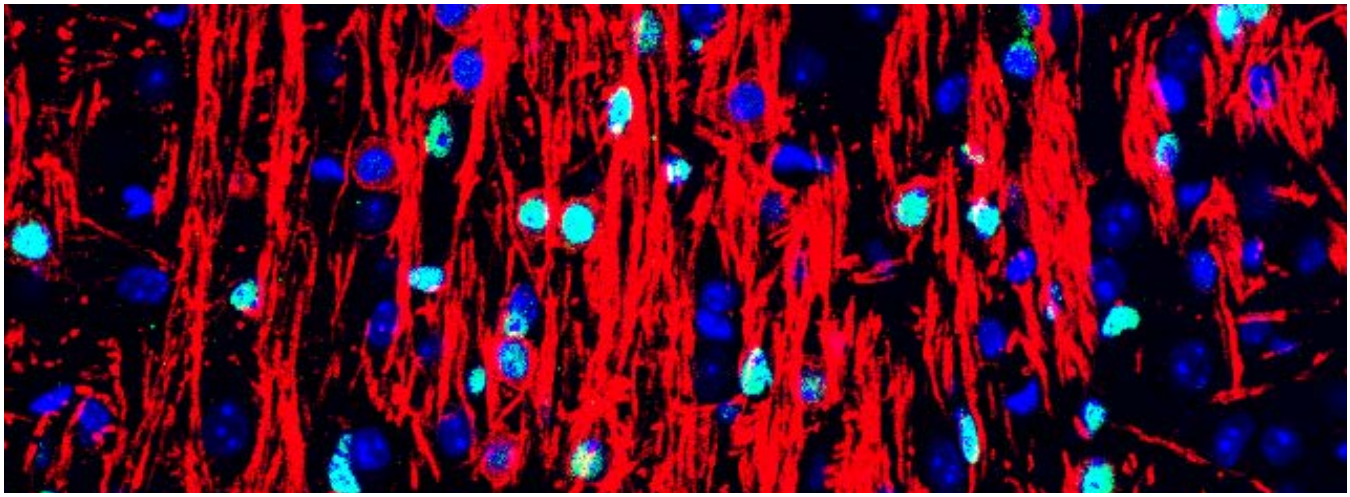
Fall 2023
Newsletter

NEUROSCIENCE INITIATIVE
ADVANCED SCIENCE RESEARCH CENTER



Message from the Director

Welcome to the Fall edition of our Newsletter. As we are entering the Holiday Season, feelings of warmth, peace, joy and celebration find home in our heart, while we are faced with the painful awareness of so much sorrow all around the world.

At this moment, within the Initiative, we try to be mindful of the energy we project to others and create an environment based on mutual understanding and respect. We are grateful to all the students, faculty and staff for sharing their enthusiasm about scientific research, for acknowledging the importance of responsible and ethical research conduct and continuing to contribute to the process of discovery. We are grateful to our supporters and donors, whose generosity have allowed us to spearhead novel outreach initiatives, with the intent to promote mental health and wellbeing in our society.

With a heart full of gratitude,

Patrizia

In this issue...

NEW INITIATIVE MEMBERS

Areej Niaz

Areej Niaz recently graduated from Stony Brook University with a degree in Biology (Neuroscience specialization) and a minor in Linguistics. She is a research assistant and lab manager for the He Lab's Live Imaging and Bioenergetics Core and MALDI-TOF MSI Core. In her leisure time, she enjoys reading fantasy books, planning getaways with friends, watching cricket, and exploring Halal cuisine in NYC and Long Island.

Manal Mansour

Manal Mansour, a second-year PhD international student in the CUNY Neuroscience Collaborative (CNC) program, joined Dr. Susana Mingote's lab in July 2023. Her research focuses on understanding the neural mechanisms behind the brain's response to novel and familiar sensory cues in the environment, specifically, the role of dopamine signaling in this process. Manal enjoys pencil sketching, and baking in her leisure time.

Neha Punia

Neha Punia is a second-year Graduate student in Prof. Patrizia Casaccia's lab; she joined the Neuroscience Initiative in February of 2023. She is interested in understanding the underlying mechanism for tau pathology-mediated neurodegeneration in Alzheimer's diseases. She is also a hobbyist and an aesthete.

