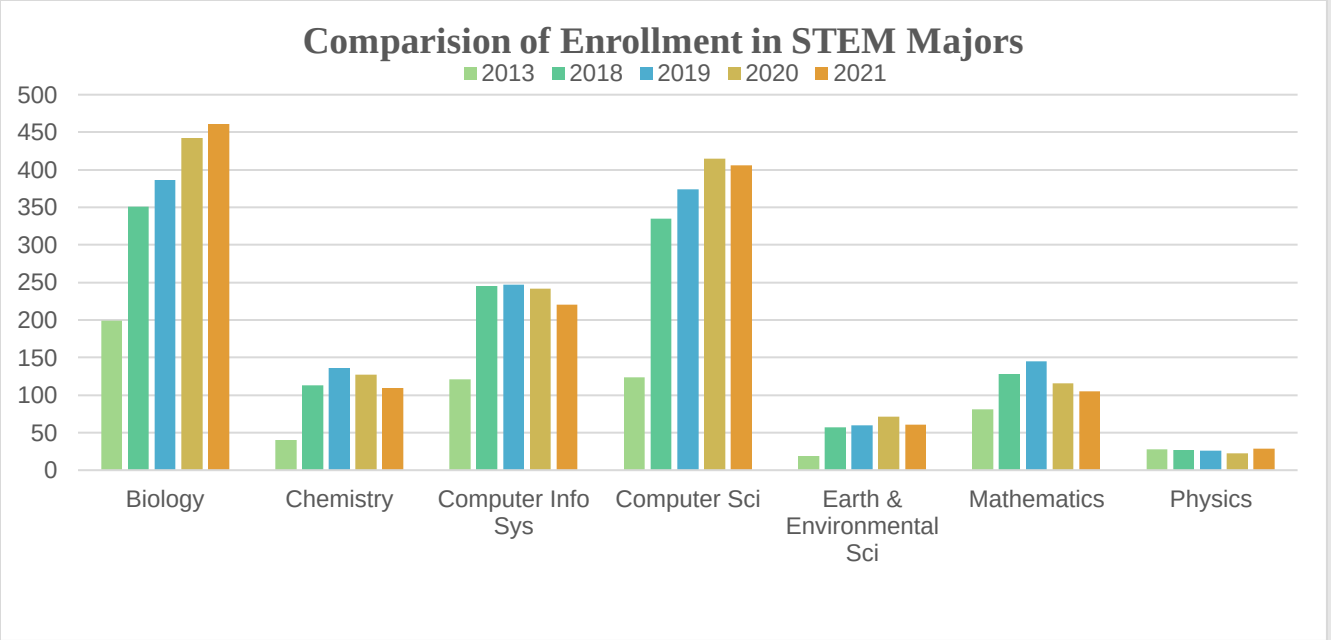



**Figure 5 Lehman College STEM Enrollment Trends**. This graph compares the enrollment of students in STEM majors at Lehman College from 2013 to 2021.

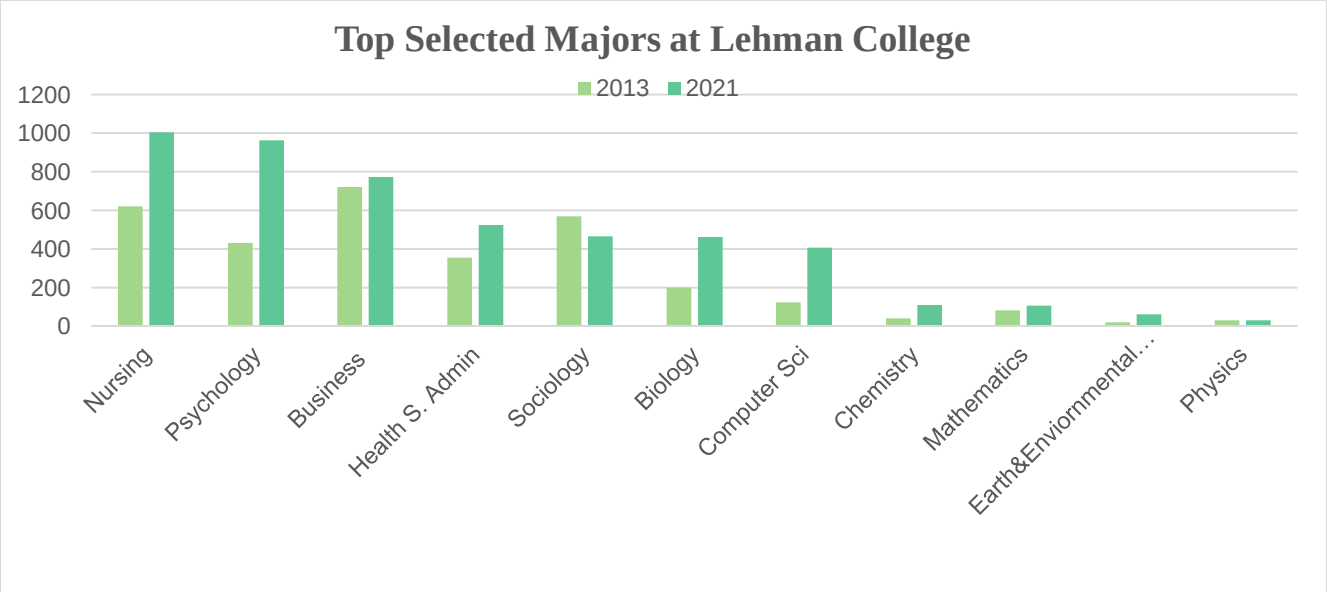



**Figure 6. Top Selected Majors at Lehman College.**

Undergraduates not only showed a greater interest in biology as indicated by the increased enrollment, but they also graduated in larger numbers with a degree in biology (**Figure 7**). In 2013-

2014, the number of biology BA degrees awarded was 34. By 2020-2021, that number had increased to 89 BA and BS degrees. Despite the upward trend in graduation rates, the numbers suggest some level of attrition for all STEM majors.

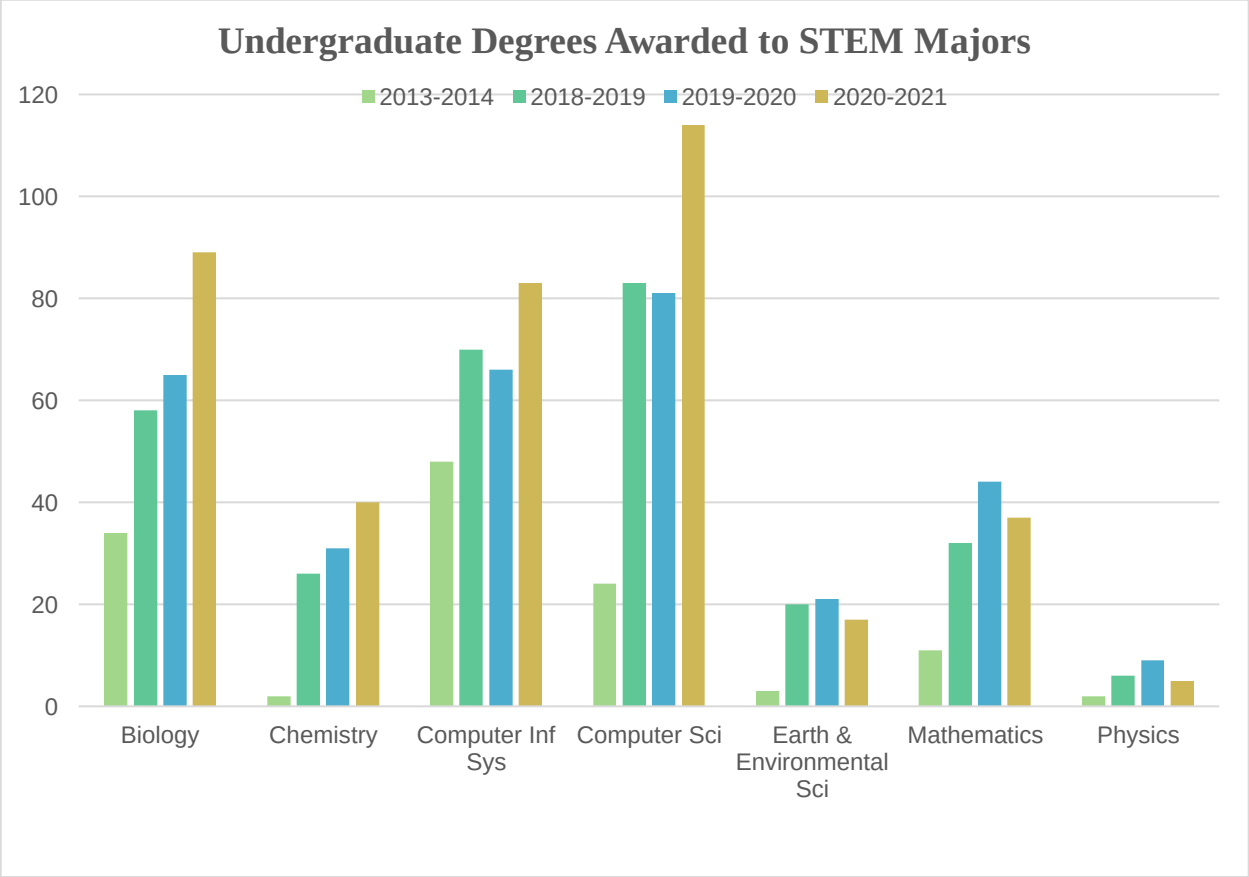



**Figure 7. Undergraduate Degrees Awarded to STEM Majors.** The number of undergraduate degrees awarded to STEM majors at Lehman College from 2013 to 2021.

## A New Undergraduate Curriculum

Since its last self-study in 2013, the Department redesigned its undergraduate curriculum in accordance with recommendations set forth by the National Research Council on "A New Biology for the 21st Century" [6] to train biologists who have both specific and broad knowledge in life sciences for solving complex problems. Additionally, the biology curriculum was modified to provide a clear pathway to multiple career options in life sciences, and the steps for meeting the requirements were simplified to aid students in completing their degree on time. In 2013, the Department offered these undergraduate degree options: 1) 70-credit BA degree for its biology students; 2) 53-credit BA degree for teacher training; and 3) minor in biology. Today, the Department offers better options: 1) 78-credit BS degree for its biology students with four different tracks; 2) 55-credit BA degree for teacher training; 3) BS-MS dual degree for eligible students which is completed in five years; 4) minor in biology; and 5) minor in quantitative systems biology. The four tracks for the BS degree were created with the aim of delineating a clear path to meeting career goals and providing the option to receive training in a specific field such as biomedicine or a broad interdisciplinary field such as bioenvironmental and brain sciences (**Figure 3**).

As shown in Appendix A, the BS degree consists of a set of prerequisite courses and a set of foundation courses that all students must take, and two sets of elective courses from lists A and B that vary according to the track that students choose to complete. To graduate, all students must also complete a third set of elective courses from list C that gives them the option to either attend research seminars or engage in a faculty-mentored research project.

Although the new curriculum was designed in accordance with recommendations of a national council, the revisions ultimately adopted were also based on understanding the needs and perceptions of Lehman students. Prior to revising the curriculum, a survey designed by the curriculum chair, Dr. Maryam Bamshad, was completed in 2016 by 154 students taking the first semester of the Principles of Biology (Bio 166) course. Student responses are summarized in **Table 1** (*see next page*) and shown in **Figure 8** (*see page 17*). The responses suggested that most students were interested in biology as a path to a health-care career and most did not view research or problem solving as useful endeavors. Based on these data, the curriculum committee designed the Biomedical Science track to prepare students for their top career choice. owever, the curriculum committee also advised that the Department revise its goals and objectives to focus on training

[6] https://www.nap.edu/catalog/12764/a-new-biology-for-the-21st-century

biology students not only for acquiring knowledge but also for learning to conduct research and for understanding how to apply their knowledge in biological sciences to solve real-world problems.

**Table 1. Summary of Survey Responses in Introductory Biology Course**

| |
|---|
| Similar attitude towards biology/science regardless of being freshman or transfer |
| Most take biology because it is a prerequisite for health-related careers |
| Very few want to become bench scientists |
| Most want to gain more practical skills |
| Most find general education and math irrelevant and chemistry relevant to biology |
| Less than half believe that biology helps them solve everyday problems |
| Most think they understand what the scientific method is |
| Most think they can pass biology by memorizing facts |
| Less than half find research experience more useful than laboratory experiments |

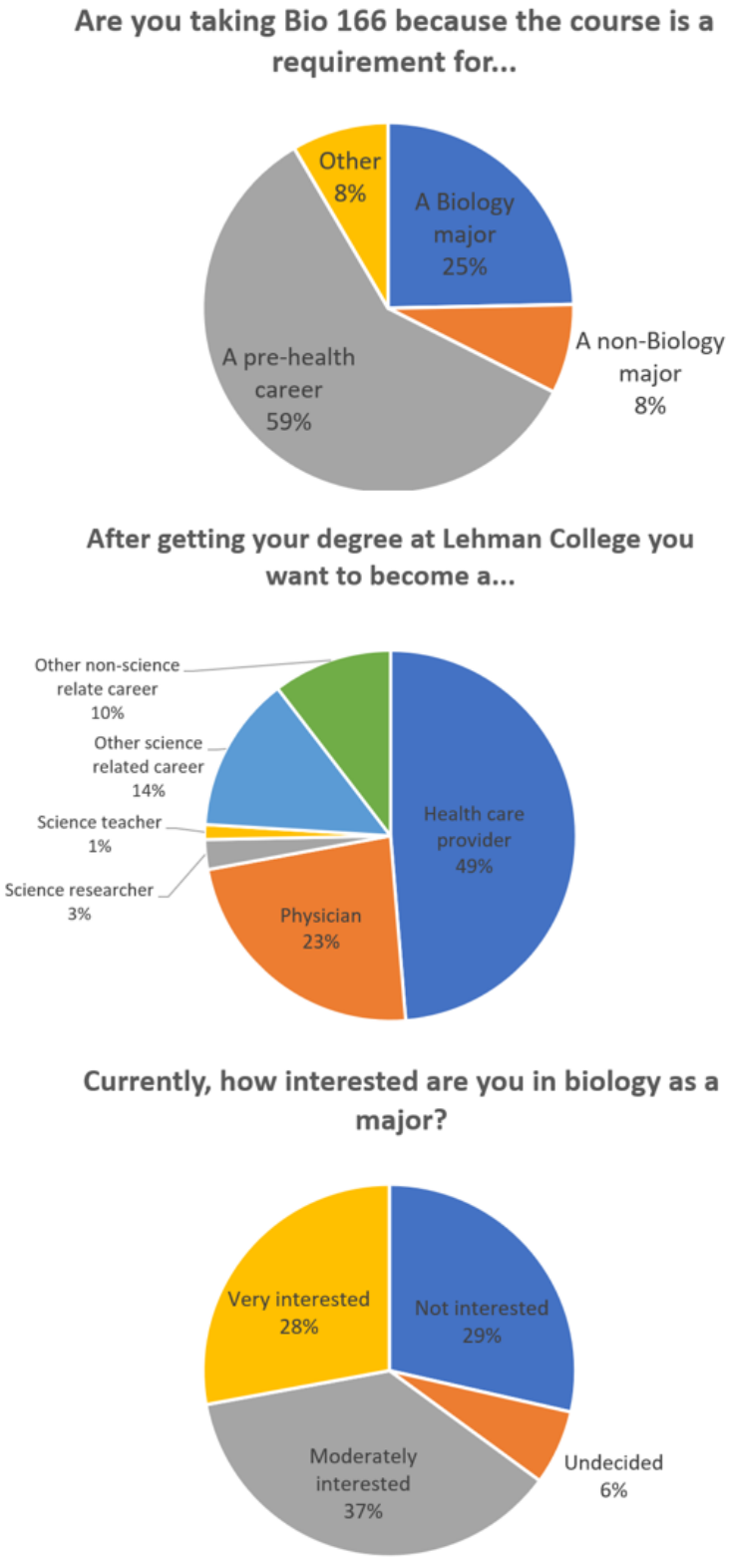



**Figure 8. Graphical Representation of the Student Survey Responses.**

## Undergraduate Course Offerings

To meet the student demands within the constraints of the new curriculum, the Department has increased its efforts to offer a variety of courses and has hired five new faculty (3 in the lecturer line and 2 in the research line). The curriculum committee meets regularly to adjust the new curriculum and review newly proposed courses or course revisions. The course syllabi and the faculty teaching the courses are shown in Appendix C.

Currently, the Department has 550 majors. Approximately 2000 students take laboratory courses that require advanced preparations. The Department has five college laboratory technicians (CLTs), three CLTs, one Senior CLT and one Chief CLT. The CLTs work with 20 faculty and ~40 adjunct instructors to prepare for the labs and follow up with all the tasks that are required to ensure that classes held in Davis Hall and Science Hall run smoothly and the greenhouse is maintained for teaching and research. The Chief CLT orders and processes all teaching supplies and equipment, manages and organizes all service contracts for teaching and research equipment, assists new faculty in startup fund purchasing, and coordinates the lab with the scheduling of courses. In 1999, the Department had five CLTs to maintain one greenhouse (not three) and assist 14 faculty members and a few adjunct instructors to prepare for classes that took place exclusively in Davis Hall, since Science Hall was not yet built. Today there are 20 faculty teaching 3400 students and 550 majors, still with only 5 CLTs, only three of whom are prepping courses. In the near future, the need for CLTs will further escalate as a result of the recent opening of the new Nursing building in Spring 2024. It is anticipated that the Department will see increased enrollments in prenursing courses with labs to accommodate the projected tripling of students admitted into the Lehman Nursing program to alleviate the nursing shortage in New York City. With a significant increase in the number of majors and laboratory classes offered that span two nonadjacent buildings, there is a great need to hire an additional two or more CLTs for the department.

## Assessment

Since 2019, the department's assessment coordinator, Dr. Maryam Bamshad, has collaborated with the Office of Assessment and Educational Effectiveness at Lehman College to design and implement assessment for biology undergraduate courses. In Spring 2024, Dr Sarah Moroianu took over the position. The assessment coordinator regularly attends professional development

workshops to develop strategies for strengthening a culture of evidence in the department. The assessment coordinator works closely with the biology faculty to design assessment plans for their courses and to use the collected data for improving teaching techniques or revising the curriculum. A sample of an assessment report is shown in Appendix D. The report was created based on the uniform six-step assessment process adopted by the college in 2019[7]

## Advisement

Major: From 2005 to 2021, Dr. Maryam Bamshad served as the major advisor for the undergraduate biology students. The advisor met regularly with current and prospective students either in person or on Zoom (since the pandemic) to guide them in scheduling their classes, choose their major and track in Biology, review their career options, monitor their progress towards graduation, and resolve issues with their coursework or degree.

In 2021, the Department changed its advising model from a single advisor for all the biology-major students to multiple advisors, with Dr. Maryam Bamshad continuing to serve as the advisement coordinator. The new model was adopted to better familiarize faculty advisors with the students' needs and to allow students to have one-on-one dialogues with instructors who will train and mentor them. All biology faculty now provide advisement on zoom or in-person. Additionally, Dr. Michael Waterson and Dr. Sebastian Rojas-Villa who were hired as doctoral lecturer faculty in 2022 have assigned hours to focus on advisement and as of Spring 2024 have taken over the role of Dr. Bamshad. Students schedule appointments on a new platform called Navigate (Link to Navigate) that was adopted by CUNY to streamline and coordinate advisement tasks (Link to Bio Advisement Page). As most Lehman students transfer to the college, Dr. Sebastian Rojas-Villa is also overseeing course equivalencies and articulation agreements with other CUNY colleges using a newly adopted platform called T-REX (Link to T-REX).

