Borough of Manhattan Community College • The City University of New York

A Journal of Faculty and Student Excellence in Research and Learning

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At BMCC, we are committed to creating a learning environment in which all students can thrive. Faculty-mentored research provides a unique learning opportunity for students to investigate issues related to the environment, public health, assistive technology and other areas they care deeply about. This engagement gives students a sense of belonging both at BMCC and in the larger research community. It keeps students on track for graduation and creates a pathway to further education and meaningful, family-sustaining careers.

In this issue of *Marks of Excellence*, we highlight several research projects at BMCC. Guided by professors who are valued researchers in their respective fields, the students featured in these articles have joined the global fight against AIDS, shed light on water quality and usage, examined the potential of alternative medicine, and analyzed how the brain processes visual perception, an area of study that could one day benefit patients unable to move or speak.

Students engaged in research at BMCC develop skills and knowledge that serve them well in the next phase of their education. They present at major conferences and co-write peer-reviewed articles with their professors. They even earn research stipends through the BMCC Foundation Fund for Undergraduate Research, the Collegiate Science and Technology Entry Program (CSTEP), CUNY Research Scholars Program (CRSP), National Science Foundation (NSF), Louis Stokes Allied Minority Participation (LSAMP) and other friends of BMCC.

BMCC has taken a leadership role in improving and enhancing undergraduate research in the STEM disciplines and other areas. We provide our students with research opportunities unprecedented in community colleges and access to to faculty who are actively engaged in research in their fields, as well as create benefits to the broader community.

Our faculty mentors and student researchers apply their skills, talent and passion to solving some of today's most compelling challenges, addressing injustice and quality of life issues in their own communities and beyond. I encourage you to join us in celebrating and supporting our students' achievements.

Thank you,

Karrin E. Wilks, Interim President
Borough of Manhattan Community College
The City University of New York

Healing the Rift Between Ancient and Modern Medicine

A certified Reiki master leads students in research that investigates the validity of energy therapies.

"It is very important to contribute to the understanding of how and if certain energy therapies, such as Reiki, actually work," says Borough of Manhattan Community College (BMCC/CUNY) Professor of Science, biochemist and certified Reiki master Patricia DeLeon. "They offer promise in treating diseases in a less traumatic way and also could make western medicine therapies more effective."

With two BMCC science majors, Claudia Guerrero and Joanne Callaghan, DeLeon is conducting experiments using C. elegans lab worms and human cells subjected to Reiki treatment—and the preliminary results are warranting continued study.

"It is important to be open-minded about complementary medicine," says Guerrero, an aspiring physician. One of her tasks is to quantify and compare larvae production between the Reiki-treated and control groups of worms.

The results, so far, "show a small but consistent increase in the number of larvae produced by the treated group when compared to the other two groups," DeLeon says.

In another part of the experiment, the team uses breast cancer cells as their subject. "One group gets Reiki treatment—hands held four inches above the cells—which I perform," she says. "One group gets a 'mock' Reiki treatment performed by a student who goes through Reiki motions, and one group gets nothing."

Using a microscope, the team tracks the rate of cellular division. "The slower the cancer cells divide, the better for the patient," DeLeon says. "Based on what we are seeing, it appears that the cancer cells are dividing more slowly when they get the Reiki treatment."

In plotting the number of cells versus the number of Reiki treatments, she adds, "we are seeing that the graph for the treated cells shows a smaller slope, and this indicates an overall smaller growth or slower cellular division."

The team's goal now is to reach the "P value," DeLeon says, "the point at which you can say, 'This is happening because of our treatment, not because of chance.' In other words, with enough test results to compare, you start to see patterns that indicate more than randomness."

Students Join the Global Fight Against AIDS

Students join their professor in researching a plant-based protein that has anti-viral properties.

Almost 37 million people around the world are living with HIV, the virus that leads to AIDS, according to UNAIDS. An international community of researchers continues efforts to wipe out transmission of the virus, and expand treatment options for those who have it.