NEW INITIATIVE MEMBERS

Lele Xu

Lele Xu is a second-year PhD student in the He Lab, joining us in June of 2023. Her current research interests employ advanced imaging techniques including super-resolution live imaging, two-photon imaging, MALDI MS imaging to study: 1) metabolism during development and disease; 2) functional interactions between nanomaterials and biological systems. Lele's hobbies include hiking, going to concerts, and playing with her cat, Tiger.

Chikako Olsen

Chikako Olsen is our new research assistant for the MRI facility. She recently earned her master's degree in Data Science and Engineering from the City College of New York. Her research focuses on utilizing Machine Learning to predict electric currents induced by Transcranial Direct Current Stimulation. Chikako loves to learn Japanese traditional culture, such as calligraphy, tea ceremony, and flower arrangements.

Rahaf Sarrar

Rahaf is the new lab manager for Dr. Orie Shafer's lab, joining us in June of 2023 where the area of research focuses on circadian timekeeping and the neural mechanisms that support them. Outside the lab Rahaf enjoys roller skating, live music performances, and cats

INITIATIVE ACHIEVEMENTS

Congratulations to Faculty Grant Recipients!

Ye He, *Research Associate Professor*, is a recipient of a ***PSC-CUNY Award*** entitled "*Evaluate the potential of phase-separation peptide as mitochondria dye*" together with **Dr. Tong Wang** from Nanoscience Initiative. In collaboration with **Dr. Rein Ulijn's** group, they will use various imaging approaches to study the mitochondrial labeling property of a novel phase-separation peptide discovered in Ulijn lab.

Ye He is also the recipient of a sub-award of an ***NIH R01*** grant entitled *"Glial and neuronal metabolic status governs neural regeneration in the CNS."* Together with the PI of the grant **Dr. Yuanqaun Song** from The Children's Hospital of Philadelphia (CHOP) and the University of Pennsylvania Perelman School of Medicine, they aim to understand the extrinsic inhibitory mechanism and develop a strategy to reverse glial inhibition of regeneration and promote behavioral recovery after CNS injury.

Orie Shafer, *Professor*, successfully renewed an ***NIH R01*** grant on "*Network Properties of Circadian Clock Modulation and Entrainment."* The unifying goal of the proposal is to advance our understanding of circadian timekeeping and entrainment in the brain. The results of this work will ultimately inform the development and implementation of interventions designed to alleviate the significantly adverse metabolic and psychological effects of circadian dysfunction in the modern world.

Patrizia Casaccia, *Professor and Director***,** is co-investigator on **Dr. Shana Elbaum-Garfinkle's *NIH R01*** grant entitled "*Architecture, dynamic and cell-specific behavior of tau condensates*" which focuses on testing novel hypotheses of Alzheimer's Disease pathogenesis. The study is the result of an integrated biophysical and neurobiological approach , where in vitro models are inspired by the behavior of Tau in oligodendrocyte lineage cells. The ultimate goal is to test the involvement of non-neuronal cells at the early stages of the disease, with the hope to inform early therapeutic intervention

INITIATIVE ACHIEVEMENTS

Congratulations!

The Neuroscience Initiative welcomed two more post-doctorates to the fold over the Summer!

David Dansu successfully defended his thesis titled "*Changes in the Epigenetic Landscape of Oligodendrocyte Progenitors with Time*" on May 24th. His thesis focused on understanding the molecular mechanisms underlying the functional differences between neonatal and adult oligodendrocyte progenitor cells, a subtype of glia in the central nervous system named for their essential role as precursors of oligodendrocytes.

Sami Sauma defended his thesis titled "*Metabolic Control of Proliferation and Differentiation in Oligodendrocytes*" on July 26th. His thesis addressed the influence of glucose and glucose-related metabolites on the proliferation of immature oligodendrocyte progenitor cells, and whether controlling the movement of glucose-related metabolites from one area of the cell to another influenced the maturation of oligodendrocytes.

Congratulations Doctors!

Dvir Avnon-Klein of the Ayata Lab is the recipient of the *Excellence in Neuroscience Research Award* for his thesis titled "*The Molecular Basis of the Microglial Response to Foreign Aggregates.*" This honor, from the Neuroscience Awards Committee recognizes two graduating seniors who have performed outstandingly in the lab. Congratulations!