Each student that declares biology as a major receives a "Welcome" email from the advisement coordinator with information to complete the degree requirements and guidelines to schedule an advising appointment. The advisement coordinator is available via email to assist students or process their paperwork all year round. During the summer period, advisement duties are shared by the biology faculty, who meet with students either in person or on Zoom.

[7] https://www.lehman.cuny.edu/institutional-effectiveness/office-of-assessment-educational-effectiveness.php

For students who cannot or choose not to meet for advisement or require additional information, the advisement coordinator has created several webpages on the departmental website with information on degrees, successful graduation, career options, and guidelines for seeking help or access to resources within and outside the department. The advising webpages have been recently been redesigned to include a "Student Success" page where the achievements of biology students are highlighted (Link to Student Success page).

To introduce prospective students to the Department of Biological Sciences programs, faculty, and resources, the advisement coordinator created a brochure shown in Appendix G. The brochure highlights the successes of biology students, faculty research areas, and training programs that the Department offers to its students. The brochure is distributed at recruitment events within and outside of Lehman College.

The Department has also had a bio pre-health advisor (Dr. Ayanna Alexander-Street) who advised students on prerequisite courses for nursing programs or other health-related schools. As of Spring 2024, this position is now being handled by other departments.

Pre-Health: In 2017, Lehman college hired Dr. Scott Calvin to serve as the college's pre-health advisor Dr. Calvin meets year-round with students from any major to guide them in pursuing health-related careers.

SMART MDs (Link): The Student Mentoring Assistance for the Recruitment of Tomorrow's MDs (SMART MDs) program was founded through a generous private donation, as a pilot program to increase the acceptance rate of underrepresented minority students into medical schools. The program at Lehman College was created in 2018 by Dr. Hai-Ping Cheng with significant contributions from Dr. Jack Henning, who continues to serve as an unofficial advisor for students who are admitted to the program. Dr. Lyda Williams was hired as the student advisor for the SMART MDs program. In 2022, the program was expanded to a college-wide program to widen the opportunities for Lehman students. Since its inception, the number of Black students applying to medical schools from Lehman has increased by 186%, and the number of Latinx students has increased by 333%. The result is that Lehman is now among the top schools nationally for having the highest number of Latinx and Black medical school applicants. **Table 2** lists students who were accepted into medical school since the inception of the program, reflecting the contribution of the

SMART MDs program to the success of the Department of Biological Sciences and Lehman College in preparing students for medical schools.

Students are accepted to the SMART MDs program at the beginning of their sophomore year, with another application window allowed at the start of their junior year. Both first year students and transfer students are eligible. Students apply to the program, top candidates are invited for interviews, and finalists are invited to join the program. The SMART MDs program provides services that are tailored to meet the specific needs of under-represented, non-traditional, minority students. In collaboration with Lehman's Office of Pre-Health Advisement, students are guided through the medical school application process. Advisers counsel students on timelines and offer the support needed to become competitive applicants to medical schools. Students are provided with proactive, intensive academic advising, MCAT coaching and study materials, tips on procuring recommendation letters, support in writing and editing personal statements, and interview prep. Advisors support students in finding research positions and internships, volunteer or shadowing roles, and academic programs or activities that help to improve their candidacy.

**Table 2. Contribution of SMART MDs to the Department of Biological Sciences and Lehman College**

| | number of graduates entering medical schools | | | SMART MDs contribution % | | Biology contribution % |
|---|---|---|---|---|---|---|
| Apply year | SMART MDs* | Biology | Lehman | to Biology | to Lehman | to Lehman |
| 2016 | NA | 3 | 5 | | | 60 |
| 2017 | NA | 1 | 3 | | | 33 |
| 2018 | NA | 5 | 6 | | | 83 |
| 2019 | 5 | 6 | 11 | 83 | 45 | 55 |
| 2020 | 3 | 3 | 9 | 100 | 33 | 33 |
| 2021 | 7 | 7 | 13 | 100 | 54 | 54 |
| 2022 | 10 | 11 | 17 | 91 | 59 | 65 |
| 2023 | 2 | 3 | 7 | 67 | 29 | 43 |

*SMART MDs program was launched in 2018 and started advising immediately so that 5 students from the SMART MDs program was accepted into medical schools

Other prehealth successes: Beyond medical school, Biology graduates are competitive for entry into professional schools including dental, pharmacy, optometry, physical therapy, physician assistant and veterinary. By comparing the number of Biology and Lehman students successfully

enrolled in those professional schools and programs in **Tables 3** and **4**, it is clear that the Department of Biological Sciences is a major contributor to the success of Lehman College in getting students accepted into competitive professional schools and programs.

**Table 3. The number of students with Biology Degrees (1st, 2nd, MA/MS) who entered professional schools**

| Year | Medical | Dental | Pharmacy | Optometry | Physical Therapy | Physician Assistant | Veterinary |
|---|---|---|---|---|---|---|---|
| 2019 | 6 | 1 | 4 | 0 | 0 | 3 | 0 |
| 2020 | 3 | 0 | 3 | 0 | 0 | 4 | 0 |
| 2021 | 7 | 2 | 3 | 0 | 0 | 4 | 3 |
| 2022 | 11 | 4 | 4 | 0 | 1 | 4 | 2 |
| 2023 | 3 | 0 | 2 | 0 | 0 | 3 | 0 |

**Table 4. The number of students with Lehman Degrees (1st, 2nd, MA/MS) who entered professional schools.**

| App year | Medical | Dental | Pharmacy | Optometry | Physical Therapy | Physician Assistant | Veterinary |
|---|---|---|---|---|---|---|---|
| 2019 | 11 | 1 | 8 | 0 | 7 | 5 | 0 |
| 2020 | 9 | 2 | 10 | 0 | 9 | 6 | 0 |
| 2021 | 13 | 4 | 9 | 0 | 10 | 6 | 3 |
| 2022 | 17 | 4 | 14 | 1 | 16 | 8 | 2 |
| 2023 | 7 | 2 | 4 | 0 | 21 | 13 | 1 |

To further improve the success of Biology and Lehman students in getting into professional schools and programs, the Pre-Health Clinical Training Scholarship was established by Prof. Haiping Cheng with the support and participation of multiple Schools and Offices at the College. The first phase of the program focuses on pre-dental students. The scholarship, $2514/student ($38,000/15 students), covers the cost of obtaining pre-dental certification from the Lehman School of Continuing Education, which will enable to scholarship recipients to obtain the position of chair-side dental assistant in a dental office. The scholarship enables recipients to supplement their salary, increase their study hours, and use the working experience to further enhance their applications to dental schools. The first cohort of scholarship recipients will be selected in Spring 2024, trained in summer 2024, and begin working in dental offices starting in Fall 2024.

In the coming years, this Pre-health clinical training scholarship will be expanded to include the remaining 5 pre-health tracks: Pharmacy, Optometry, Physical Therapy, Physician Assistant, and Veterinary.

## Student Engagement

To create a learning community, promote inclusiveness, and establish a peer-support system, the Department of Biological Sciences offers several student clubs including the Tri-Beta Honor Society and the Biology Club. Dr. Michael Waterson serves as the advisor for the Tri-Beta Honor Society and Dr. Sebastian Rojas-Villa serves as the advisor for the Biology Club. Students who are interested in pre-health programs and professions can also join the Minority Association of Pre-Health Students club or Dental club, which are advised by Dr. Jack Henning.

## Experiential Learning

All 4-credit biology courses have a lab component whereby students acquire technical skills through hands-on projects. Some 3-credit biology courses are lecture only, but most have a separate lab component that students can take as a pre-requisite or co-requisite (See Appendix A for course list and Appendix C for course syllabi).

Students also gain research experience and learn about research careers by taking advanced biology courses, including Bio 450 Seminar, Bio 489 Introduction to Experimental Biology, and Bio 490 Honors in Biological Sciences. Since the pandemic, Bio 450 has been offered as an online course which meets weekly. Dr. Stephen Redenti has revised the course to invite research-active scientists from around the nation, postdoctoral fellows at CUNY and Lehman alumni to speak about their career path to science as well as their research projects. In Bio 489, students are mentored by faculty to either conduct an experiment or learn the cognitive skills required for research, such as developing a testable hypothesis and designing an experiment. The course is designed to be taught by all research faculty and the doctoral lecturers in the department. In Bio 490, faculty guide eligible students in conducting research in their labs. Students who complete Bio 490 and have a minimum major GPA of 3.5 will graduate with honors.

A committee on Undergraduate Research was formed by the Department to oversee the process of assigning students to mentors. The committee is chaired by Dr. Julio Gallego-Delgado and includes Dr. Joseph Rachlin, Dr. Pratyusha Mandal, and Dr. Haiping Cheng as members. The committee has created a policy for student engagement in research courses and matches students to faculty based on research interests and availability. The committee also seeks scientists outside

of Lehman College (e.g., The New York Botanical Garden) who are willing to provide internship opportunities for biology majors.

The School of Natural and Social Sciences supports student research through various programs (LINK) which provide funding such as the RISE program, REACH, and NYC LSAMP. From the Department of Biology Sciences, Dr. Renuka Sankaran serves as the advisor for the NYC LSAMP program, and Dr. Julio Gallego-Delgado is Co-PI on a recently funded ~$1 million, NIH-URISE grant to support student experiential learning in Biology and Chemistry. In 2023, CUNY initiated a multicampus effort (CUNY Inclusive Economy) to facilitate student success in accessing internships. Students in the Department of Biological Sciences work with two of eight Lehman staff members who provide training in the application process and access to discipline-relevant internships.

## 4. Master's Program

### Degrees

At the time of the last self-study in 2013, the Department offered a Master of Arts degree with two tracks: A and B. For track A, students completed 30 credits of coursework and an independent thesis project that they defended in an oral presentation prepared for a committee composed of Lehman graduate faculty and/or other affiliated institutions such as the New York Botanical Garden or the Albert Einstein College of Medicine. For track B, students completed 30 credits of coursework and a 4-credit tutorial. The tutorial, consisting of a laboratory research project, a literature review, or a combination of the two, was performed under the supervision of a member of the Lehman graduate faculty. The written work was submitted to the Department in partial fulfillment of the requirements of the master's degree.

As of 2017, the Department now offers:

MS- thesis research track

MA- tutorial track and/or nonmatriculated

BS-MS (5-year program) *for current Lehman students*

**Admissions Requirements**

MS and MA Admission Requirements The Department revised its admission requirements to require a personal statement and a guide to finding a faculty mentor.

- A bachelor's degree (or its equivalent) from an accredited college or university.
- Demonstrate the potential to pursue graduate study successfully - that is, have attained a minimum undergraduate grade average of B or 3.0 in the field selected for the graduate major and a minimum grade average of B- or 2.7 in the overall undergraduate record.
- Have completed a major in biology, chemistry, physics, or an allied field.
- With Undergraduate Specialization in Biology: Candidates whose undergraduate major was in biology must have completed: (1) one year of organic chemistry, with laboratory; (2) one year of college physics; and (3) either one year of calculus or one semester of calculus and a semester of statistics.
- With Undergraduate Specialization in Chemistry, Physics, or Allied Field: Candidates whose undergraduate major was in either chemistry, physics, or an allied field must have completed: (1) the equivalent of an undergraduate minor in biology; (2) one year of organic chemistry,

with laboratory; (3) one year of college physics; and (4) either one year of calculus or one semester of calculus and a semester of statistics.

- In addition, students must submit a personal statement describing their career goals, explain how the master's program will help to achieve these goals, and how their prior education and research experience, if any, have prepared the student to move on to a master's degree. Students should indicate their research interests and identify at least one possible research mentor who is willing to advise the student for thesis research. It is recommended that students contact the Department Master's Program Graduate Advisor to get help in identifying possible thesis mentors. Students should also submit up to three letters of recommendation and, if conditionally admitted, satisfy the conditions within one year.

BS-MS Admission Requirements Admission into the five-year BS-MS program is restricted to Lehman students who apply through the Biology Undergraduate advisor in the Spring of their second year or Fall of their third year. The undergraduate advisor coordinates the application with the Masters Advisor.

Eligibility: Minimum of 48 semester hours of math and science study towards the BS in Biology, including MAT175 with a GPA of 3.0, as well as a GPA of 3.25 in the major through the first three years of study, and by completing all prerequisites.

**Degree Requirements:**

Masters degree requirements were revised to clarify the membership of the advisory committee from Lehman and its other affiliated institutions. All Masters students (matriculated or nonmatriculated) should consult with the Departmental Graduate Adviser regarding their programs. Additionally, the BS-MS students must consult with the undergraduate advisor. The current degree requirements are as follows:

Master of Science A student must complete 30 credits of coursework and complete an independent laboratory research project. A student may elect to substitute 1 to 6 credits in original laboratory research (BIO 799.1, 799.2, and 799.3) for 1 to 6 credits of coursework. When a student is ready to select a research project, a research advisory committee of faculty members will be established in consultation with his or her thesis adviser to guide the investigation. Students who choose a thesis adviser at the New York Botanical Garden or at another institution must have an "in-house" adviser. This individual must be a full-time faculty member of the Department of Biological Sciences at Lehman College and a member of the graduate faculty in biological

sciences. A thesis based on this research must be hypothesis driven, scientifically sound and defended satisfactorily in an oral presentation prior to its submission in partial fulfillment of the requirements for the degree of Master of Science. Approved copies of the thesis must be deposited in the Lehman College Library and the Department of Biological Sciences.

Masters of Arts Students must complete 30 credits of coursework and a 4-credit tutorial. The tutorial, consisting of a laboratory research project, a literature review, or a combination of the two, are performed under the supervision of a member of the Department of Biological Sciences faculty.

BS-MS Lehman students consult with the undergraduate advisor to indicate interest in the program. The structure of the five-year joint degree is as follows:

Years 1-4: BS courses

Year 2 (Spring) or Year 3 (Fall): Apply to BS-MS program.

Year 3: Begin research in Spring

Year 4: 3 MS. courses (12 credits); BS graduation in June with Honors

Year 5: MS courses, research, and thesis.

Advisement and Recruitment

In 2019, the Department reorganized its Graduate Studies Committee to include the Graduate Advisor as the committee chair, four faculty members, and a student representative. The previous Graduate Advisor, Dr. Eleanore Wurtzel, worked with the committee members, Dr. Stephen Redenti, Dr. Renuka Sankaran, Dr. Edward Kennelly, and Dr. Maryam Bamshad to increase recruitment efforts, create guidelines for thesis preparation and tutorials, provide information on resources available to students on and off campus, and establish collaborations with other institutions to support student scholarly work. In addition, Dr. Wurtzel created two new Masters courses on scientific writing:

***BIO7921:*** *RESEARCH AND CAREER SKILLS (how to read papers; analyze data; prepare presentations; develop a hypothesis; etc., in preparation for BIO 79305)*

***BIO 79305:*** *GRANTSMANSHIP AND DEVELOPING A RESEARCH PROPOSAL (*Masters students learn to communicate orally and in writing with other Masters students and PhD students from multiple disciplines [e.g., biochemistry, molecular biology, ecology, plant biology, chemistry, neuroscience] who are enrolled in a similar course for PhD students, BIO 79303, which is taught through the CUNY Graduate Center.)

Dr. Stephen Redenti serves as the current Graduate Advisor for the master's programs. He oversees admissions, advisement, registration, and graduation. Dr. Redenti worked with faculty members, Dr. Renuka Sankaran, Dr. Joseph Rachlin, Dr. Maryam Bamshad, and former Graduate Advisor, Dr. Eleanore Wurtzel, to establish a new initiative with the Albert Einstein College of Medicine, in collaboration with the Montefiore Einstein Cancer Center and Einstein-Montefiore Institute for Clinical and Translational Research. The collaborative program offers Lehman Biology MS students a $12,000 stipend to work in a research lab and opportunities to attend seminars and career development workshops led by Einstein faculty. Under the Lehman-Einstein program, students can earn an MS degree by taking courses at Lehman while engaging in a full-year of research and training at an Einstein laboratory. Students are mentored by leading Einstein scientists and conduct research that can be published and included in their thesis.

From left: Anne Bresnick, Ph.D., **Jackriel Pina Morales (MS student),** Zoe Tsagaris, M.S., OTR/L, **Marilyn Vallejo (MS student)**, Kristina Ames, Ph.D., **Akua Mensah (MS student)**, Paul Marantz, M.D., M.P.H.

Enrollment

Funding Gaps Hinder Diversity in Science. While the change in the Masters program structure has equipped more students with invaluable research training, a critical roadblock remains: insufficient fellowship opportunities for self-funded students, particularly those from underrepresented backgrounds. While teaching assistantships provide some support, dedicated graduate fellowships for MS students were non-existent until the recent Einstein program, which restricts research training to the few students funded to work with scientists at Einstein. This dearth of funding creates a significant obstacle to diversifying the scientific workforce.

Enrollment Numbers. It is no surprise that the number of students who enrolled in the Biology Masters program decreased during the pandemic in 2020 to 2021 (**Figure 9**). Master's enrollment in other STEM departments showed a similar decrease (**Figure 10,** *see next page*). The number of Masters students who graduate yearly is below enrollment numbers, likely due to the high number of part-time students who must work to support their graduate education (**Figure 11**, *see next page*).[8] **Tables 5** and **6** (*see page 32*) show the current students in the program. **Table 7** (*see page 33-34*) list students who recently graduated from the program.

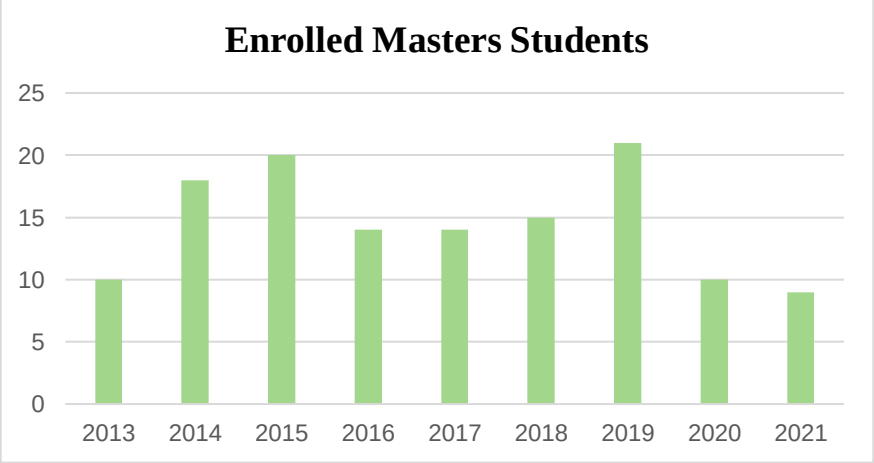



**Figure 9. Enrollment of Masters Students.** Number of enrolled Biology Masters Degree students (2013 to 2021).

[8] https://www.lehman.edu/institutional-research/interactive-factbook.php

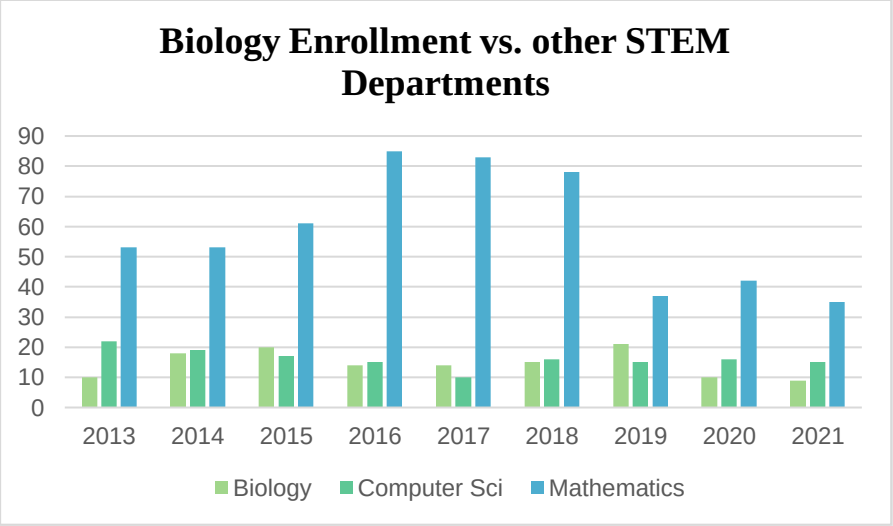



**Figure 10. Biology Enrollment vs. other STEM Departments.** Comparison of enrollment in the Biology Masters Degree programs to those of Computer Science and Mathematics.