That community of researchers extends to Borough of Manhattan Community College (BMCC/CUNY), where Science Professor José A. Fernandez Romero is leading a team of four BMCC students; Nadjet Cornejal, Gearoff Cruz Rodriguez and Claudia Melo, as well as Betty Kim, who is fulfilling prerequisites for medical school, in HIV-related research at the Population Council lab in Rockefeller University, on the east side of Manhattan.

Data the students are gathering will help inform development of an HIV prevention table that could be an option for those who want "an on-demand, inexpensive, discreet, portable product to prevent HIV acquisition," Romero says. There are other antiretroviral medications available that prevent HIV acquisition, he explains, but their efficiency is limited. Also, the HIV-prevention treatment the BMCC students are helping to develop is organic, or plant based, which distinguishes it from other options.

"Scientists at NCI—the Molecular Targets Laboratory of the Center for Cancer Research at the National Cancer Institute—discovered that red algae growing in the ocean off the coast of New Zealand produces a very special protein," Romero says. "That protein was named 'griffithsin.' The gene responsible for the production of griffithsin was identified, cloned and introduced into a tobacco plant, causing the tobacco plant to produce large quantities of this protein, which has anti-viral properties."

Wearing lab coats, gloves and goggles—and under Romero's close supervision—the students work with griffithsin protein and HeLa cells grown on microplate dishes.

For science major Gearoff Cruz Rodriguez, the research "makes you think about how long it took researchers to create the medicines and prevention technologies we have today." Betty Kim says the project "has allowed me to learn about inequalities that have prevented developing countries from getting access to HIV and AIDS treatments." According to Claudia Melo, "Professor Romero teaches us to critically analyze the results of our experiments whether they prove or disprove our initial hypothesis. Through his mentorship I have become a hardworking and responsible scientist, and very resilient."

Brain Activity, Reality and Illusion

A student helps explore the possibilities of reading the human brain.

A man sits at a computer screen, watching two disks, one red and one yellow. At times, one of the disks seems to disappear, and he taps a certain key to report this. Is it possible to know what he thinks he is seeing, without his reporting of it?

Based on existing data and data collected in a research project at Borough of Manhattan Community College (BMCC/CUNY), Professor of Science Marjan Persuh, who holds both a Ph.D. in biochemistry and a Ph.D. in psychology, and his student, science major William Yu, believe the answer is "Yes."

"I am trying to understand how our brain activity relates to our conscious experience of the world around us," Persuh says. "In this project, we are using a visual illusion called 'motion-induced blindness,' in which continuous motion on computer monitor results in momentary disappearance of a bright yellow disk presented on the screen."

The yellow disk, Persuh explains, remains present on the screen at all times—though a person's perception of it can make it appear to go away.

Participants report this perceived change manually, he says, "but we are trying to develop a new measure of their conscious perception that is independent of their report." That measure will take into account, pupil size, "and could be useful for patients in a coma or vegetative state, unable to move or speak," says Persuh.

Science major William Yu sets up the lab activities and ensures they conform to the same standards. Subjects watch a bright yellow disk on the screen, then he and Persuh look for any pupil changes. They also use an EEG, or electroencephalogram, in the form of an electrode cap, to evaluate the electrical activity in the brain, with the goal of tracking brain activity that occurs in response to perceived changes on the screen.

Yu plans to enter NYU as a neural science major while minoring in childhood and adolescent mental health, he says. "Then if all goes well, in ten years, I'll be practicing psychiatry while doing research in neuroscience." The research at BMCC has led him to wonder "how often we miss things that are there, but our brain chooses to ignore."

Fellow researcher and biology major Danielle A. Burke says, "This project gives me the opportunity to really dissect common beliefs about how perception and veridictions influence human responses. Also, the apparatus for testing is pretty cool."