INITIATIVE ACHIEVEMENTS

Publications

1. **Ayata, P.**, Amit, I. and Cuda, C.M. (2023). Editorial: Microglia in neuroinflammation. *Frontiers in Immunology. 14*:1227095. doi: 10.3389/fimmu.2023.1227095

2. Ralvenius, W. T., Mungenast, A. E., Woolf, H., Huston, M. M., Gillingham, T. Z., Godin, S. K., Penney, J., Cam, H. P., Gao, F., Fernandez, C. G., Czako, B., Lightfoot, Y., Ray, W. J., Beckmann, A., Goate, A. M., Marcora, E., Romero-Molina, C., **Ayata, P**., Schaefer, A., Gjoneska, E., … Tsai, L. H. (2023). A novel molecular class that recruits HDAC/MECP2 complexes to PU.1 motifs reduces neuroinflammation. *The Journal of experimental medicine, 220*(11), e20222105. https://doi.org/10.1084/jem.20222105

3. Chen, X., Momin, A., Wanggou, S., Wang, X., Min, H.K., Dou, W., Gong, Z., Chan, J., Dong, W., Fan, J.J., Xiong, Y., Talipova, K., Zhao, H., Chen, Y.X., Veerasammy, K., Fekete, A., Kumar, S.A., Liu, H., Yang, Q., Son, J.E., Dou, Z., Hu, M., Pardis, P., Juraschka, K., Donovan, L.K., Zhang, J., Ramaswamy, V., Selvadurai, H.J., Dirks, P.B., Taylor, M.D., Wang, L.Y., Hui, C., Abzalimov, R., **He**, **Y**., Sun, Y., Li, X., Huang, X. (2023). **COVER STORY**: Mechanosensitive Brain Tumor Cells Construct Blood-Tumor Barrier to. Mask Chemosensitivity. *Neuron, 111*(1):30-48.e14. doi: 10.1016/j.neuron.2022.10.007

4. **Pruvost, M.**, Patzig, J., Yattah, C., **Selcen, I.**, Hernandez, M., Park, H., Moyon, S., Liu, S., **Morioka, M.S.**, Shopland, L., Al-Dalahmah, O., Bendl, J., Fullard, J.F., Roussos, R., Goldman, J., **He, Y.**, Dupree, J.L., **Casaccia, P**. (2023). The stability of the myelinating oligodendrocytes transcriptome is regulated by the nuclear lamina. *Cell Reports, 42* (8), 112848. DOI: https://doi.org/10.1016/j.celrep.2023.112848.

5. Dong, W., Fekete, A., Chen, X., Liu, H., Beilhartz, G., Chen, X., Bahrampour, S., Xiong, Y., Yang, Q., Zhao, H., Kong4, T., **Morioka, M**., Jung, G., Kim, J-E., Schramek, D., Dirks, P.B., Song, Y., Kim, T-E, **He, Y,** Wanggou, S., Li, X., Melnyk, R., Wang, L-Y., Huang, X. (2023). A designer peptide against the EAG2-Kvβ2 potassium channel targets the interaction of cancer cells and neurons to treat glioblastoma. *Nature Cancer Nat Cancer*, 2023. DOI: https://doi.org/10.1038/s43018-023-00626-8.

6. Ravenelle, R., Fernandes-Henriques, C., Lee, J., **Liu, J.**, Likhtik, E., Burghardt, N. (2023). Serotonergic Modulation of the BNST-CeA Circuit Promotes Sex Differences in Fear Learning. *bioRxiv*, 2023. DOI: https://doi.org/10.1101/2023.07.03.547577.

7. Caldwell, M., Ayo-Jibunoh, V., Mendoza, J.C., Brimblecombe, K., Reynolds, L., Zhu, X.Y., Alarcon, C., Fiore, E., **Tomaio, J.**, Phillips, G., **Mingote, S.**, Flores, C., **Casaccia, P.**, **Liu, J.**, Cragg, S., Yetnikoff, L. (2023). Axo-glial interactions between midbrain dopamine neurons and oligodendrocyte lineage cells in the anterior corpus callosum. *Brain Structure and Function, 228*(8):1993-2006. DOI: 10.1007/s00429-023-02695-y

8. Kadam, I., Dalloul, M., Hausser, J., Huntley, M., Hoepner, L., Fordjour, L., Hittelman, J., Saxena, A., **Liu, J.**, Futterman, I., Minkoff, H., Jiang, X. (2023). Associations of one carbon nutrient intake and status with fetal DNA methylation in pregnancies with or without gestational diabetes mellitus. *Clinical Epigenetics. 12*(3): 838. DOI: 10.3390/nu12030838. In press.