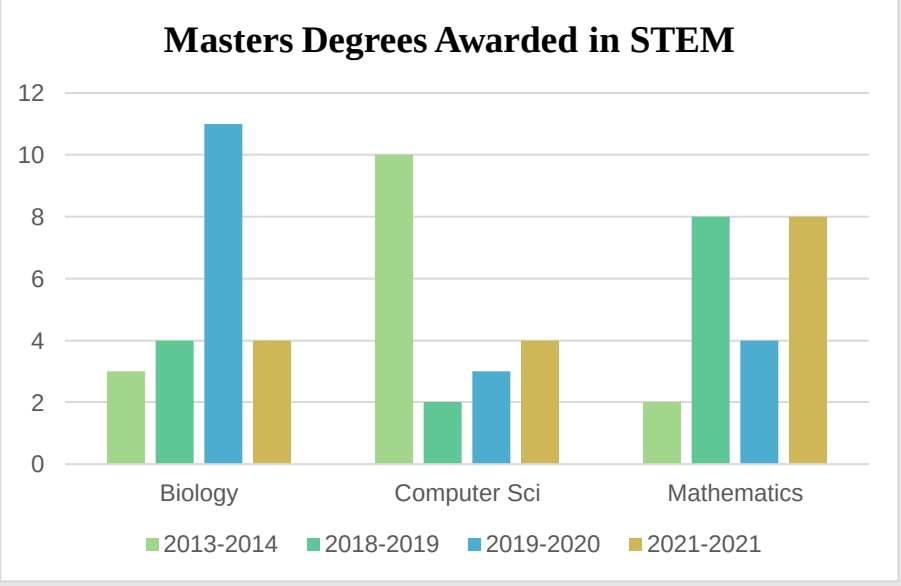



**Figure 11. Masters Degrees awarded in STEM.** Comparison of the numbers of Masters Degree graduates from Biology, Computer Science, and Mathematics (2013 to 2021).

Curriculum for MS students in the Lehman-Einstein program

The Lehman-Einstein students follow a specific curriculum and are jointly mentored by Lehman and Albert Einstein faculty. **Figure 12** and **Figure 13** show the two-year curriculum jointly designed by the Einstein faculty and the Lehman Graduate Studies Committee.

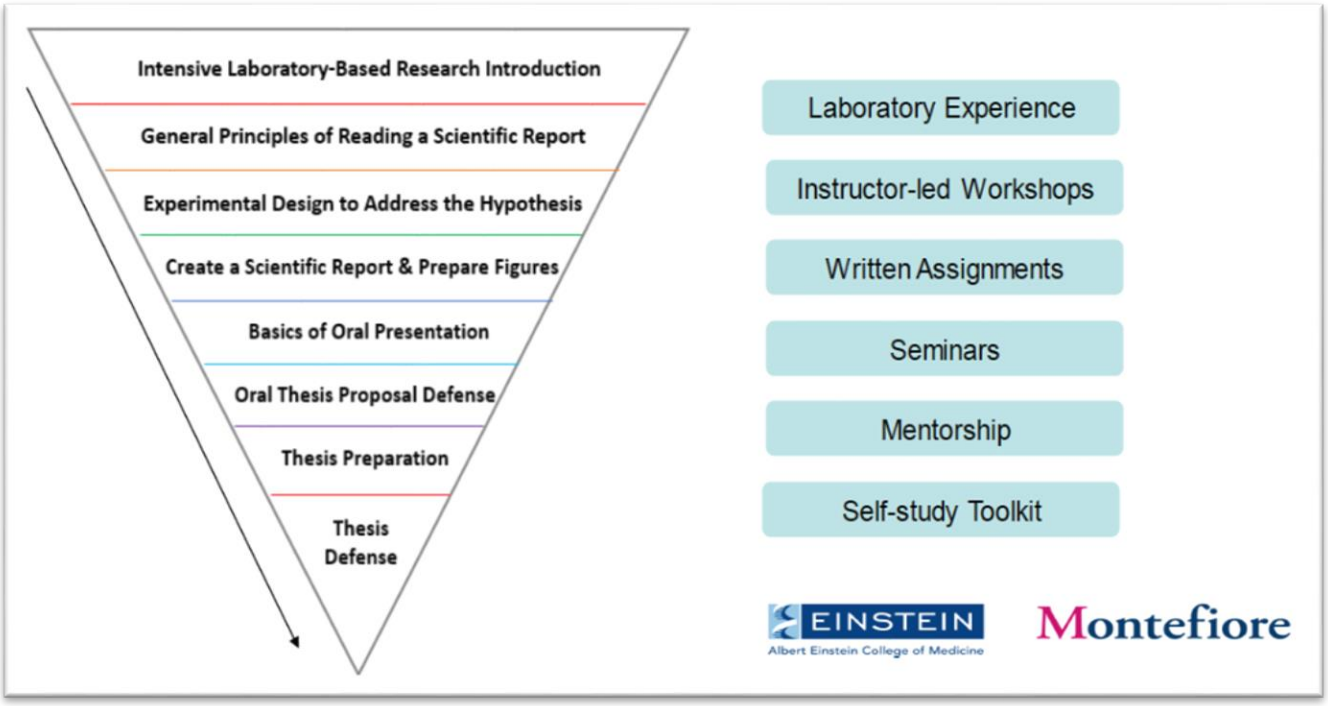



**Figure 12. Curriculum for the Lehman-Einstein track of the Biology MS degree program**

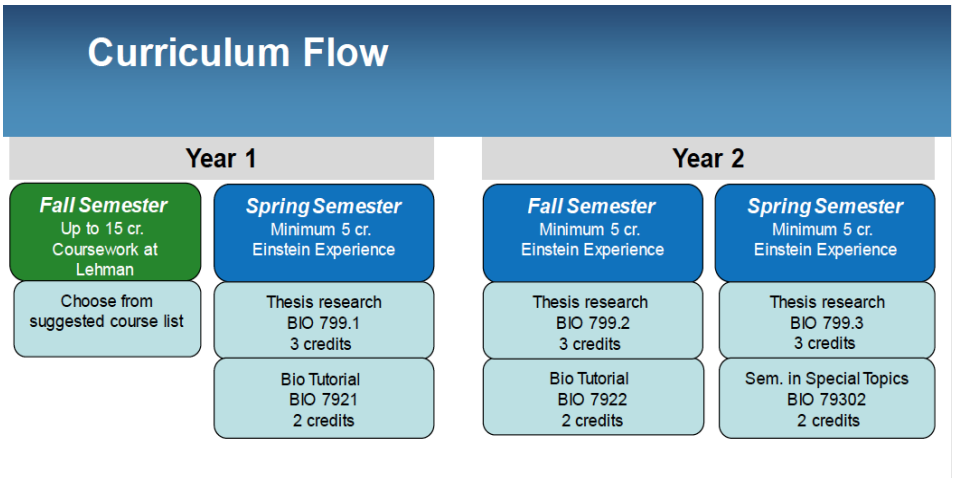



**Figure 13. Course list for the Lehman-Einstein track of the Biology Masters program**

**Table 5. Biology MA/MS enrollment and graduates**

| **Programs** | **Current Enrollment** | **2013-2022 graduates** |
|---|---|---|
| Biology MA | 3 | 46 |
| Biology MS | 8 | 7 |
| Biology BS/MS | 1 | 0 |
| total | 12 | 53 |

**Table 6. MS & MA Students Enrolled in 2022** *(Data provided by Dr. Redenti)*

| **Student Names** | **Degree** | **Mentors** |
|---|---|---|
| John Soto | BS-MS | Dr. Stephen Redenti |
| Christian Guaraca | MA | To be selected |
| David Espino | MA | Dr. Maryam Bamshad |
| Rosana Lombardo | MA | To be selected |
| Akua Mensah* | MS | Dr. Stephen Redenti |
| Belkes Nour El Houda, Stambouli | MS | Dr. Edward Kennelly |
| Danielle Preston | MS | Dr. Eleanore Wurtzel |
| Jisue Kang* | MS | Dr. Stephen Redenti |
| Katharhy Flores-Panama | MS | Dr. Eleanore Wurtzel |
| Luis Vega | MS | Dr. Jack Henning |
| Marcos Rivera | MS | Dr. Renuka Sankaran |
| Marilyn Vallejo* | MS | Dr. Stephen Redenti |
| Exequiel Sisso | Non-Degree | NA |

*Students doing research in Einstein Medical research labs as part of the Joint Lehman College-Einstein Research Program

**Table 7. Recent graduates from Biology MA/MS programs**

| Last Names | First Names | Degrees | Degree Dates |
|---|---|---|---|
| Zajac | Cynthia | Biology MA | 4/11/2014 |
| Watson | Marlena | Biology MA | 7/9/2014 |
| Hussein | Adel | Biology MA | 8/15/2014 |
| Cortez | Briseida | Biology MA | 1/29/2015 |
| Figueroa | Lourdes | Biology MA | 6/24/2015 |
| Boadu | Michael | Biology MA | 7/6/2015 |
| Oncu | Tugba | Biology MA | 7/6/2015 |
| Alie | Nadia | Biology MA | 7/21/2015 |
| De Leon | Yessica | Biology MA | 9/1/2015 |
| MacBeth | Scott | Biology MA | 9/17/2015 |
| Nwokafor | Chiso | Biology MA | 1/14/2016 |
| Riker Romero | Linda | Biology MA | 1/21/2016 |
| Jean-Louis | Richard | Biology MA | 1/26/2016 |
| Kisavi | Stephen | Biology MA | 2/4/2016 |
| Cavaliere | Dario | Biology MA | 2/17/2016 |
| Court | Brenda | Biology MA | 6/8/2016 |
| Kamal | Marina | Biology MA | 6/8/2016 |
| O'Connor | David | Biology MA | 1/10/2017 |
| Del Valle | Jose | Biology MA | 1/13/2017 |
| Rountree | Shawn | Biology MA | 2/6/2017 |
| Martinez | Matthew | Biology MA | 2/14/2017 |
| Molina | Karen | Biology MA | 6/22/2017 |
| Alvarado | Susana | Biology MA | 6/28/2017 |
| Kaur | Bhanu | Biology MA | 10/2/2017 |
| Khan | Riben | Biology MA | 10/2/2017 |
| Garcia | Janneth | Biology MA | 2/1/2018 |
| Onyenadum | Susan | Biology MA | 7/18/2018 |
| Onyeukwu | Valerie | Biology MA | 7/18/2018 |
| Opoku | George | Biology MA | 7/18/2018 |
| Zybtseva | Anna | Biology MA | 7/18/2018 |
| Parbhudayal | Raveena | Biology MA | 1/4/2019 |
| Benyi | Maxwell | Biology MA | 5/30/2019 |
| Chaudhry | Sahir | Biology MA | 5/30/2019 |
| Khatri | Ami | Biology MA | 5/30/2019 |
| Gordon | Michael | Biology MA | 9/10/2019 |

| | | | |
|---|---|---|---|
| Cabral-Hernandez | Abdiel | Biology MA | 1/3/2020 |
| Skumial | Magdalena | Biology MA | 2/5/2020 |
| Spencer | Rowanne | Biology MA | 2/5/2020 |
| Wysocki | Konrad | Biology MA | 2/11/2020 |
| Nunez | Emerson | Biology MA | 6/11/2020 |
| Kabre | Abdoulaye | Biology MA | 6/29/2020 |
| Sowah | Welbeck | Biology MA | 6/29/2020 |
| Naut | Sean | Biology MA | 9/1/2020 |
| Quizhpi | Henry | Biology MA | 6/8/2021 |
| Liranzo | Emely | Biology MA | 6/9/2021 |
| Sillah | Maryama | Biology MA | 6/3/2022 |
| Kokici | Eni | Biology MS | 2/5/2020 |
| Espinal | Jei | Biology MS | 6/29/2020 |
| Soto | Joseph | Biology MS | 6/29/2020 |
| Bisal | Eris | Biology MS | 9/1/2020 |
| Glass | Sarah | Biology MS | 9/1/2021 |
| Chaudhry | Sovira | Biology MS | 6/3/2022 |
| Afrifa | Andrews | Biology MS | 6/16/2022 |

## 5. Doctoral Programs

The City University of New York's Graduate School and University Center offers courses and research training leading to the Ph.D. degree in Biology and Biochemistry, among many other programs. Faculty from the various CUNY campuses including the new Advanced Science Research Center (ASRC), where research labs are located, apply to be accepted as Doctoral Faculty members. Other affiliated institutions in the PhD programs include the New York Botanical Garden (NYBG) and the American Museum of Natural History (AMNH). Students take courses through the Graduate Center but also have free access to courses through the Interuniversity Doctoral Consortium including Columbia University, Princeton, NYU, Cornell University, among others. In the Biology and Biochemistry PhD programs, students are supported by five-year fellowships which require support from the advisor in years 2-5; the graduate center funds the $35,000 stipend in year 1 and tuition and health insurance for 5 years. Students may specialize in Molecular Biology, Cellular and Developmental Biology (MCD); Neuroscience (NS); Ecology, Evolutionary Biology, and Behavior (EEB); or Plant Sciences (PS). The specialization in Plant Sciences is offered primarily at Lehman College, in affiliation with the New York Botanical Garden. Students in this program may obtain the MA or the MS as a degree "enroute" to the Ph.D.

**Table 8** (*see next page*) shows the students who are currently enrolled in the program and **Table 9** (*see next page*) shows students who graduated from the program since the last self-study.

## Table 8. Current doctoral students in the Department of Biological Sciences

*MCD: Molecular, Cellular & Developmental Biology; EEB: Ecology, Evolution & Behavior; PS: Plant Sciences; NS: Neuroscience* (Data provided by Dr. Renuka Sankaran)

| Last Name | First Name | Mentor | Year admitted | PhD program/subprogram |
|---|---|---|---|---|
| BENSALEL | JOHANNA | GALLEGO-DELGADO, JULIO | 2019 | BIO/MCD |
| CUMMING | ROYCE | WURTZEL, ELEANORE | 2019 | BIO/EEB |
| HUANG | KUNHUI | REDENTI, STEPHEN M. | 2016 | BIO/MCD |
| JOHNSON | TONI | KENNELLY, EDWARD J. | 2022 | BIO/PS |
| KASTRAT | ERTAN | CHENG, HAI-PING | 2017 | BIO/MCD |
| PARBHUDAYAL | RAVEENA | CHENG, HAI-PING | 2020 | BIO/PS |
| RAJKHOWA | NEHA | SANKARAN, RENUKA P. | 2019 | BIO/PS |
| SAWANT | PRAJAKTA | MANDAL, PRATYUSHA | 2023 | BIO/MCD |
| SHI | CUI | REDENTI, STEPHEN M. | 2017 | BIO/MCD |
| VARDEMAN | ELLA THOMAS | KENNELLY, EDWARD J. | 2019 | BIO/PS |
| VERNON | CORINA | SANKARAN, RENUKA P. | 2023 | BIO/PS |
| ZHAO | YI | KENNELLY, EDWARD J. | 2019 | BIO/PS |

## Table 9. Graduated doctoral students in the Department of Biological Sciences (2013-2023)

(*Data provided by Dr. Renuka Sankaran*)

| Last Name | First Name | Mentor | Year admitted | PhD | Current Position |
|---|---|---|---|---|---|
| BELTRAN | JESUS | WURTZEL, ELEANORE | 2009 | 2014 | Assistant Professor of Synthetic Biology, U. Delaware (hired 9/23) |
| MIGHTY | JASON | REDENTI, STEPHEN M. | 2013 | 2019 | Scientist, Regeneron, New York |
| MORCOL | TAYLAN BARIS | KENNELLY, EDWARD J. | 2013 | 2021 | Natural Resources Specialist, US Forest Service, Hawai'i |
| PERSAUD | LEAH | SAUANE, MOIRA | 2014 | 2019 | Medical Editor, Consumer Drug Information, RVO Health |
| TAVAREZ | MICHAEL ANTHONY | SANKARAN, RENUKA P. | 2013 | 2021 | Scientist, Regeneron, New York |
| ZHONG | XUELIN | SAUANE, MOIRA | 2015 | 2020 | Pathology Resident, Lenox Hill Hospital |

## Plant Sciences at Lehman

The Bronx has a long tradition of active research in plant sciences that continues until this day. The CUNY PhD program in Plant Sciences (https://www.gc.cuny.edu/biology/subprograms/plant-sciences) was established in 1968. Presidents William C. Steere of The New York Botanical Garden (NYBG), Leonard Lief of Lehman College, CUNY, and Harold M. Proshansky of the Graduate Center, CUNY worked together to create the program, and based it administratively in the Department of Biological Sciences at Lehman. Lehman and NYBG are located about 1 mile from each other in the north Bronx and have maintained a continuous partnership that has now spanned 56 years.

### Plant Science Doctoral Students

The first Ph.D. degree in the program was awarded to Dr. William S. Cohen who defended on February 18, 1970 under the mentorship of Professor Marcia Brody. More than 175 students from around the world have come to the CUNY Plant Sciences PhD program to pursue their Ph.D. degrees. These students have published their results in top tier peer-reviewed scientific journals, and have gone on to distinguished careers in academia, industry, government, and botanical gardens located world-wide.

With the advent of the CUNY Science Fellowships in 2008, plant sciences doctoral students are now guaranteed free tuition, low-cost health insurance, and a stipend (currently $35,000 per year) for up to five years. There are currently 18 students in the plant science doctoral program. They are admitted through the CUNY Graduate Center (www.gc.cuny.edu/biology) Biology PhD Program, subprogram Plant Sciences. First-year students take plant sciences classes, typically taught either at Lehman or NYBG, and they are given the opportunity to do rotations with any of the plant sciences faculty who are accepting doctoral students, or who using techniques that the student wishes to gain knowledge. First-year students are fully supported by the CUNY Graduate Center, but starting in their second year, mentors must pick up the cost of the stipend, while CUNY continues to cover the cost of tuition and health insurance for the next four years. The program is limited by the number of Science Fellowship slots provided through the Graduate Center and Grad A lines at the College.

Of the 18 current plant science doctoral students, four are first-year students who have yet to select their PhD mentor; this match occurs in spring of their first year. Four students have mentors at the NYBG, five students have mentors at Lehman College, two students have mentors at CUNY Advanced Science Research Center, and one student each are at Brooklyn and Queens College. While the Plant Sciences program is truly a CUNY-wide doctoral program, the majority of the students are at the two Bronx-based institutions, Lehman and NYBG.