Putting the Power of Plants to the Test

Students investigate medicinal properties of plants used in their childhood to treat illnesses.

When Briana Gonzalez had a stomach ache growing up, her mother would prepare a stew infused with cilantro, an herb native to the Caribbean. Claudia Melo's family, from the Dominican Republic, made tea from the leaves of guava plants, to aid indigestion. Rosemary Perdomo learned, in her travels in South Africa, how Ethiopian pepper is used to treat asthma and other ailments. Anna Miller's mother combatted illness with a butternut squash sage soup, and Savinoz Sayfillaeva's parents, who are from Uzbekistan, treated their daughter's flu symptoms with a rhubarb dish.

Do these plants actually provide health benefits? Working closely with BMCC Science Professor Adolfina Koroch, the five science majors are investigating that question. Standing side by side in BMCC's Core Lab, they are grinding plant samples, preparing extracts with various solvents, and determining the amount of phenolics and flavonoids—indicators of medicinal properties of the plant.

"The amount of phenolics and flavonoids is determined using a spectrometer," says Koroch. Phenols can repel or kill microorganisms that might harm the plant, she explains. They can also create a defense against ultraviolet radiation. Ingested by humans, plants rich in phenols can act as an antioxidant, and provide some protection against disease

"The environment we have created in the BMCC Core Lab is a community," Koroch says. "In general, the students start with a simple guiding research question that they develop themselves. They collect literature in their area of interest and write an abstract. As the research progresses, they engage with the question in a more complex way."

"I wanted my career path to be medical school, a traditional path to being a doctor," says Gonzalez, who is now leaning toward research "and getting hands-on experience testing different plants, and publishing articles on food science." Rosemary Perdomo wants to enter the field of diagnostic imaging and to help develop new applications of healthcare technology, while Claudia Melo plans to eventually earn a Ph.D. in plant science at the New York Botanical Garden. "When I was little, I dreamed about a world where humans lived long lives," she says. "By studying plants, I believe humanity is closer to one of my dreams."

Students Test the Waters

Using social science, biochemistry and GIS analysis, students correlate perceptions and realities of NYC water quality.

According to the New York City Department of Environmental Protection (DEP), New York City water is world-renowned for its quality—which seems in contrast to the fact that New Yorkers buy about a billion bottles of drinking water a day.

Why is this? Does perception not match the reality of water in New York City? Two professors in the Social Sciences, Human Services and Criminal Justice Department at Borough of Manhattan Community College (BMCC/CUNY); Henry Bulley, a geospatial scientist and Brenda Vollman, a social scientist, are leading a three-student team to examine the situation.

Under their leadership, and with funding from the CUNY Research Scholars Program (CRSP), BMCC students Emmanuel Ologundudu, Sarah Stillman and Zhimei Xie are collecting public drinking water samples, canvassing New Yorkers and administering a brief online survey to explore correlations between actual water quality and perceptions of water quality—all of which inform choices to drink bottled, tap and fountain water.

After collecting water samples from public fountains in Union Square Park, Washington Square Park and other areas, the students worked with Professor Bulley to assess nitrate levels and other factors. They applied the same tests to commercially bottled water samples, using paper testing strips to measure the pH, or level of acidity, as well as water "hardness," the level of dissolved solids. They also integrated their results into spatial analyses using Geographic Information Systems (GIS), highlighting the influence of place or neighborhood characteristics on those choices.

Science major Ologundudu learned in his research that while the FDA regulates bottled water as a food, it cannot require certified lab testing or violation reporting. "Many of us drink from the tap or decide to spend money on bottled water, yet we do not know the origin of the water or how it is handled," he says.

Business major Xie has gained a social perspective on water usage. "Drinking boiled water is the habit of everybody I know and it is my family's daily habit," she says. "From the perspective of the commodity market, bottled water already has a fixed consumer group." Ultimately, she says, "I hope I can become an economic market investigator, offering insight into people's views on the items they purchase."

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