**Plant Science Doctoral Faculty**

Today, the Plant Sciences program is the most comprehensive of its kind in the New York area and consists of 30 doctoral faculty (**Table 10**) drawn from CUNY and the New York Botanical Garden. Research areas include biotechnology and metabolic engineering of plant biosynthetic pathways, synthetic biology, natural product biochemistry, medicinal plants and economic botany, signal transduction in plants, plant-microbial interactions, plant development, cell biology, molecular biology, biochemistry, genetics, ecology, biodiversity, and systematics.

Plant Sciences faculty at Lehman College have been well supported by federal and private extramural funding, including USDA, NSF, NIH, Rockefeller Foundation, DOE, McKnight Foundation, American Cancer Society, and other agencies. Faculty have been recognized as AAAS Fellow, ASPB Fellow, Fellow of the International Carotenoid Society, Trevor Goodwin Awardee for life accomplishment in carotenoid biochemistry, Fulbright, and Guggenheim Fellows.

| Last name | First name | Institution |
|---|---|---|
| Ambrose | Barbara | NYBG |
| Armstrong | Kate | NYBG |
| Balick | Michael | NYBG |
| Cheng | Haiping | Lehman College |
| Daly | Douglas | NYBG |
| Gunner | Marilyn | CCNY |
| He | Ye | ASRC |
| Henderson | Andrew | NYBG |
| Ikui | Amy | Brooklyn College |
| Karol | Kenneth | NYBG |
| Kelly | Lawence | NYBG |
| Kennelly | Edward | Lehman College |
| Lendemer | James | NY State Museum |
| Little | Damon | NYBG |
| McAlvay | Alex | NYBG |
| Michelangeli | Fabian | NYBG |
| Naczi | Robert | NYBG |
| Oberle | Brad | NYBG |
| Pace | Matthew | NYBG |
| Plunkett | Gregory | NYBG |
| Polle | Juergen | Brooklyn |
| Reinmann | Andrew | ASRC |
| Sankaran | Renuka | Lehman College |
| Sessa | Emily | NYBG |
| Singh | Shaneen | Brooklyn |
| Stark | Ruth | CCNY |
| Thomas | William | NYBG |
| Torke | Benjamin | NYBG |
| Zheng | Zhiliang | Lehman College |
| Wurtzel | Eleanore | Lehman College |

**Table 10. Plant Science Faculty by Institution**

**Plant Science Infrastructure**

Lehman College has a 69,000-sq. ft. LEED silver-certified science building, Science Hall, that opened in 2014. The building houses all the Lehman research-active plant science faculty. In addition to modern research laboratories, the building houses other facilities needed for plant science research, like rooftop greenhouses, plant growth chambers, and core facilities for mass spectrometry and confocal microscopy. Adjacent to Science Hall is the Lehman College corn field. With the opening of Science Hall, the college invested significantly in the future of biological science research, especially in plant sciences, at Lehman College. All five plant biologists have research labs in science hall which was designed with the open lab concept to promote collaboration across lab groups.

## 6. Interdepartmental Programs

The Department of Biological Sciences contributes significantly to other departments and programs at Lehman College by offering several courses that fulfill their degree requirements including:

- Bio 181 and Bio 182 (Anatomy and Physiology) and Bio 230 (Microbiology) which serve as prerequisites for degrees from the Nursing and Health Sciences Departments.
- Bio 183 (Human Biology) which is required for degrees from the Health Sciences Department.
- Bio 173 (Concepts in Human Biology) which fulfills the Pathways General Education requirements.
- Bio 166 and Bio 167 (Principles and Organismic Biology) which are required for degrees from Chemistry, Anthropology, Environmental Sciences, and Health Sciences Departments.

The two-semester combined lecture/lab courses in Anatomy and Physiology (Bio 181 and Bio 182) and Microbiology (Bio 230) offered by the Department of Biological Sciences are gateway courses for the nursing program at Lehman College, which was recently recognized as No.1 in best-value R.N. programs in New York state.

Approximately 900 students per semester are served in the Anatomy and Physiology (A&P) courses, with section enrollment ranging from 24 students/class to 510 students/class. All labs have a capacity limit of 24 students (current in-person capacity of 16 students/lab). Fall 2021 Bio 181 included 5 lecture sections and 23 sections of lab. Fall 2021 Bio 182 included 2 sections of lecture and 7 sections of lab. The course was managed by 2 course coordinators, who also served as instructors of the two jumbo lectures, are responsible for selection of course materials, and drafting of the standard syllabi for the course. In recent semesters, we have changed to a model of one lecture, and the lecturer serves as the coordinator of all the labs. In this period, our instructional staff included 1 doctoral lecturer, 4 adjunct assistant professors, 11 adjunct lecturers.

Prior to the pandemic, all lectures were taught in-person. Post pandemic, small (30/class), mid-size (60/class) and large (90/class) lectures were expected to resume standard in-person lecture with in-class activities (discussions, checkpoint questions). Jumbo lectures (200+ students) will remain online in an asynchronous format. Students in the asynchronous course attend virtual interactive lectures (embedded checkpoint questions, videos, and information links) which are graded for completion. Multiple review sessions are conducted weekly in large sections.

Attendance is not mandatory but is encouraged. To enhance student learning, we have added weekly, small capacity (24 student) recitation as a scheduled component of our course. Students in all sections have access to an online learning platform and complete weekly review assignments. Timed, randomized question exams are administered online in Blackboard, using question pools accessible to all instructors. All other lecture course materials are available on a Microsoft Teams site, ensuring uniformity across sections.

The lab is also standardized across all sections by using lab course shells stored in a common Blackboard site accessible to all A&P instructors. The shells can be copied into each instructor's course Blackboard, and specify the learning objectives, contain pre-lab exercises, in-class activities, and post-lab assignments. Instructors are allowed to supplement with additional activities if they choose. We plan to formalize our lab instructor training/support to further ensure that we have uniform instruction across all sections of the course. During in-person lab, students identify anatomical structures using microscopes, models, and online programs (interactive cadaver dissection, online histology slides, anatomy atlases), conduct physiology experiments (cardiovascular physiology, reflexes), and multiple organ and whole organism dissections.

In addition to service courses taught for other programs, the Department of Biological Sciences offers several interdisciplinary programs in collaboration with other departments including:

- Quantitative Systems Biology minor in collaboration with the Department of Mathematics and Computer Science.
- A new track in Bioenvironmental Sciences in collaboration with the Department of Earth, Environmental, and Geospatial Sciences.
- Courses for the BA and an MA degree in collaboration with the Department of Education.
- Courses for the Ph.D. degree in Plant Sciences through the CUNY Graduate Center.

## 7. Department Structure and Recent Reorganization Efforts

**Surviving through the pandemic**

*Dr. Haiping Cheng*
***Prior Chair*** *(*7/2015 -7/2022)

Under the incredible effort and leadership of our former Chair, Dr. HaiPing Cheng, the Department was able to rapidly pivot in Spring 2020 from in-person lectures and labs to online learning. To facilitate communication, Dr. Cheng created a Microsoft TEAMS site which today is the crux of our departmental function and memory. Dr. Cheng led the Department through this very difficult time, where untenured faculty were anxious to get back into their research labs, and the Department had to ensure that biological research in the Greenhouses and Animal Care Facility was not disrupted. Dr. Cheng supervised the CLTs who were instructed to support the online lab components of courses. Everyone met by zoom and often worked in isolation. After about four month's closure of the research labs, faculty and students were allowed to slowly return to their research, which was often delayed and disrupted by difficulties in campus access and delivery of materials and supplies. In 2022, Dr. Cheng wisely requested support from the administration to create a Deputy Chair position, held by Dr. Rena Quinlan, who together with CLT Kasi Molina-Velez, helped to assemble the course schedules and hire adjuncts. The Department is ever grateful to Dr. Cheng for working so diligently with the administration to keep our Department moving at this critical time.

**Department Reorganization**

*Dr. Eleanore Wurtzel*
***Current Chair*** *(7/2022-7/2025)*
Web Site

Fall 2022 began the path out of the pandemic from online to in-person activities. During the pandemic, faculty and staff worked independently, and it was time to regroup. As the new Chair, Dr. Eleanore Wurtzel recognized an opportunity to implement changes to improve departmental operations, promote equity, and lessen the burden on future chairs faced with running a growing Department with over 70 faculty and staff, 550 majors and 3400 enrolled students (as of Fall 2023).

*Expanding Office Staffing:*

As of Fall 2022, the Bio office was down to one secretary, Dolores Vitanza, and yet all operations required extensive tasks and use of numerous technological platforms that far-exceeded the staffing. We were given permission to hire an aHEO, Academic Program Administrator, Velveth

Suarez (March 2023), who has helped to expand the BIO office functions to meet current demands. CLT Kasi Molina-Velez helped to train Velveth and continues to support administrative efforts in the department.

*Technical Staff, Restructuring CLT Support, New Hires, And Equity:*

In Fall 2022, Kent Gentry joined the Department as a new CLT to support the greenhouses, which had not been managed by permanent staff for some years. His arrival brought the CLT staff up to five members: Senior CLT Christina West; Senior CLT Christine Delevan; CLT Kasi Molina-Velez, and technical Chief CLT Dr. Hunki Paek, who was hired to manage budgeting, instrumentation, along with course support, but not supervision of other CLTs. For many years prior, the departmental CLTs worked independently to support their specific courses, including ordering and preparation of materials. There was no unified vision or collaboration. Therefore, in Fall 2022, Dr. Wurtzel began meeting with the CLTs to develop a team by giving them the responsibility of working together to handle course budgets, solve problems, and make group decisions on priorities. During this year, Dr. Paek's contract was not renewed, and permission was given to hire a replacement CLT. Knowing that the CLTs knew best what to look for in a new CLT hire, the Chair requested of the remaining CLTs, Christine Delevan, Kasi Molina-Velez, and Kent Gentry, to join together to form a search committee under the leadership of Christina West, the most senior CLT. The committee also included one faculty member, Dr. Sebastian Rojas-Villa. A rapid and successful search was conducted during Summer 2023 and a wonderful new CLT colleague was hired, Cristian Sanlatte, who began in Fall 2023. Thus, there were a total of 5 CLTs (including 1 CLT for the greenhouse), four of whom were responsible for prepping courses including all ordering for teaching and new faculty but worked independently under the direction of the Chair. However, the ultimate plan was to move to a team structure with a supervisory Chief CLT. The Chair worked with the NSS Dean to move Christina West into a subline Chief CLT. In February 2024, Christina West was promoted to Chief CLT and now supervises the team, taking a large burden off the chair, while enhancing CLT collaboration and improving job satisfaction for all. The Chief CLT handles all ordering and service contracts, supervises the CLT team and participates in course scheduling to maximize course support with the limited number of CLTs. With the change in structure, there are now only three CLTs who are prepping courses, while one greenhouse CLT handles the greenhouse, associated facilities, and related ordering. Given the large number students being taught in lab courses, it necessary to hire part-time adjunct CLTs each

semester, to adjust course timing to maximize CLT support, and to limit the number of lab courses offered both for majors and for affiliated programs that require Biology courses. The CLTs now work together as a team. In addition, salaries of the CLTs were reviewed and efforts were successfully made that led to salary equity across this group. Although efforts to bring in a CLT to support the Animal Care Facility (ACF) failed at this time, the NSS Dean helped the Department get approval of a plan to support a research assistant funded through a combination of return of grant indirect costs and user fees. As a result, future support of this individual and the ACF will depend on continuous research funding of the animal users. Current users are three faculty in Biological Sciences, with the expected addition of one more who awaits grant proposal outcomes, and one in the Chemistry Department.

*New Faculty Hires:*

Teaching faculty- In Fall 2022 and Fall 2023, three lecturers were hired, Michael Waterson, Sebastian Rojas-Villa and Sarah Moroianu, all of whom have teaching expertise but also come from research backgrounds. These new hires join our current lecturers, Drs. Rena Quinlan, Jack Henning, and Ayanna Alexander-Street. We were thus able to reduce the staff of part-time adjunct lecturers and improve student learning and access to fulltime faculty. The new lecturers have taken an active role in the Department in advising and leading the student clubs (Bio Club and TriBeta Honor Society) which were inactive during the pandemic.

Research Faculty- The most recent hires of tenure-track faculty were Dr. Julio Gallego-Delgado, parasitologist (as of Fall 2018) and Dr. Pratyusha Mandal, immunologist (as of Fall 2022). Of the Plant Sciences faculty, three have retired, one is inactive, and one is about to retire. Given the longstanding graduate and undergraduate research training programs with the New York Botanical Garden, the Department faces a crucial point in maintaining viability of this novel strength.

*Deputy Chairs transition to a team:*

The responsibility of the Deputy Chair has been to organize the course schedule and hire the adjuncts, who number about 40 per semester. With the huge growth of the department, the Chair

has now divided this position into a team of two. As of Spring 2024, Dr. Rena Quinlan is handling the adjunct hiring and Dr. Maryam Bamshad is handling the course scheduling and reaching out to line faculty. The Academic Program Coordinator is supporting these efforts with hiring paperwork and input into CourseDog. Further assistance on the administrative aspects of scheduling is being provided by CLT Kasi Molina Velez. A Deputy Chair team can also provide functional continuity in the Department as Chairs rotate after one or more three-year terms.

*Advising transition to a team:*

After many years of being the undergraduate advisor, Dr. Maryam Bamshad has stepped down to be a co-Deputy Chair. It was timely to split this growing role into two. As of Spring 2024, Dr. Sebastian Rojas Villa and Dr. Michael Waterson are sharing the Advisor role, which includes a wide range of activities as specified on our Microsoft TEAMS site. In addition, all faculty participate in weekly advising.

*New Course Coordinators and Teaching Assistants (TAs):*

Course Coordinators- The growth of the Department to 550 majors and over 3400 enrolled students (as of Fall 2023) is evidenced by several courses which have multiple lab sections and jumbo lectures. As of Fall 2022, the current chair moved to structure large courses with only one lecture. There still remains a coordination issue in managing the multiple lab sections and ensuring that student grading is equitable. Therefore, a request was made to dean to implement Course Coordinators for such large courses. Most of the coordinators are fulltime faculty who receive released time, while the coordinator for BIO173/BIO183 is currently an adjunct and is paid through non-teaching adjunct funds from the Dean's office. We have now coordinators for the following courses:

BIO 166 or 167 (~240 enrolled/semester) Introductory Biology (majors)
BIO 230 (~200 enrolled/semester) Microbiology (nonmajors)
BIO 181 (~500 enrolled/semester) Anatomy and Physiology I (nonmajors, mostly prenursing)
BIO 182 (~143 enrolled/semester) Anatomy and Physiology II (nonmajors, mostly prenursing)
BIO 173/183 (~160 enrolled/semester) Concepts of Human Biology/Human Biology (nonmajors)

Teaching Assistants (TAs)- TAs are hired for large courses to help in monitoring exams and fielding questions. The recent access to Navigate, an early response tool for

monitoring student problems, helps to identify students who are missing classes or doing poorly on exams. Keeping track of hundreds of students in large courses is now facilitated with the hiring of graduate TAs (e.g., Masters students).

*Budget:*

Teaching-related-The decision was made to ask the Freshman Year Initiative (FYI) program to support adjunct staff needed in lab courses that FYI requests for the Department of Biological Sciences to run. This change has helped us better manage our overall adjunct requests. Materials fees for teaching are managed by Chief CLT Christina West. Research Foundation (RF) fees, including Chair grants and Lehman Foundation funds, are managed by the Academic Program Coordinator, Velveth Suarez. The management of Chair RF funds was motivated by a desire to set in place logistical changes to ease the work of current and future departmental chairs.

Infrastructure and long-term maintenance- The Chair has been working with the Dean and Chief CLT to develop a list of maintenance contracts and repair needs for the department. This effort includes long term planning for maintenance, repair, and replacement. Of current concern are the autoclaves, environmental rooms, and plant growth chambers, most of which were installed in Science Hall when it was built ten years ago and are now starting to break down. In addition, the Dean is working to increase available funding to support research equipment repair by return of indirect grant costs to the school of Natural and Social Sciences.

*Creation of a Center for Undergraduate Research in Biology:*

Plans are underway to convert Davis 039 to a space for undergrad-mentored research. This effort is being spearheaded by our new lecturers (Drs. Sebastian Rojas Villa, Michael Waterson, and Sarah Moroianu) who when hired, were encouraged to mentor undergrad students taking BIO490. The space will also serve as a center for student research activities organized through the Biology Club and TriBeta, which are advised by Drs. Sebastian Rojas Villa and Michael Waterson, respectively. The space will also serve as a test bed for the lecturers to develop new lab course components.

*Weekly staff meetings:*

To coordinate the various activities in the department, the Chair meets weekly with staff, including Academic Program Coordinator Velveth Suarez, Secretary Dolores Vitanza, Deputy Chairs Drs.

Rena Quinlan, and Maryam Bamshad, Chief CLT Christina West and CLT Kasi Molina-Velez. For example, the deputy chairs construct the course schedule which is then reviewed by the Chief CLT for compatibility with CLT support and then is further discussed by the group. Issues such as the need for Course Coordinators was brought up in these staff discussions.

*Departmental meetings:*

In Fall 2022, the college was still eking its way out of the pandemic and so the Chair organized hybrid meetings, which were great to get everyone together, but less effective with members joining in on zoom. In Fall 2023, we moved to in person meetings with lunch, which has proved to increase collaborations and discussions. Meetings are always kept to an hour and advance distribution of meeting agendas include departmental "BIONEWS" to keep everyone up to date without necessitating lengthy meetings. All faculty members serve on committees. Appendix F shows the committees and the elected members who have been serving on those committees since the last departmental election in May 2022.

## Faculty

The Department has 20 full-time faculty and ~40 part-time adjunct instructors. Of the 20 full-time members, 14 are research faculty (9 full professors, including one about to retire; 2 associate professors; 3 assistant professors), and 6 are doctoral lecturers. The newest additions to the Department since the last self-study are Drs. Julio Gallego-Delgado and Pratyusha Mandal who were hired as assistant professors, and Drs. Michael Waterson, Sebastian Rojas-Villa, and Sarah Moroainu who were hired as doctoral lecturers. All full-time faculty hold doctorates. All faculty are on nine months appointments and are required to teach a given number of contact hours according to the PSCUNY union contract (professors: 18hrs/year and lecturers: 24 hours/year). All faculty are required to participate in advising and service; all professors are also expected to engage in scholarly activities (research, publications, grants, patents, etc.) and student mentoring.

**Department of Biological Sciences, Lehman College, CUNY, Fall 2023**
***Front:*** S. Rojas Villa, J. Henning, R. Quinlan, L. Vega*, D. Vitanza, A. Singh*, V. Suarez, E. Wurtzel, M. Bamshad, J. Rachlin, K. Molina-Velez;
***Back:*** M. Muntzel, E. Kennelly, M. Waterson, S. Moroianu, A. Negrin*, K. Gentry, S. Redenti, J. Gallego-Delgado, M. Sauane, C. Sanlatte, H-P Cheng;
***Full-time faculty members not pictured:*** G. Aisemberg, A. Alexander-Street, D. Kincaid, P. Mandal, R. Sankaran, Z-L. Zheng. *adjunct faculty

## Full Professors

*Maryam Bamshad Ph.D., Professor,* ***Co-Deputy Chair*** *(Link to CV)*
Teaching: Human body and brain; Endocrinology (link to syllabus)
Research: Examining how stress affects cognition related to decision-making and problem-solving. We are studying human subjects to better understand the effect of stress on mental effort when solving problems. Our aim is to determine whether training can alter neuronal connections in the brain to enhance attentiveness and to change the mind's cost-benefit analysis of mental effort exertion.
Link to Google Scholar Citations

*Haiping Cheng, Ph.D., Professor (Link to CV)*
Doctoral Program Affiliation: Biochemistry; Biology (Plant Sciences subprogram; Molecular Cellular & Developmental Biology subprogram)
Teaching: Experimental Microbiology; Medical Microbiology (*Link to Syllabi*)
Research: Bacterial sensing mechanisms required for microbe-plant nitrogen fixing symbiosis; bacterial metabolites with antibiotic activities.
Link to web site

*Edward Kennelly, Ph.D., Professor* ***Graduate Deputy Chair, PhD*** *(Link to CV)*
Doctoral Program Affiliation: Biology; Biochemistry; Chemistry
Teaching: Biochemistry (link to syllabus)
Research: Dr Kennelly's research focuses on biologically active phytochemicals in plants. Plants produce a myriad of unusual compounds that are not used for primary metabolism but are thought to be used for plant survival in various environmental challenges. The biological activities of these phytochemicals, also known as secondary products or natural products, have been harnessed by humans for millennia as medicines. The research conducted in Kennelly laboratory examines phytochemicals for novel biological actions with a focus on phytochemicals with antioxidant activity that may help to prevent cancer and cardiovascular disease.
Link to Google Scholar Citations

*Dwight Kincaid, Ph.D., Professor (Link to CV)* (plans to retire as of Fall 2024)
Teaching: Biostatistics (Link to Syllabi)
Prior Research: Plant ecology; programming in R

*Martin Muntzel, Ph.D., Professor (Link to CV)*
Teaching: Mammalian Physiology
Prior Research: Effects of subfornical organ lesions on sympathetic nerve responses to insulin, effects of adrenergic, cholinergic, and autonomic blockade on metformin-induced depressor responses in spontaneously hypertensive rats, and Metformin attenuates salt-induced hypertension in spontaneously hypertensive rats.
Link to ResearchGate

*Joseph Rachlin, Ph.D., Professor (Link to CV)*
Teaching: Marine Biology; Comparative Anatomy of Vertebrates (Link to Syllabi)
Research: Aquatic ecology and population dynamics; use of parsimony analysis to address ecological questions, specifically on vascular plant distributions.
Link to ResearchGate

*Stephen Redenti, Ph.D., Professor,* ***Graduate Studies Advisor (Masters Program)*** *(Link to CV)*
Doctoral Program Affiliation: Biology; Biochemistry
Teaching: Neurophysiology; Bio Seminar (Link to Syllabi)
Research: The Redenti Lab explores cellular communication involved in the development and regeneration of retinal and other central nervous system tissues. A particular interest of the lab is in how cells respond to morphogenetic fields of discrete, localized biochemical and electrical signals leading to the development of organized neural tissue.
Link to Google Scholar Citations

*Zhi-Liang Zheng, Ph.D., Professor, (Link to CV)*
Doctoral Program Affiliation: Biology
Teaching: Genetics; Genetics of Man (Link to Syllabi)
Research: The Zheng lab pursues cellular signaling in four major areas: function of Rho GTPases; how environmental carbon, nitrogen, and sulphur nutrients cross-talk in Arabidopsis; understanding the involvement of phytohormone auxin in cell morphogenesis and sulfate nutrient signaling; imaging of epigenetic studies of drug addiction in humans.
(Link to Google Scholar Citations)

*Eleanore T. Wurtzel, Ph.D., Professor and* ***Chair*** *(2022-present) (Link to CV)*
***AAAS*** *Fellow,* ***ASPB*** *Fellow,* ***ICS*** *Fellow of the International Carotenoid Society,*
*2023* ***Trevor Goodwin Award*** *for lifetime research in carotenoid biochemistry.*
Doctoral Program Affiliation: Biochemistry; Biology (Plant Sciences subprogram; Molecular Cellular & Developmental Biology subprogram)
Teaching: Grantsmanship and scientific writing courses (*Link to Syllabi*)
Research: Interdisciplinary research on provitamin A carotenoid biosynthesis which is enabling sustainable solutions to global vitamin A deficiency.
Link to Google Scholar Citations  Web Site

## Associate Professors

*Renuka Sankaran, Ph.D., Associate Professor,* ***LSAMP Coordinator; Chair, Plant Sciences PhD subprogram of Biology*** *(Link to CV)*
Doctoral Program Affiliation: Biology; Biochemistry
Teaching: Plant Physiology; Research Design (Link to Syllabi)
Research: The ongoing goal in the Sankaran lab is to enhance nutritional quality and ensure the safety of the cereal grains grown and marketed. Our research focuses on two important complementary strategies: to reduce the concentration of contaminants in the edible tissues while improving nutritional quality and quantity; to focus on the bioavailability of these nutrients and contaminants in the diet.
Link to ResearchGate

*Moira Sauane, Ph.D., Associate Professor (Link to CV)*
Doctoral Program Affiliation: Biology; Biochemistry
Teaching: Molecular Biology; Biochemistry of Differentiation (Link to Syllabi)

Research: The research in Sauane laboratory focuses on identifying the molecular basis of the translational control of protein synthesis and its importance in cancer, inflammation, and viral replication. The aim of the laboratory is to discover the precise molecular mechanisms by which cancer-therapeutic agents selectively kill cancer cells. The ultimate goal is to exploit this knowledge for new therapeutic developments.
Link to ResearchGate

## Assistant Professors

*Gabriel Aisemberg, Ph.D., Assistant Professor (Link to CV)*
Teaching: Neural Development (Link to Syllabi)
Prior Research: Animal development

*Julio Gallego-Delgado, Ph.D., Assistant Professor,* ***Undergraduate Research Committee Chair*** *(Link to CV)*
Doctoral Program Affiliation: Biology; Biochemistry
Teaching: Parasitology (Link to Syllabi)
Research: The Gallego-Delgado laboratory focuses on the pathology of severe malaria, using *in vitro* and *in vivo* models of malaria. The research aims are to understand the changes taking place in brain endothelial cells during malaria infection and to identify the molecular pathways underlying acute kidney injury during severe malaria.
Link to Google Scholar Citations

*Pratyusha Mandal, Ph.D., Assistant Professor (Link to CV)*
Doctoral Program Affiliation: Biology; Biochemistry
Teaching: BIOL 7921 Graduate Tutorial; BIOL 350 Introduction to Immunology (Link to Syllabi)
Research: The Mandal Laboratory aims to understand host-pathogen interactions with a focus on how innate immune components (cell death, inflammation) contribute to immunity or tissue injury during pathogen infection and insult. Dr. Mandal is particularly interested in understanding how ubiquitous viruses such as herpesviruses modulate innate immune signaling to establish life-long infections and cause disease.
Link to Google Scholar Citations

## Doctoral Lecturers

*Ayanna Alexander-Street, Ph.D., Lecturer (Link to CV)*
Teaching: Anatomy & Physiology; Drugs, Brain & Behavior (*Link to Syllabi*)

*Jack Henning, Ph.D. Lecturer and* ***Bio Pre-Health Advisor*** *(Link to CV)*
Teaching: Genetics; Urban Ecology (Link to Syllabus)

*Sarah Moroianu, Ph.D. Lecturer* and ***Assessment Coordinator*** (Link to CV)
Teaching: Microbiology (Link to Syllabus)

*Rena Quinlan, Ph.D., Lecturer and* ***Co-Deputy Chair*** *(Link to CV)*
Teaching: Astrobiology (*Link to Syllabus*)

Link to ResearchGate

*Sebastian Rojas-Villa, Ph.D. Lecturer,* ***Undergrad Advisor/ Biology Club Advisor*** *(Link to CV)*
Teaching: Human Biology (Link to Syllabus)
Link to Web Site

*Michael Waterson, Ph.D. Lecturer,* ***Undergrad Advisor/TriBeta Honor Society Advisor*** *(Link to CV)*
Teaching: General Biology (Link to Syllabus)
Link to Google Scholar Citations

## Staff

| College Laboratory Technicians | Role |
|---|---|
| Christina West, Chief CLT | Supervisory |
| Christine Delevan, Senior CLT | Course support |
| Kasielis Molina-Velez, CLT | Course support; academic scheduling support |
| Cristian Sanlatte-Reyes, CLT | Course support |
| Kent Gentry, CLT | Greenhouse support only |

| Office Administration | Role |
|---|---|
| Velveth Suarez, aHEO | Academic Program Coordinator |
| Dolores Vitanza, COA | Secretary |

## Adjunct Faculty

Each semester, the Department hires 30-40 adjunct faculty to teach courses, mostly lab sections. The adjuncts include PhD and Masters students, along with instructors who apply to the Department to teach part-time. Priority for teaching is given to PhD students for whom 5-year support commitments are made when an advisor is selected. Next priority is given to adjuncts who have been teaching for some time in the department. We also hire a varying number of adjunct technical staff to provide course prepping on evenings and weekends plus other times that are outside of the 35-hour work week and capacity of the CLT team.

## 8. Shared Facilities and Resources

**New Science Facility:** Since the last self-study, Lehman received funds from CUNY for the construction of a new integrated Science Building for research and teaching, "Science Hall." The building was to be built in two phases. Phase I, with a budget of $71,000,000 to build 60,000 gross square feet, broke ground in the fall of 2008 and was completed in January 2013. We began our move in January moving the classrooms first followed by the research laboratories. The original plan was to move primarily the Plant Sciences research faculty into Science Hall and the remaining faculty would remain in Davis Hall until Phase II would be built. Science Hall contains a research greenhouse and was planned to contain offices for a Plant Science Center, which was later changed to space for the Dean of Natural and Social Sciences. Phase I houses biology and chemistry laboratories, with state-of-the-art instruments equivalent to what is found in the research labs. Learning in such an environment helps to better prepare our students for their future careers. The research lab design, open labs shared by three research groups on each of three floors, serves to promote collaboration across disciplines and enhance undergraduate and graduate research. Science Phase II has yet to be built, the other half of the department and the Dept office have remained in Davis Hall. The physical separation of the Department across two buildings causes constraints on teaching

Science Hall

and research. Preliminary discussions to build Phase II would greatly benefit teaching and research, both of which contribute to student success. A future Phase II will need to accommodate the entire department (taking into account its continued growth), a second greenhouse for teaching and adequate space for the associated headhouse (prep) and computers, shared office space for graduate students, shared CLT offices and shared adjunct lecturer office space, small meeting rooms for lab seminars, common space for shared equipment, common space for heat-generating equipment and freezers, a modern animal care facility, and a large auditorium for classes and special lectures.

**Greenhouses**: The Department has three greenhouses, two currently in Davis Hall and a research greenhouse on the fourth floor of Science Hall. The upper research greenhouse in Davis Hall needs maintenance as does the lower-level greenhouse, which was devoted to teaching and housing plant collections, such as the orchid and cacti rooms, and hosting student visits. Plans for Phase II were to include a new teaching greenhouse on the roof of Science Hall. Currently, the research greenhouse in Science Hall is being used for teaching materials. Since the greenhouse is used for research, it is no longer possible to host student visits, which will hopefully change once the Phase II teaching greenhouse is built.

**Animal Care Facility**: The Animal Care Facility was built in the early 1980s and became operational from 1984 to 1985. The facility is in the Davis Hall basement and occupies the entire southeast wing. It contains four animal rooms, three storage rooms, two procedure rooms, and a kitchen. It has a cage washer that was recently renovated to maintain sterile conditions. This facility was staffed and supported by the Lehman College until 2018 when supporting staff was eliminated due to budget constraints. Our Department agreed to reopen the animal facility with Dr. Redenti as head of the facility to support the growing needs of the research faculty members. In 2023, the Department got approval to hire a research associate to oversee the daily operations. Future support of this position will depend on the return of faculty grant indirect costs and cage charge fees paid by users. The animal rooms are currently occupied by mice and used by Drs. Redenti and Dr. Gallego-Delgado. Additional users are anticipated as grants get funded. All animal work has received annual IACUC approval by the Campus IACUC committee chaired by Professor Redenti. There are some issues regarding

fluctuations in temperature/humidity and light/dark cycles within the facility, which are monitored and repaired by the office of Campus Facilities, as necessary.

**Imaging Core Facility:** The Imaging Core Facility at Lehman College (Science Hall, third floor) is managed and maintained by Dr. Hai-Ping Cheng and available to all faculty after training. The facility currently houses a Leica Sp5 confocal microscope system which was funded by GRTI funds ($350,000) to Dr. Cheng and colleagues. The College funds the annual service contract.

**Electron Microscope Facility**: This facility (Davis Hall basement) consists of a Hitachi S-2700 Scanning Electron Microscope (SEM) and a Hitachi H-7000 Transmission Electron Microscope (TEM) as well as ancillary equipment required for specimen preparation. The SEM was installed in 1995 and it is used by Biology and Chemistry faculty. The SEM was upgraded to digital imaging in 2003. The only negative aspect of the SEM is the long time (20 minutes) required to change samples. There is a Critical Point Dryer in excellent condition and a Sputter Coater to gold coat samples. The sputter coater is over thirty years old and will soon have to be replaced.

The TEM is 17 years old and was upgraded with a digital imaging system in 2004. Due to budget constraints at the time, we settled on a less than ideal digital system. Another problem is that the X-Ray Analysis system interface with the TEM is very old, not user friendly and uses a Unix operating system. If there are any problems with the software, it is expensive to repair. Two ultramicrotomes are available for sectioning material.

**NMR Facility:** The NMR facility was developed as a joint endeavor of the Departments of Biological Sciences, Chemistry, and Physics, with Professors Edward Kennelly, Manfred Phillip, and Chris Gerry serving as PIs of a Department of Defense grant. The facility is in Davis 035 and was designed by Dr. Kennelly. In 2004 we installed a Bruker Avance 300 MHz NMR instrument. The College provided funds for a major renovation for the room which included a new heating and· air conditioning system to maintain the constant temperature needed to house the instrument. The facility has been used primarily by Biological Sciences, Chemistry, and EGGS (Department of Earth Environment and Geospatial Sciences). The NMR has been staffed by a combination of existing, CLT part-time help contributed by the Department and by Chemistry. Unfortunately, the instrument quenched this past year and efforts are being made to repair or replace the instrument.

**Department Office:** The Biological Sciences office (Davis 217) was renovated in 2005. The office was painted, the floors refinished, and new furniture and lighting was installed to modernize the reception area. Additional mailboxes, a networked copier and a department server were added. Davis 217 is less cluttered and more welcoming to students, faculty, staff, and visitors and displays on the front wall, photographs, and descriptions of faculty research.

**Classroom Technology.** Since the last self-study we upgraded all classrooms to smart classrooms. All rooms have ceiling mounted projectors connected to Crestron systems. Additionally, we have two sets of laptops, one set is for BIO 181/182 laboratories and the other set for upper-level courses. This upgrade was made possible through the successful proposal to charge lab fees. This additional budget has allowed us to upgrade all the labs offered by the department.

**Computer Rooms:** In September 2003, the Department of Biological Sciences opened two computer laboratories with real-time videoconferencing capabilities for use by undergraduate and graduate students. Davis 225 has 25 workstations and is ideal for teaching introductory biology courses, but it is also used for M.A. and Ph.D. courses. Davis 223 has 12 workstations, and a conference table with internet access, and is designed for smaller upper-level biology courses, graduate courses, and seminars. These laboratories were funded through grants to Drs. Kennelly and Wurtzel from the US Department of Agriculture, US Department of Defense, GRTI, and college funds. Upgrading of these facilities is now being requested through a technology fee proposal being prepared by Chief CLT Christina West.

**Instructional Support.** Academic support is available to Biology students through the Science Learning Center and the Title V Office of Supplemental Instruction and Technology. The Science Learning Center provides one-on-one tutoring. The center also conducts workshops to prepare students prior to taking challenging courses such as Anatomy and Physiology. Supported courses receive lab equipment and wireless laptop mobile carts for student use as well as computers and projectors for instructor use. Model students are chosen to serve as supplemental instructor (SI) leaders. The SI leaders attend the targeted class lectures and

hold review sessions to facilitate group learning. This program is improving the transition of Biology students to upper-level courses.

## 9. Future Vision for a Growing Department to Support Student Success

### New faculty needed to support the longstanding Plant Sciences PhD Program

The Department of Biological Sciences at Lehman has a long and distinguished history of excellence in Plant Sciences, dating back to 1968. The Plant Sciences PhD Program, in collaboration with the New York Botanical Garden (NYBG), has been a source of prestige, innovation, funding, and research for the College and the CUNY system. However, the Department is now facing a critical shortage of plant biology faculty, especially at the assistant professor level. This shortage jeopardizes the future of the program and its ability to train the next generation of plant biologists for the diverse and changing needs of society.

According to the 1999 self-study, 50% of the department faculty at the time were plant biologists, bringing in most of the departmental funding and research, and the Plant Sciences PhD program was training 46 of 53 PhD students (the others being 4 in BIO-Neuroscience, 1 in BIO-EEB, and 2 in Biochemistry). Since then, hires were made in parasitology, immunology, neuroscience, and microbiology to provide more breadth in the department; six lecturers were hired to reduce use of adjunct faculty and assist in teaching of nonmajors courses. While these hires were beneficial for the Department and the College, they did not address the growing need for plant biology faculty to support the PhD program and the undergraduate curriculum. With earlier and/or impending retirements we will have lost expertise in plant development, plant physiology, plant ecology, algal research (which is gaining importance in bioenergy), bryophyte model systems, use of computational biology and imaging technologies.

<u>The current situation and challenges:</u> Currently, Lehman has no plant biology faculty who are at the assistant professor level and there is only one Associate Professor who is expected to go up soon for promotion; the remaining 4 are Full Professors. This year, one of our former doctoral faculty members, Professor Dwight Kincaid, is expected to retire at the end of the summer. Dr. Kincaid's departure will leave only five plant biologists: Professors Haiping Cheng (microbe-plant interactions; new antibiotics), Edward Kennelly (medicinal plants and human health), Eleanore Wurtzel (plant biochemistry and metabolic engineering for human health), Zhiliang Zhang (nutrient signaling/human health), and Associate Professor Renuka Sankaran (micronutrients and human health). These faculty are highly productive and respected in their fields, but they cannot sustain the program alone. The remaining Plant Sciences faculty outside of Lehman College are at NYBG (17), Brooklyn College (3), CCNY (2), ASRC (2), New York State Museum (1). Lehman

has always had the largest number of faculty in Plant Sciences from the 5 participating CUNY campuses and serves as the beacon of the Plant Sciences program. The faculty at other CUNY campuses have their own commitments and constraints and cannot fully compensate for the growing loss of plant biology faculty at Lehman.

The urgency and importance of hiring new plant biology faculty: Lehman is in a unique position to be collaborating with the world-famous NYBG for over 56 years and training plant biologists of the diverse workforce of tomorrow. The research emphasis of current Lehman plant biologists on food security and health is especially relevant for the borough of the Bronx, which faces many challenges in these areas. A new hire in plant biology with interests in food security and human health would be synergistic with the growing health sciences at Lehman, including nursing and nutrition. A new hire would also enhance the interdisciplinary and translational potential of the Department and the College.

The Department urgently needs to replace at least one line, if not more, to maintain its excellence in plant sciences. The Department and the PhD program would greatly benefit from new hires who have synergistic research interests and expertise in emerging plant biology disciplines which address the challenges of food security and human health. The Department and the Administration value hires who have the potential to secure funding to support cutting-edge research and high-quality graduate training. Some possible areas of interest include plant biochemistry (a core strength of the Department), synthetic biology and metabolic engineering, biotechnology, developmental biology, and applications in computational biology (to align with the recent college and departmental expansion of a data science track and to meet the teaching needs of the Department).

Lastly, hiring new plant biology faculty would reduce the reliance on adjuncts (40 adjuncts to 20 fulltime faculty), which would improve the quality and consistency of teaching, mentoring, and advising for the students.

In Summary: The Plant Sciences PhD Program at Lehman is a vital and valuable asset for the department, the College, the CUNY system, and society at large. The program has a long and proud tradition of excellence, innovation, and collaboration with the NYBG. However, the program is facing a serious threat due to the shortage of assistant professors and aging of the plant biology faculty. This situation needs to be addressed as soon as possible, by hiring new plant biology faculty who can support and enhance the program, and who can contribute to the research,

teaching, and service missions of the Department and the College. Hiring new plant biology faculty is not only a necessity, but also an opportunity, to strengthen and expand the Plant Sciences program and its impact in the Bronx and beyond.

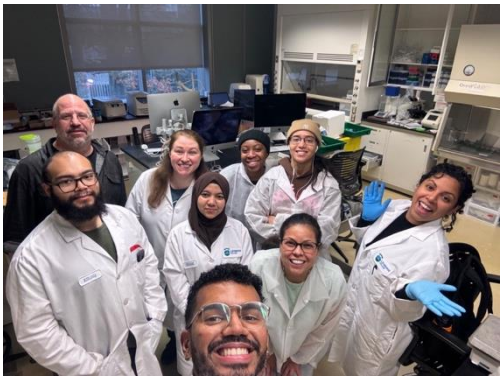
## Graduate assistantships

PhD students. Historically, Lehman has supported doctoral students through a mechanism known as graduate assistantships A (Grad A) lines, which are negotiated salaries from the CUNY union (PSC-CUNY), but due to budget cuts all 12 Grad A lines were retrenched in 1995. Recently the Lehman's Dean in the School of Natural and Social Sciences has reinstated a few Grad A lines which enable faculty to support PhD students in combination with teaching commitments. These 12-month appointments ensure that student stipends are paid evenly, and the student typically teaches one or two laboratory sections per semester, https://www.gc.cuny.edu/fellowships-and-financial-aid/doctoral-student-funding/graduate-assistantships. The Department would like to expand the number of Grad A slots to grow the programs, increase faculty research productivity, and ultimately increase grant funding.

Masters students. Unlike the PhD students, Masters students do not have access to Grad A lines or other fellowships, except for the ~5 fellowships for MS students working with Einstein faculty. Students can apply to teach in the Department. However, teaching does not adequately support students so that they can engage in fulltime education and research. Many of our students are older and have outside jobs needed to support their families. This limitation is reflected in the higher enrollments of Masters students relative to the lower annual graduation rates. The dearth of funding for Masters students limits the pipeline of Masters students who can then go on to PhDs or jobs, a great penalty to diversification of the scientific workforce. The Department is actively seeking ways to expand support for our Masters student population.

## New hiring to support lab courses for an expanding student population

Lab courses are a vital and valuable component of the curriculum in the Department of Biological Sciences at Lehman. However, the Department is facing a serious challenge in supporting these lab courses, due to the insufficient number of CLTs and the increasing demand for lab courses. As of 2024, the Department has one Chief College Laboratory Technicians (CLTs), three CLTs to support lab course prepping, and one CLT to support plant growth and facilities maintenance for teaching and research. The split of the Department into two buildings causes further challenges. The Chief CLT supervises all other CLTs, is responsible for all course ordering plus faculty start-up funds, and expenditures related to equipment service contracts. The Chief CLT provides input to course scheduling based on required CLT duties, reviews lab courses every semester and assign workloads to the other CLTs. The Greenhouse CLT manages and oversees two greenhouses, one in Science Hall and one in Davis Hall, greenhouses which are used for teaching and research. The greenhouse CLT also helps manage the 6 environmental rooms located in various research labs. The greenhouse CLT supports all teaching labs that require plant growth or support, such as Principles of Biology (Bio166 and Bio 167), AstroBiology (Bio229), and Plant Physiology (Bio330) among others. Other than providing plant support to the teaching labs, the greenhouse CLT does not prep individual lab courses. This leaves only three full-time CLTs to support the 15-20 different labs that are offered per semester in the department. At the time of the 1999 self-study, the Department taught 130 majors in one building by a staff of 6 Professors, 2 Associate Professors, 3 Assistant Professors and 1 Lecturer. The CLT staff in 1999 was exactly the same size as what we have today to support a department teaching over 3000 students and 550 majors per semester (20 faculty including 14 research faculty and 6 lecturers; 30-40 Adjunct Faculty; and adjunct technical staff) and these activities are now split between two buildings. The Department of Biological Sciences has grown significantly, and new lab courses are continuously being developed. The opening of the new Nursing Building to meet the severe nursing shortage in New York City, which is expected to triple its classes, means that the Department of Biological Sciences will need to increase sections of its gateway courses for prenursing students which currently enroll ~1000 students/semester. Therefore, we have a clear and urgent need to hire several additional



CLT team (5) and four of the Adjunct CLTs

CLTs in the department. The hiring of more adjunct CLTs is a poor solution because of the administrative burden in hiring, the burden on staff needed to train a changing pool of part-timers, and a burden on maintaining facilities by inexperienced staff. This alternative simply takes away from maximizing student learning though lab courses that are supported by an experienced and knowledgeable staff.

## Long range planning for infrastructure and maintenance

After a decade of use, Science Hall is now facing challenges with maintenance of its infrastructure and equipment. The building of Science Hall was accompanied by much new equipment for teaching and various in-house facilities and equipment of research, including greenhouses, plant growth chambers, environmental rooms, mass spectrometers and shared autoclaves, not to mention all of the equipment purchased through grant funds and tax-levy funds. Davis Hall is an old building which brings its own set of maintenance problems. The Department is working with the Dean to better plan long range budgets for repair and replacement instead of last-minute desperate requests to fund a broken instrument. Efforts to return indirect costs to the Department or School of Natural and Social Sciences will help in this planning.

## Improving undergraduate education of the Biology Major

Although the Department has made significant changes to its program since the last self-study and has seen a steady growth in its undergraduate enrollment, challenges remain to be addressed.

- **Increasing graduates with the Bio Major** The total number of students declaring biology as a major has increased to a much greater level than the number of students who graduate with a biology degree. This suggests that students are either dropping out or changing their major, or they are taking Biology Major as second-degree students to retake some of the biology courses to improve their grades in preparation for other education opportunities such as medical schools. The Department aspires to reverse this trend through more intentional advisement, greater effort on creating learning communities through student clubs, and guiding students to apply for internship or scholarship opportunities. Additionally, the Department could recognize high-achieving and improving students earlier on (sophomores and juniors) as we do for graduating seniors.

- **Increasing the enrollment of students Major in Biology** Despite the increase in the number of biology majors, the total undergraduate enrollment at the college is showing a downward trend. A large pool of incoming students majoring in biology is critical for the success of the department. Significant decreases in the number of majors because of low college enrollment could result in cancelation of advanced courses leaving students with fewer options for courses and the faculty with unfulfilled workloads. The Department could increase its recruitment efforts by having departmental representatives proactively introduce teaching and research opportunities available at the Department to local schools.
- **Increasing the number of Biology Graduates attending professional schools** Many of our majors aspire to go to medical school or some other professional school in the healthcare field, yet a minority of these students realize this dream. Through advising and seminars, the Department could offer more information to students on alternative careers that do not require admittance into a highly competitive professional school. The Department can help strengthen and expand the SMART MDs and Pre-Health Clinal Training Scholarship program to include more students, to provide better and more coordinated training for our students.
- **Increasing the number of Biology graduates with research experience** Many students still graduate without knowing how to conduct research or how to communicate research findings. The Department aspires to increase availability of research opportunities for a greater number of students earlier in their academic career as freshmen or sophomores. Department members presenting at the student biology seminar could also be used to let students know about what research is happening on campus.
- **Increasing the number of Biology students graduating from non-medical track** Although the Department has created various tracks for students to pursue different science career options, most students major in biology because they want to apply to health-professional schools. To encourage students to consider other science-related career paths, the Department could convert its Organismic Sciences track (see Figure 3, page 11) into a Research track and redesign it to intentionally train students for hands-on experiences by taking courses that involve in-class research projects followed by independent research in faculty labs or engagement in internships. The Department could also strengthen its interdisciplinary tracks such as the bioenvironmental or brain sciences track by offering more exciting courses and greater opportunities to support students in their scholarly work and by establishing more collaborations across departments within or outside Lehman.

- **Increase active learning and student engagement in Biology courses** Despite the ease of accessibility to information on the internet and availability of in-person, online/hybrid/hyflex teaching modalities, it remains challenging to capture and maintain student attention during class and train them in cognitive (ask testable question, think critically, make decisions/solve problems) or technical skills (use laboratory instruments to do research or solve problems). Many view classes as hurdles to pass to get a degree rather than a place for molding their brain by gaining knowledge. The Department could attempt to meet this challenge by offering a greater number of courses in which personally relevant research projects become the cornerstone of the course curriculum and by providing intentional guidance for students to apply for experiential learning opportunities on and off campus. We could also increase the number of active learning experiences within our courses (especially large, introductory-level courses) to get students to develop the skills to take control of their own learning.

**Future of the Animal Care Facility**, a Ten-Year Development plan

Year 1-2: Initial Planning and Fundraising

a. Establish a committee consisting of key stakeholders, including faculty members, administrators, and potential donors.

b. Conduct a feasibility study to determine the scope and potential impact of the Animal Care Facility (ACF).

c. Begin fundraising efforts, including seeking grants, donations from alumni, and partnerships with local businesses and organizations.

d. Hire a project manager to oversee the planning and fundraising efforts.

Year 3-4: Facility Renovation and Expansion

a. Secure necessary funding through grants, donations, and other sources to commence facility renovation.

b. Collaborate with architects and contractors to design and execute a full-scale renovation that meets the latest standards for animal care and research.

c. Create dedicated spaces for research, teaching, and training within the ACF.

d. Ensure that the facility is equipped with state-of-the-art technology and resources to support research endeavors.

Year 5-6: Research Development

a. Allocate a portion of the ACF space for faculty research projects led by yourself, Julio, Moira, Pratyusha, and Columba.

b. Encourage faculty members to submit research proposals that incorporate animal models and utilize the ACF's resources.

c. Promote interdisciplinary collaborations to maximize the impact of research conducted within the ACF.

d. Establish a research review committee to evaluate and approve research projects.

Year 7-8: Teaching and Training Programs

a. Develop a comprehensive curriculum for courses on basic animal model handling, ethics in animal research, and related subjects.

b. Identify existing or hire experienced instructors and lecturers to teach these courses.

c. Offer training programs for faculty members across various colleges on topics such as animal surgery, in situ analysis, and primary cell isolation.

d. Collaborate with other institutions to ensure the ACF becomes a hub for animal research education and training.

Year 9-10: Sustainability and Growth

a. Hire a full-time ACF manager and potentially an assistant to provide 24/7 coverage and ensure the welfare of animals.

b. Continue fundraising efforts to support the growth of faculty research and the long-term sustainability of the ACF.

c. Explore opportunities to host collaborative research projects with other institutions, potentially generating additional income.

d. Evaluate the success of the ACF in meeting its research, teaching, and training goals and make necessary adjustments for continuous improvement.

Throughout the ten-year plan, regular assessments and feedback from faculty, students, and staff should be gathered to adapt to changing needs and priorities. The ultimate goal is to develop the Animal Care Facility into a thriving research, teaching, and training center that contributes significantly to the academic and scientific community while ensuring the highest standards of animal care and ethical research practices.

## 10. Appendices

## Appendix A: Bio-BS Degree and Tracks

Biology, B.S. (39-78 Credit Major)
THE REQUIRED COURSES AND CREDITS ARE DISTRIBUTED AS FOLLOWS:

**Prerequisites * (34-38 credits):**

| | | CREDITS |
|---|---|---|
| BIO 166 | PRINCIPLES OF BIOLOGY: CELLS AND GENES | 4 |
| BIO 167 | PRINCIPLES OF BIOLOGY: ORGANISMS | 4 |
| CHE 166 | GENERAL CHEMISTRY I | 4 |
| CHE 167 | GENERAL CHEMISTRY LABORATORY I | 1.5 |
| CHE 168 | GENERAL CHEMISTRY II | 4 |
| CHE 169 | GENERAL CHEMISTRY LABORATORY II | 1.5 |
| PHY 166 | GENERAL PHYSICS I | 5 |
| PHY 167 | GENERAL PHYSICS II | 5 |
| MAT 175 | CALCULUS | 4 |

**Foundation (Required) Courses** (19 credits):
Biology (7 credits):

| | | CREDITS |
|---|---|---|
| BIO 238 | GENETICS | 4 |
| BIO 240 | BIOSTATISTICS | 3 |

Organic Chemistry (12 credits):

| | | CREDITS |
|---|---|---|
| CHE 232 | ORGANIC CHEMISTRY LECTURE I | 4 |
| CHE 233 | ORGANIC CHEMISTRY LABORATORY I | 2 |

| | | |
|---|---|---|
| CHE 234 | ORGANIC CHEMISTRY LECTURE II | 4 |
| CHE 235 | ORGANIC CHEMISTRY LABORATORY II | 2 |

At least 20-21 credits in one of the following tracks:

**TRACK: Biomedical Sciences** at least 21 credits

**SELECT COURSES FROM LISTS: A, B, and C**

At least 12 credits from List A:

| | | CREDITS |
|---|---|---|
| BIO 228 | MAMMALIAN PHYSIOLOGY | 4 |
| BIO 267 | COMPARATIVE ANATOMY OF VERTEBRATES | 4 |
| BIO 331 | EXPERIMENTAL MICROBIOLOGY | 4 |
| BIO 333 | ENDOCRINE PHYSIOLOGY | 4 |
| BIO 350 | INTRODUCTION TO IMMUNOLOGY | 4 |
| BIO 400 | BIOLOGICAL CHEMISTRY | 4 |
| BIO 410 | CELL PHYSIOLOGY AND BIOCHEMISTRY | 4 |
| BIO 411 | PRINCIPLES OF VIROLOGY | 2 |
| BIO 415 | MEDICAL MICROBIOLOGY | 4 |
| BIO 420 | MOLECULAR BIOLOGY | 4 |

At least 8 credits from List B:

| | | CREDITS |
|---|---|---|
| BIO 241 | EVOLUTION, SPECIES, AND BIOGEOGRAPHY | 3 |
| BIO 268 | VERTEBRATE EMBRYOLOGY | 4 |
| BIO 311 | PARASITOLOGY | 3 |

| | | |
|---|---|---|
| BIO 312 | PARASITOLOGY LABORATORY | 2 |
| BIO 320 | NEURAL DEVELOPMENT: FROM GENES AND CELLS TO BRAINS | 3 |
| BIO 321 | NEURAL DEVELOPMENT LABORATORY | 2 |
| BIO 330 | PLANT PHYSIOLOGY | 4 |
| BIO 338 | GENETICS OF MAN | 4 |
| BIO 340 | HUMAN BODY AND BRAIN | 3 |
| BIO 341 | HUMAN BODY AND BRAIN LABORATORY | 2 |
| BIO 431 | COMPARATIVE ANIMAL PHYSIOLOGY | 4 |
| BIO 435 | NEUROPHYSIOLOGY | 3 |
| BIO 438 | GENOMICS AND HUMAN HEALTH | 4 |
| BIO 465 | MICROBIAL PHYSIOLOGY AND GENETICS | 4 |

At least 1 credit from List C:

| | | CREDITS |
|---|---|---|
| BIO 440 | BIOLOGY JOURNAL REVIEW | 2 |
| BIO 450 | BIOLOGY SEMINAR | 1 |
| BIO 489 | INTRODUCTION TO EXPERIMENTAL BIOLOGY | 1 (MAY BE REPEATED FOR A MAXIMUM 3 CREDITS). |
| BIO 490 | HONORS IN BIOLOGICAL SCIENCES | 3 |

**TRACK: Organismic Sciences** at least 21 credits

**SELECT COURSES FROM LISTS A, B, and C**
At least 12 credits from List A:

| | | CREDITS |
|---|---|---|
| BIO 241 | EVOLUTION, SPECIES, AND BIOGEOGRAPHY | 3 |
| BIO 251 | INTRODUCTION TO ENVIRONMENTALISM | 2 |
| BIO 268 | VERTEBRATE EMBRYOLOGY | 4 |
| BIO 311 | PARASITOLOGY | 3 |
| BIO 312 | PARASITOLOGY LABORATORY | 2 |
| BIO 320 | NEURAL DEVELOPMENT: FROM GENES AND CELLS TO BRAINS | 3 |
| BIO 321 | NEURAL DEVELOPMENT LABORATORY | 2 |
| BIO 330 | PLANT PHYSIOLOGY | 4 |
| BIO 336 | MARINE BIOLOGY LECTURES | 3 |
| BIO 338 | GENETICS OF MAN | 4 |
| BIO 339 | ECOLOGY | 4 |
| BIO 340 | HUMAN BODY AND BRAIN | 3 |
| BIO 341 | HUMAN BODY AND BRAIN LABORATORY | 2 |
| BIO 425 | ICHTHYOLOGY | 3 |
| BIO 426 | ICHTHYOLOGY LABORATORY | 2 |
| BIO 431 | COMPARATIVE ANIMAL PHYSIOLOGY | 4 |
| BIO 435 | NEUROPHYSIOLOGY | 3 |
| BIO 438 | GENOMICS AND HUMAN HEALTH | 4 |
| BIO 465 | MICROBIAL PHYSIOLOGY AND GENETICS | 4 |

At least 8 credits from List B:

| | | CREDITS |
|---|---|---|
| BIO 228 | MAMMALIAN PHYSIOLOGY | 4 |
| BIO 267 | COMPARATIVE ANATOMY OF VERTEBRATES | 4 |
| BIO 331 | EXPERIMENTAL MICROBIOLOGY | 4 |
| BIO 333 | ENDOCRINE PHYSIOLOGY | 4 |
| BIO 350 | INTRODUCTION TO IMMUNOLOGY | 4 |
| BIO 400 | BIOLOGICAL CHEMISTRY | 4 |
| BIO 410 | CELL PHYSIOLOGY AND BIOCHEMISTRY | 4 |
| BIO 411 | PRINCIPLES OF VIROLOGY | 2 |
| BIO 415 | MEDICAL MICROBIOLOGY | 4 |
| BIO 420 | MOLECULAR BIOLOGY | 4 |

At least 1 credit from List C:

| | | CREDITS |
|---|---|---|
| BIO 440 | BIOLOGY JOURNAL REVIEW | 2 |
| BIO 450 | BIOLOGY SEMINAR | 1 |
| BIO 489 | INTRODUCTION TO EXPERIMENTAL BIOLOGY | 1 (MAY BE REPEATED FOR A MAXIMUM 3 CREDITS). |
| BIO 490 | HONORS IN BIOLOGICAL SCIENCES | 3 |

**TRACK: Brain Sciences** at least 20 credits

**SELECT COURSES FROM LISTS: A, B, AND C**

At least 13 credits from List A:

| | | CREDITS |
|---|---|---|

| | | |
|---|---|---|
| BIO 228 | MAMMALIAN PHYSIOLOGY | 4 |
| BIO 320 | NEURAL DEVELOPMENT: FROM GENES AND CELLS TO BRAINS | 3 |
| BIO 321 | NEURAL DEVELOPMENT LABORATORY | 2 |
| BIO 340 | HUMAN BODY AND BRAIN | 3 |
| BIO 341 | HUMAN BODY AND BRAIN LABORATORY | 2 |
| BIO 435 | NEUROPHYSIOLOGY | 3 |

At least 1 credit from List B:

| | | CREDITS |
|---|---|---|
| BIO 440 | BIOLOGY JOURNAL REVIEW | 2 |
| BIO 450 | BIOLOGY SEMINAR | 1 |
| BIO 489 | INTRODUCTION TO EXPERIMENTAL BIOLOGY | 1 (MAY BE REPEATED FOR A MAXIMUM 3 CREDITS). |
| BIO 490 | HONORS IN BIOLOGICAL SCIENCES | 3 |

6-9 credits from List C:

| | | CREDITS |
|---|---|---|
| PSY 166 | GENERAL PSYCHOLOGY | 3 |
| PSY 308 | MOTIVATION AND EMOTION | 3 |
| PSY 310 | PSYCHOLOGY OF LEARNING | 3 |
| PSY 312 | PSYCHOLOGY OF MEMORY | 3 |
| PSY 314 | COGNITIVE PSYCHOLOGY | 3 |
| PSY 317 | PSYCHOLOGY OF SENSATION AND PERCEPTION | 3 |

| | | |
|---|---|---|
| PSY 366 | CLINICAL NEUROPSYCHOLOGY | 3 |

*PSY 166 CAN BE USED TO FULFILL GENERAL EDUCATION REQUIREMENTS AND IS A PREREQUISITE TO ALL OTHER PSY COURSES. STUDENTS WHO COMPLETE PSY 166 BEFORE DECLARING THE MAJOR ONLY NEED TO COMPLETE 6 CREDITS IN THIS AREA.*

**TRACK: Bioenvironmental Sciences** at least 23 credits

**SELECT COURSES FROM LISTS: A, B, AND C**
**AT LEAST 12 CREDITS FROM LIST A:**

| | | CREDITS |
|---|---|---|
| BIO 241 | EVOLUTION, SPECIES, AND BIOGEOGRAPHY | 3 |
| BIO 242 | FLOWERING PLANTS | 4 |
| BIO 251 | INTRODUCTION TO ENVIRONMENTALISM | 2 |
| BIO 270 | INVERTEBRATE ZOOLOGY | 3 |
| BIO 271 | INVERTEBRATE ZOOLOGY LABORATORY | 2 |
| BIO 330 | PLANT PHYSIOLOGY | 4 |
| BIO 331 | EXPERIMENTAL MICROBIOLOGY | 4 |
| BIO 336 | MARINE BIOLOGY LECTURES | 3 |
| BIO 339 | ECOLOGY | 4 |
| BIO 400 | BIOLOGICAL CHEMISTRY | 4 |
| BIO 420 | MOLECULAR BIOLOGY | 4 |
| BIO 425 | ICHTHYOLOGY | 3 |
| BIO 426 | ICHTHYOLOGY LABORATORY | 2 |
| BIO 502 | TOPICS IN URBAN ECOLOGY | 4 |

**AT LEAST 1 CREDIT FROM LIST B:**

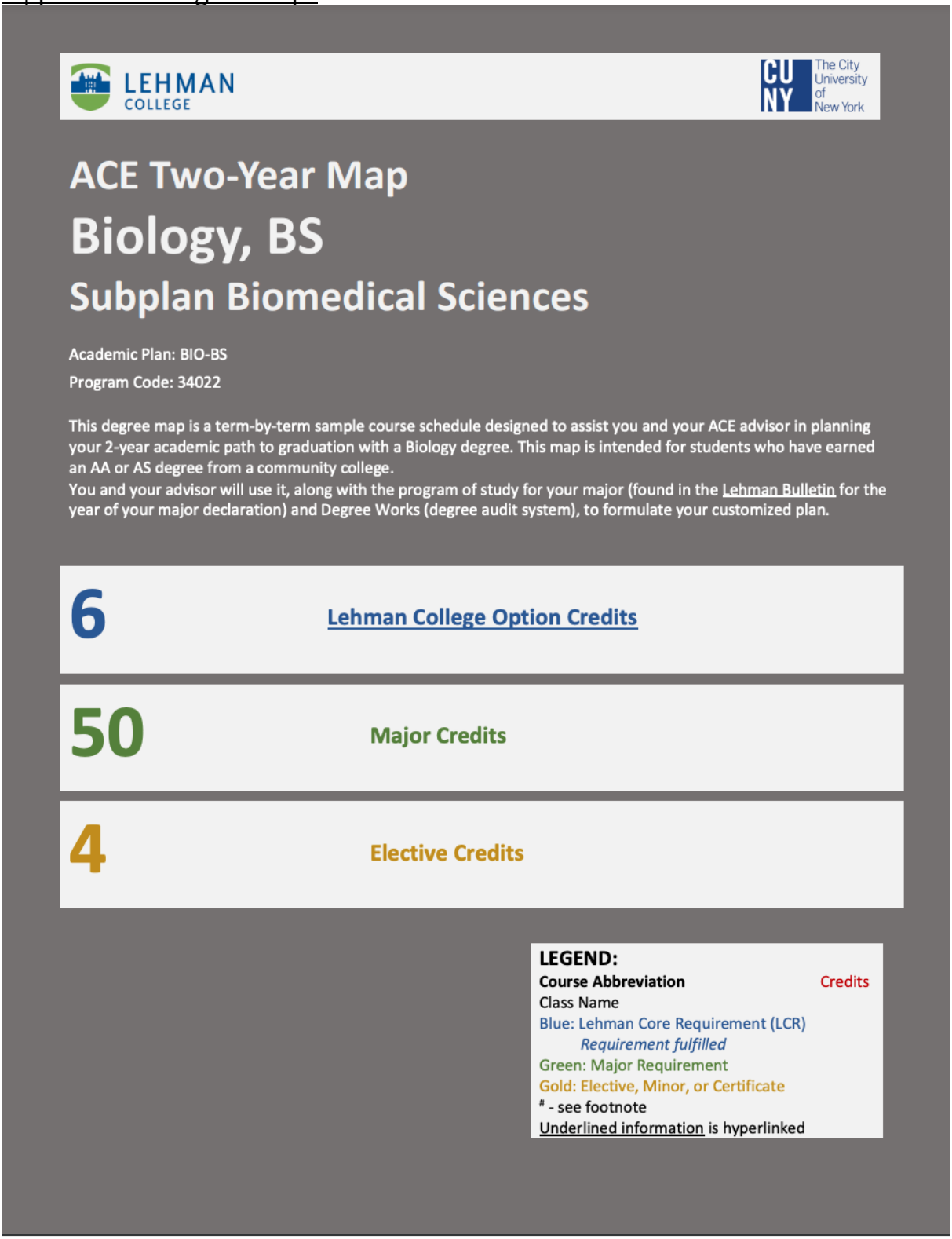
| | | CREDITS |
|---|---|---|
| BIO 440 | BIOLOGY JOURNAL REVIEW | 2 |
| BIO 450 | BIOLOGY SEMINAR | 1 |

| | | |
|---|---|---|
| BIO 489 | INTRODUCTION TO EXPERIMENTAL BIOLOGY | 1 (MAY BE REPEATED FOR A MAXIMUM 3 CREDITS). |
| BIO 490 | HONORS IN BIOLOGICAL SCIENCES | 3 |

**AT LEAST 11 CREDITS IN GEOSPATIAL AND ENVIRONMENTAL SCIENCES FROM LIST C:**

| | | CREDITS |
|---|---|---|
| ENV 251 | INTRODUCTION TO DIGITAL DATA | 2 |
| | AND | |
| GEP 205 | PRINCIPLES OF GEOGRAPHIC INFORM SCI | 3 |
| | OR | |
| GEP 3060 | RASTER APPLICATIONS | 3 |
| | OR | |
| GEP 3750 | DATA ACQ AND INTEGR FOR GIS ANALYSIS | 3 |
| | OR | |
| ENV 235 | CONSERVATION OF THE ENVIRONMENT | 3 |
| | OR | |
| GEP 340 | NATURAL HAZARDS AND DISASTERS WITH GIS | 3 |
| | AND | |
| ENV 326 | ENVIRONMENTAL POLICY | 3 |
| | OR | |
| POL 368 | GLOBAL ENVIRONMENTAL POLITICS | 3 |
| | AND | |
| HEA 301 | ENVIRONMENTAL HEALTH | 3 |
| | OR | |
| ENV 270 | ENVIRONMENTAL POLLUTION | 3 |

Appendix B: Degree Maps



## JUNIOR

### FALL

| | |
|---|---|
| LCR<br>LEH 352, 353, 354, or 355 [1]<br>*Lehman College Option* | 3 CR |
| BIO 238<br>Genetics | 4 CR |
| BIO 240<br>Biostatistics | 3 CR |
| CHE 232<br>Organic Chemistry Lecture I | 4 CR |
| CHE 233<br>Organic Chemistry Lab I | 2 CR |

### SPRING

| | |
|---|---|
| LCR<br>LEH 352, 353, 354, or 355 [1]<br>*Lehman College Option* | 3 CR |
| BIO 2## or 3## [2]<br>Major Electives (List A) | 4 CR |
| CHE 234<br>Organic Chemistry Lecture II | 4 CR |
| CHE 235<br>Organic Chemistry Lab II | 2 CR |
| Elective [5] | 2 CR |

**16 FALL CREDITS + 15 SPRING CREDITS = 31 CREDITS**

## SENIOR

### FALL

| | |
|---|---|
| BIO 2## or 3## [2]<br>Major Electives (List A) | 4 CR |
| BIO 2## or 3## [2]<br>Major Electives (List A) | 4 CR |
| BIO 4## [4]<br>Select Any From List (List C) | 1 CR |
| PHY 166<br>General Physics I | 5 CR |

### SPRING

| | |
|---|---|
| BIO 2## or 3## or 4## [3]<br>Select Any From List (List B) | 4 CR |
| BIO 2## or 3## or 4## [3]<br>Select Any From List (List B) | 4 CR |
| PHY 167<br>General Physics II | 5 CR |
| Elective [5] | 2 CR |

**31 PRIOR CREDITS + 14 FALL CREDITS + 13 SPRING CREDITS = 60 CREDITS**

LEHMAN COLLEGE

CUNY The City University of New York

# Biology, BS
# Subplan Biomedical Sciences

Academic Plan: BIO-BS
Program Code: 34022

This degree map is a term-by-term sample course schedule designed to assist you and your advisor in planning your 4-year academic path to graduation with a Biology degree.
You and your advisor will use it, along with the program of study for your major (found in the Lehman Bulletin for the year of your major declaration) and Degree Works (degree audit system), to formulate your customized plan.

| | |
|---|---|
| **30** | **CUNY Common Core Credits** |
| **12** | **Lehman College Option Credits** |
| **72-76** | **Major Credits** |
| **2-6** | **Elective Credits** |

**LEGEND:**
**Course Abbreviation** Credits
Class Name
Blue: Lehman Core Requirement (LCR)
*Requirement fulfilled*
Green: Major Requirement
Gold: Elective, Minor, or Certificate
# - see footnote
Underlined information is hyperlinked

## FRESHMAN

### FALL

**ENG 111** — 3 CR
English Composition I
*Required Core – Communication*

**BIO 166 - LCR** — 4 CR
Principles of Biology: Cells and Genes
*Required Core – Life and Physical Science*

**MAT 108** and **MAT 171** or **MAT 172** [3] — 4-6 CR
Trigonometry and Elements of Precalculus or Precalculus
*Required Core – Quantitative Skills*

Elective — 3 CR
**LEH 100** (recommended)
The Liberal Arts - Freshman Seminar

### SPRING

**ENG 121** — 3 CR
English Composition II
*Required Core – Communication*

**BIO 167- LCR** — 4 CR
Principles of Biology: Organisms
*Flexible Core – Scientific World*

**CHE 166-LCR** — 4 CR
General Chemistry I
*Flexible Core – Any area* [1]

**CHE 167** — 1.5 CR
General Chemistry Lab I

**MAT 175** — 4 CR
Calculus I

**MAT 155** — 1 CR
Calculus I Lab

**14 FALL CREDITS + 17.5 SPRING CREDITS = 31.5 CREDITS**

## SOPHOMORE

### FALL

**LCR** — 3 CR
Foreign Language I
*Lehman College Option*

**CHE 168** — 4 CR
General Chemistry II

**CHE 169** — 1.5 CR
General Chemistry Lab II

**PHY 166** — 5 CR
General Physics I

Elective — 3 CR

### SPRING

**LCR** — 3 CR
Foreign Language II
*Lehman College Option*

**CHE 232** — 4 CR
Organic Chemistry Lecture I

**CHE 233** — 2 CR
Organic Chemistry Lab I

**PHY 167** — 5 CR
General Physics II

**31.5 PRIOR CREDITS + 16.5 FALL CREDITS + 14 SPRING CREDITS = 62 CREDITS**

## JUNIOR

### FALL

| | |
|---|---|
| LCR<br>LEH 352, 353, 354, or 355 [2]<br>*Lehman College Option* | 3 CR |
| BIO 238<br>Genetic | 4 CR |
| BIO 240<br>Biostatistics | 3 CR |
| CHE 234<br>Organic Chemistry Lecture II | 4 CR |
| CHE 235<br>Organic Chemistry Lab II | 2 CR |

### SPRING

| | |
|---|---|
| LCR<br>LEH 352, 353, 354, or 355 [2]<br>*Lehman College Option* | 3 CR |
| LCR<br>*Flexible Core – Individual and Society* | 3 CR |
| BIO 2## or 3## or 4## [4]<br>Select Any From List ( List A) | 4 CR |
| BIO 2## or 3## or 4## [4]<br>Select Any From List ( List A) | 4 CR |

**62 PRIOR CREDITS + 16 FALL CREDITS + 14 SPRING CREDITS = 92 CREDITS**

## SENIOR

### FALL

| | |
|---|---|
| LCR<br>*Flexible Core – World Cultures and Global Issues* | 3 CR |
| LCR<br>*Flexible Core - US Experience in Its Diversity* | 3 CR |
| BIO 2## or 3## or 4## [4]<br>Select Any From List ( List A) | 4 CR |
| BIO 2## or 3## or 4## [5]<br>Select Any From List (List B) | 4 CR |

### SPRING

| | |
|---|---|
| LCR<br>*Flexible Core – Creative Expression* | 3 CR |
| BIO 2## or 3## or 4## [5]<br>Select Any From List (List B) | 4 CR |
| BIO 4## [6]<br>Select Any From List (List C) | 1 CR |
| Elective | 3 CR |
| Elective | 3 CR |

**92 PRIOR CREDITS + 14 FALL CREDITS + 14 SPRING CREDITS = 120 CREDITS**

## Appendix C: Course Syllabi

| Course Number | Type | Course Title | Instructor |
|---|---|---|---|
| Bio 166 (Link to Syllabus) | Lec & Lab | Principles of General Biology: Cells and Genes | Dr. Sebastian Rojas Villa |
| Bio 167 (Link to Syllabus) | Lec & Lab | Principles of Biology: Organisms | Dr. Sebastian Rojas Villa |
| Bio 181 (Link to Syllabus) | Lec & Lab | Anatomy and Physiology I (Nonmajors) | Dr. Ayanna Alexander-Street |
| Bio 182 (Link to Syllabus) | Lec & Lab | Anatomy and Physiology II | Dr. Michael Waterson |
| Bio 183 (Link to Syllabus) | Lec & Lab | Human Biology (Nonmajors) | Luis Vega |
| Bio 228 (Link to Syllabus) | Lec & Lab | Mammalian Physiology | Dr. Martin Muntzel |
| Bio 230 (Link to Syllabus) | Lec & Lab | Microbiology | Dr. Sarah Moroianu |
| Bio 238 (Link to Syllabus) | Lec & Lab | Genetics | Dr. Jack Henning |
| Bio 240 (Link to Syllabus) | Lec & Lab | Biostatistics | Dr. Dwight Kincaid |
| Bio 267 (Link to Syllabus) | Lec & Lab | Comparative Anatomy of Vertebrates | Dr. Joseph Rachlin |
| Bio 303 (Link to Syllabus) | Lec & Lab | Molecular Genetics | Dr. Rena Quinlan |
| Bio 311(Link to Syllabus) | Lec | Parasitology | Dr. Julio Gallago-Delgado |
| Bio 320 (Link to Syllabus) | Lec | Neural Develop: From Genes and Cells to Brains | Dr. Gabriel Aisemberg |
| Bio 330 (Link to Syllabus) | Lec & Lab | Plant Physiology | Dr. Renuka Sankaran |
| Bio 331 (Link to Syllabus) | Lec & Lab | Experimental Microbiology | Dr. Haiping Cheng |
| Bio 338 (Link to Syllabus) | Lec & Lab | Genetics of Man | Dr. Zhi-Liang Zheng |
| Bio 340 (Link to Syllabus) | Lec | Human Body and Brain | Dr. Maryam Bamshad |
| Bio 350 (Link to Syllabus) | Lec & Lab | Introduction to Immunology | Dr. Pratyusha Mandal |
| Bio 400 (Link to Syllabus) | Lec & Lab | Biological Chemistry | Dr. Edward Kennelly |
| Bio 420 (Link to Syllabus) | Lec & Lab | Molecular Biology | Dr. Moira Sauane |
| Bio 435 (Link to Syllabus) | Lec | Neurophysiology | Dr. Stephen Redenti |
| BIO 7921(Link to Syllabus) | Lec | Research and career skills | Dr. Eleanore Wurtzel |
| Bio 79303; 79305 (Link to Syllabus) | Lec | Grantsmanship and Developing Research Proposal | Dr. Eleanore Wurtzel |

## Appendix D - Sample Assessment Report

Fall 2020 Assessment Report - Completed
Contact: Maryam Bamshad, Assessment Coordinator

**Step 1: Identify Learning Outcome(s), Goal(s), Objective(s) to be assessed:**

Goal 1: Students learn to apply the scientific knowledge and method for solving a biological problem.

- Objective 1: Understand results of a research study in biological sciences.
- Outcome 1: Correctly analyze the results of an experiment in a graphical or a tabular format, or accurately describe a figure showing the model of a biological process.

**Step 2: Determine the criteria for measuring success:**

Outcome 1: 80% of all students in lecture courses will be able to correctly analyze results of an experiment or describe model of a biological process.

**Step 3: Identify Methods and Measures for the Assessment:**

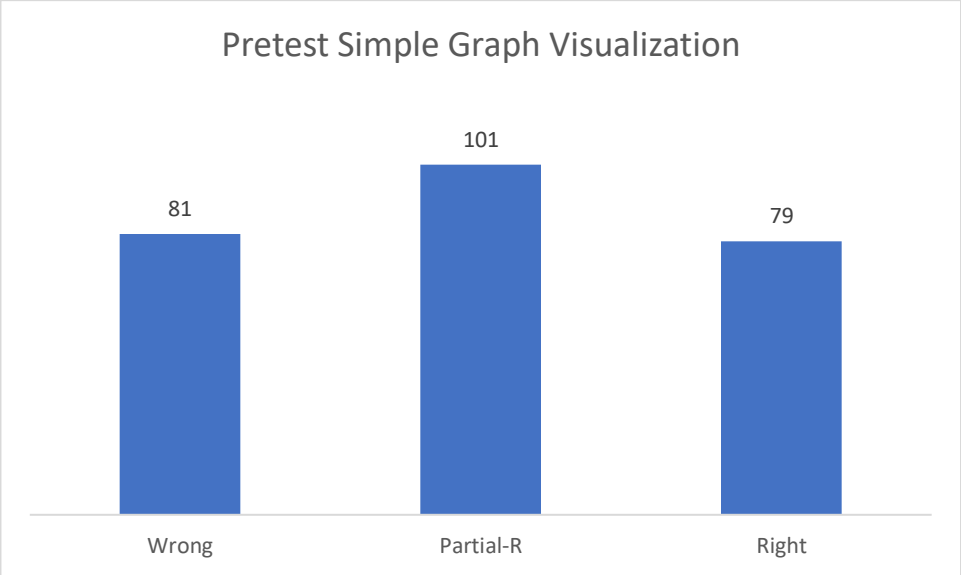
Outcome 1 and 2: A rubric will be used to assess student performance. The rubric will have qualitative measures such as Approaching (Novice), Developing (Intermediate), Achieved (Competent), Capstone (Skilled), etc. To quantify levels of performance, a numerical value will be assigned based on a mathematical formula that considers student's degree of improvement in learning. At the beginning of the semester, students will be given a pretest to assess their prior knowledge/skill. During the semester, a teaching technique will be used to train the students. At the end of the semester, students will be given a posttest to assess their learned knowledge/skill. Using the qualitative and quantitative measures, students' performance will be analyzed across all advanced biology courses (200-400 level).

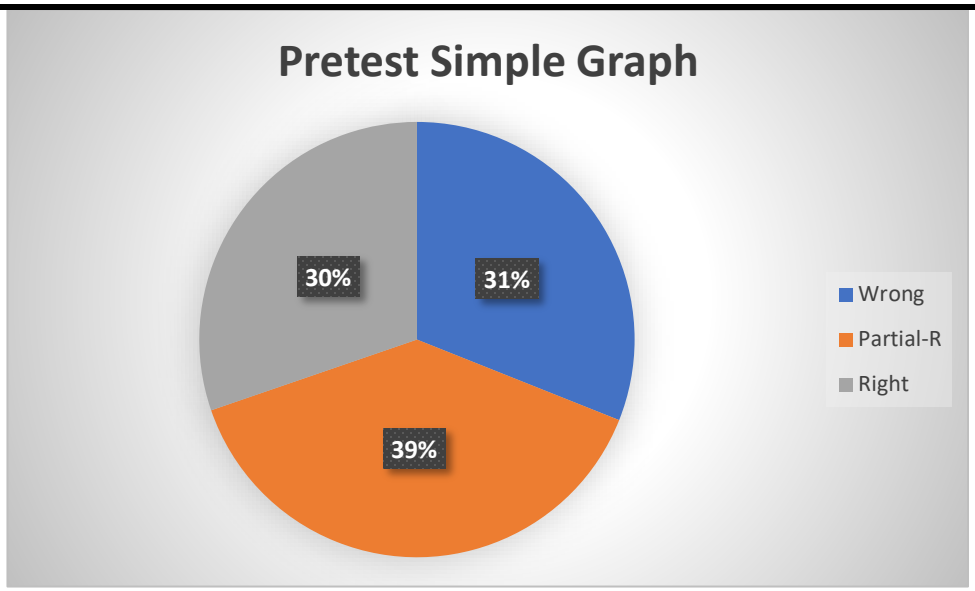
**Timeline:**

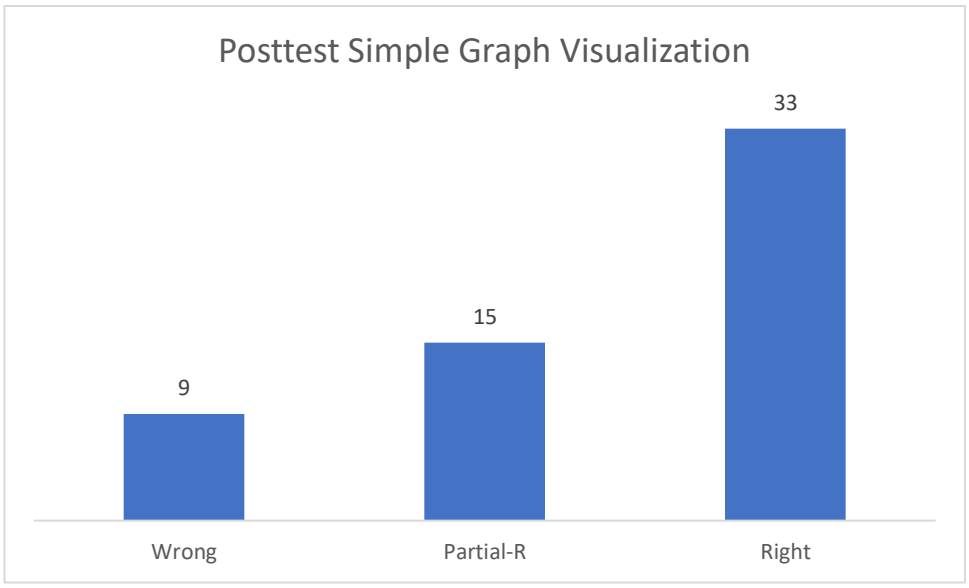
Outcome 1: Phase 1 conducted and completed in fall 2020.

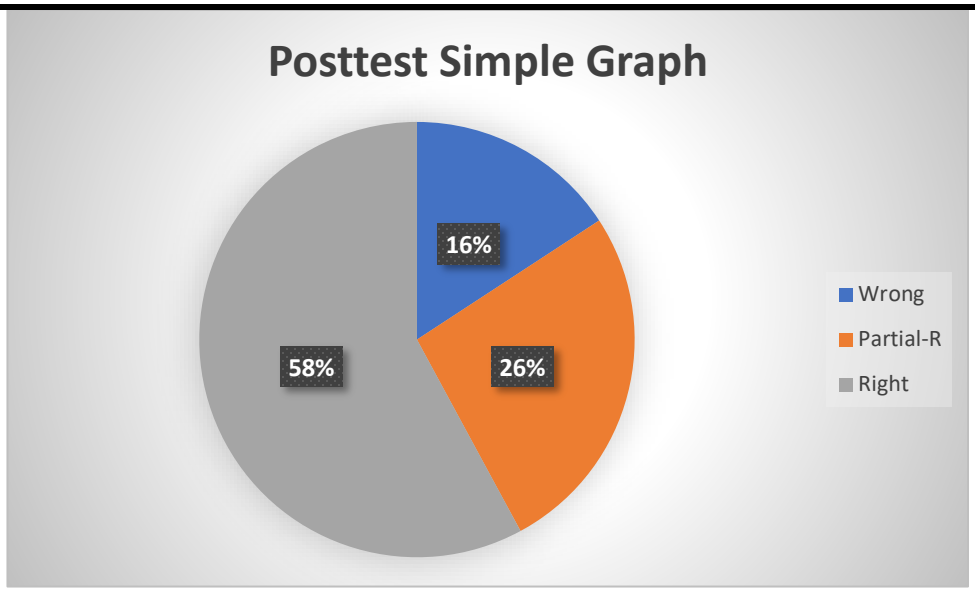
**Results:**

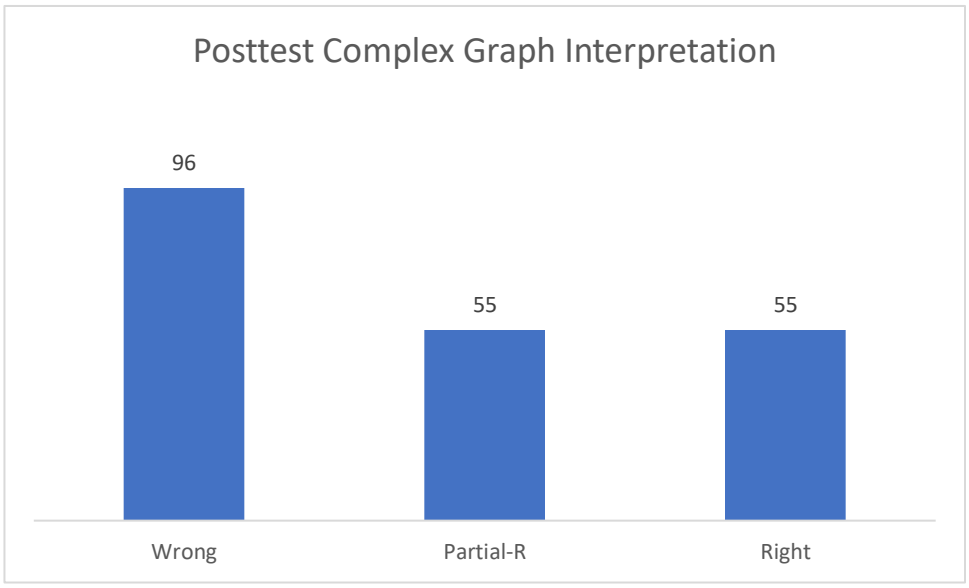
At the beginning of the fall 2020 semester, faculty in 11 Bio courses at the 200, 300, and 400 levels were provided with a graph from a published research study as a pre-test to determine their students' understanding of data presented graphically. Students' responses were scored from 1 to 4 with (1) indicating an incorrect answer, (2 and 3) indicating a partially correct answer, and (4) indicating a correct answer. At the end of the semester, faculty chose a graph from their teaching material as a post-test to determine if students' understanding had improved. Faculty in 8 out of 11 Bio courses reported their results. As most of the pre-test graphs provided by the assessment coordinator was simpler to interpret than the post-test graph designed by faculty for each course, it was impractical to compare the results for the pre-and the post-tests. Therefore, the results are shown separately for the: 1) pre-tests that were simple and required visualization of the data presented graphically, 2) post-tests that were also regarded as simple, 3) post-tests that were more complex and required visualization and interpretation of the data.

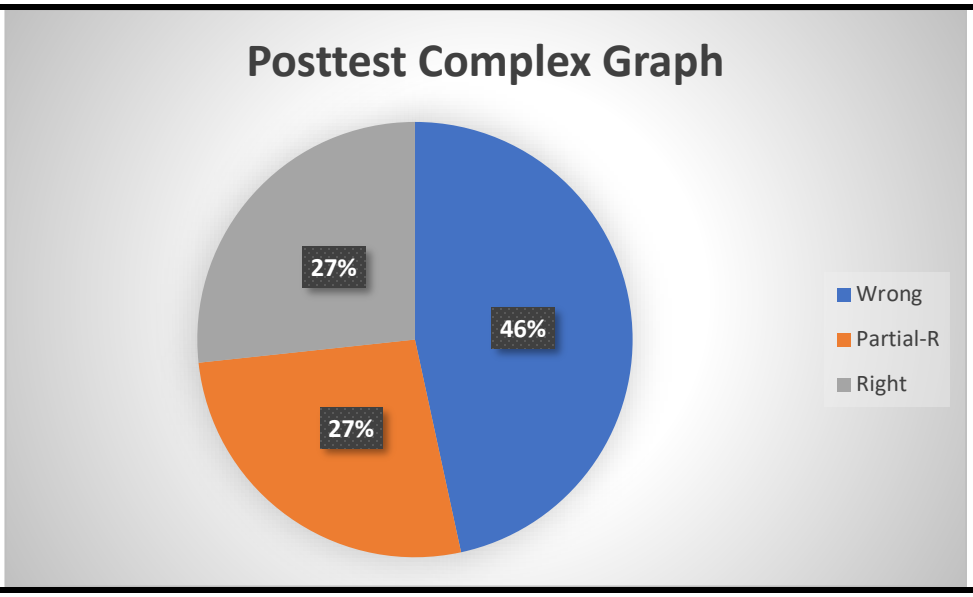



Pretest Simple Graph
30%
31%
39%
Wrong
Partial-R
Right


Posttest Simple Graph Visualization
9
15
33
Wrong
Partial-R
Right


Posttest Simple Graph
16%
26%
58%
Wrong
Partial-R
Right


Posttest Complex Graph Interpretation
96
55
55
Wrong
Partial-R
Right




**Step 4: Summary and Recommendations**

- Summary: To improve graph literacy, we must increase the percentage of biology students who can accurately interpret the results of a research study presented on a graph. To achieve the outcome, we could train students on the basics of probability, statistics, and data presentation.
- Recommendation: change the existing Bio 437 course (Data Analysis and Interpretation) to Bio 237 and offer the course for 1 credit as an alternative to Mat 155. Test students for their understanding of data analysis and presentation in students taking Bio 240 as upper sophomores and taking a Bio 400 course as upper seniors. Compare performance of students who have taken Bio 237, Bio 155, or neither course.

## Appendix E: Faculty CVs

| Rank | Name | Curriculum Vitae |
|---|---|---|
| Asst. Prof | Aisemberg, Gabriel | Link to CV |
| Professor | Bamshad, Maryam | Link to CV |
| Professor | Cheng, HaiPing | Link to CV |
| Asst. Prof. | Gallego-Delgado, Julio | Link to CV |
| Professor | Kennelly, Edward | Link to CV |
| Professor | Kincaid, Dwight | Link to CV |
| Asst Prof | Mandal, Pratyusha | Link to CV |
| Professor | Muntzel, Martin | Link to CV |
| Professor | Rachlin, Joseph | Link to CV |
| Professor | Redenti, Stephen | Link to CV |
| Assoc. Professor | Sankaran, Renuka | Link to CV |
| Assoc. Professor | Sauane, Moira | Link to CV |
| Professor and Chair | Wurtzel, Eleanore | Link to CV |
| Professor | Zheng, Zhi-Liang | Link to CV |
| Lecturer | Alexander-Street, Ayanna | Link to CV |
| Lecturer | Henning, Jack | Link to CV |
| Lecturer | Moroianu, Sarah | Link to CV |
| Lecturer | Quinlan, Rena | Link to CV |
| Lecturer | Villa, Sebastian Rojas | Link to CV |
| Lecturer | Waterson, Michael | Link to CV |

## Appendix F: Department Standing Committees

| | |
|---|---|
| Chair | Dr. Eleanore Wurtzel |
| Deputy Chairs | Drs. Rena Quinlan and Maryam Bamshad |
| Undergraduate Advisor | Dr. Sebastian Rojas-Villa and Michael Waterson |
| Master's Advisor | Dr. Stephen Redenti |
| Graduate Deputy Chair (PhD) | Dr. Zhiliang-Zheng |
| Personnel and Budget | Drs. Eleanore Wurtzel (Chair), Maryam Bamshad, Joseph Rachlin, Renuka Sankaran, Moira Sauane |
| Curriculum | Drs. Jack Henning, Maryam Bamshad, Martin Muntzel, Rena Quinlan |
| Undergraduate Research | Drs. Julio Gallego-Delgado, Joseph Rachlin, Haiping Cheng |
| Graduate Studies | Drs. Stephen Redenti, Edward Kennelly, Haiping Cheng, Maryam Bamshad, Renuka Sankaran |
| Senate | Dr. Gabriel Aisemberg |
| Awards | Drs. Martin Muntzel, Ayanna Alexander-Street, Jack Henning, Julio Gallego-Delgado, Renuka Sankaran |
| Library | Dr. Zhiliang Zheng |
| Website and Marketing | Dr. Ayanna Alexander-Street |
| Greenhouse Committee | Drs. Ed Kennelly, Renuka Sankaran, Zhiliang Zheng, Jack Henning and Kent Gentry |

Appendix G: Department Brochure

## Recent Lehman Biology Alumni

**Kelechi Ndukwe, Ph.D. candidate** in Neuroscience, CUNY Graduate Center
**Samsiya Ona, M.D.**, board certified obstetrician-gynecologist at the Mount Sinai Hospital
**Olivia Asher, Ph.D. candidate** in Bioinformatics at the University of Georgia, Atlanta
**Cesar Andrade, M.D.**, resident doctor at the Providence Swedish Hospitals, Seattle, WA
**Sophia Carryl, Ph.D.**, postdoctoral researcher at the Harvard T.H. Chan School of Public Health
**Joseph Aderemi, M.D.**, resident doctor at the Henry Ford Health
**Daniel Gurdak, Ph.D.**, life scientist/watershed management specialist at the US Environmental Protection Agency
**Jason Mighty, Ph.D.**, associate manager at Regeneration Genetics Center, NY
**Leah Persaud, Ph.D.**, medical editor, consumer drug information at RVO Health

**Michael Tavarez, Ph.D.**, associate manager-research program at Regeneration Biotechnology Research, NY

**Lyda Williams, Ph.D.**, Biochemistry from Albert Einstein College of Medicine; Adjunct Professor of Biology and (PTS3) Academic Advisor at Lehman College

FOR MORE INFORMATION
lehman.edu/biology-u
bio.department@lehman.cuny.edu
718-960-8235

LEHMAN COLLEGE | CUNY

# Making a Difference in the World

# Biological Sciences

LEHMAN COLLEGE | CUNY

UNDERGRADUATE

## The Department of Biological Sciences offers a variety of options for undergraduate students to pursue their academic and career goals.

### Biology, B.S.

**Track 1: Biomedical Sciences**
Prepares students for further training in health professions (e.g. medical doctor, dentist, veterinarian, pharmacist, physician assistant, chiropractor, osteopath, and others).

**Track 2: Organismic Sciences**
Prepares students to become entry-level lab technicians or for graduate school training to become research scientists, professors, public health specialists, or any other profession requiring knowledge of life sciences.

**Track 3: Brain Sciences**
Prepares students for graduate school training to become cognitive neuroscientists, brain science researchers, or any other profession requiring knowledge of brain sciences.

**Track 4: Bioenvironmental Sciences**
Prepares students for graduate school training to become plant scientists, ecologists, environmental biologists or any other profession requiring knowledge of environmental biology.

### Biology, B.A.
*Middle and High School Education*

Combined with a minor in education, this degree prepares students to teach science at the middle- or high school-level.

### Biology, B.S./M.S. Dual Degree

A five-year dual program for eligible students to earn both a Bachelor of Science and a Master of Science degree. Students are guided by a faculty committee to complete a research thesis.

### Biology Minor

This minor can be combined with any major to prepare students for careers and training that require basic knowledge of life sciences.

FOR MORE INFORMATION
lehman.edu/biology-u
bio.department@lehman.cuny.edu
718-960-8235

## Lehman Biology Faculty Research

**Dr. Gabriel O. Aisemberg**
Genes that control the development of nerve cells in embryos

**Dr. Edward J. Kennelly**
Phytochemistry and medicinal plants

**Dr. Stephen M. Redenti**
Retinal tissue engineering

**Dr. Ayanna Alexander-Street**
Neural effects of developmental exposure to bisphenol A

**Dr. Dwight Kincaid**
Biostatistics and Ecology

**Dr. Renuka P. Sankaran**
Physiological and molecular mechanisms underlying plant mineral nutrition and heavy metal sequestration

**Dr. Maryam Bamshad-Alavi**
Physiology of mental effort

**Dr. Pratyusha Mandal**
Understanding the interactions of viruses and bacteria with mammalian immunity

**Dr. Moira Sauane**
Molecular mechanisms of anti-cancer therapeutic agents

**Dr. Hai-Ping Cheng**
Molecular signaling between microbes and plants

**Dr. Martin S. Muntzel**
Effects of obesity and blood insulin levels on blood pressure, nerve activity, and cardiovascular diseases

**Dr. Sebastian Rojas Villa**
Genetics, developmental biology and evidence-based education

**Dr. Michael Waterson**
Active-learning strategies in large-lecture science classes

**Dr. Julio Gallego Delgado**
Host-pathogen interaction in malaria disease

**Dr. Rena Quinlan**
Plant molecular biology

**Dr. Eleanore T. Wurtzel**
Solving global vitamin A deficiency using tools of molecular biology, biotechnology, biochemistry, genomics, and bioinformatics

**Dr. Jack Henning**
Urban ecology, plant systematics, and biodiversity

**Dr. Joseph W. Rachlin**
Biology of freshwater and marine aquatic organisms

**Dr. Zhi-Liang Zheng**
Molecular mechanisms of nutrient balance and water status signaling in plants