9. **Abhilash, L., Shafer, O.T.** (2023). Parametric effects of light acting via multiple photoreceptors contribute to circadian entrainment in Drosophila melanogaster. *Proc. Biol. Sci. 13*;290. DOI: http://doi.org/10.1098/rspb.2023.0149

10. Emery, P., Klarsfeld, A., Stanewsky, R., **Shafer, O.T**. (2023). Sensitive Timing: A Reappraisal of Chronobiology's Foundational Texts. *Journal of Biological Rhythms. 38*(3):245-258. DOI: 10.1177/07487304231169080

Faculty SPOTLIGHT

Pinar Ayata, *Ayata Lab, ASRC*

Dr. Pinar Ayata of the Neuroscience Initiative's Ayata Lab is a groundbreaking researcher whose recent work focuses on epigenetic mechanisms regulating the functional specification of microglia in neurological diseases. Microglia, the brain's primary immune cells, have been implicated as the major causal cell type in Alzheimer's Disease, the most common cause of Dementia. Environmental factors play important roles in the emergence of neurological diseases. Dr. Ayata's research aims to understand how these environmental factors regulate the epigenetic landscape of microglia, and how these mechanisms influence neurological diseases, in turn.

Born and raised in Istanbul, Turkey, Pinar moved to New York City over 16 years ago in pursuit of her doctorate, which she received from Rockefeller University. Her thesis project revealed that MeCP2, known for its causal role in Rett Syndrome, binds to a newly discovered epigenetic mark 5hmC, revealing a novel disease mechanism of this rare neurological disorder primarily affecting brain development in girls. Her postdoctoral work in the laboratory of Dr. Anne Schaefer at Icahn School of Medicine at Mount Sinai was one of the first studies to show that microglia in different brain regions have different functions defined by the features of the brain regions. Our brain comprises highly specialized regions, that can be viewed almost as different organs. We found that microglia also are different in these regions because the environment in the tissue affects the epigenetics of microglia, making them adapt to the environment. This epigenetic mark was inhibited in the study, and the microglia lost "Different brain regions are almost like different organs and are highly specialized; the microglia are also like this because the environment in the tissue affects the epigenetics of microglia, making them adapt to the environment. This marker was inhibited in the study, and the microglia lost its specialty for that region their specialty for that region, causing mice to have making mice have behavioral abnormalities.

Her recent publications include an editorial in Frontiers in Immunology detailing the role of Microglia in neuroinflammation, and another titled *"A novel molecular class that recruits HDAC/MECP2 complexes to PU.1 motifs reduces neuroinflammation"* in the Journal of Experimental Medicine. Earlier this year, she was the recipient of the ***CUNY/HEALS Climate Change Healthy Impact Interdisciplinary Research Initiative Program Grant*** entitled *"The neuroimmune outcomes of prenatal exposures to air pollution and stress."* The grant will fund pilot studies examining the molecular mechanisms underlying the relationship between environmental & stress exposures during pregnancy and neurodevelopmental disorders through coordinated mouse (Dr. Ayata, CUNY) and human (Dr. Lee, Sinai) studies, aiming to discover biomarkers and drug targets for early intervention."

When Pinar is not making innovatory discoveries, she is a proud mother with an extensive background in the arts, including turns as a singer in rock & jazz bands, and drawings and paintings that have been exhibited publicly. Her current favorite hobbies include rock climbing, hiking, and skiing with her family. Find out more about the Ayata Lab here!

Student SPOTLIGHT

Emily Prentice

Emily Prentice is a doctoral student in the Molecular, Cellular, and Developmental Biology program at CUNY's Graduate Center. She earned her B.S. in Biology (having taken mostly bioengineering courses) from M.I.T., and joined the Casaccia Lab two years ago.

Emily's research is about "how mechanical or physical forces can all have an influence on cell function, [and] affect the decisions made by cells during the course of development or during disease." In the lab, which is focused on "the transition from the progenitor cell to the oligodendrocyte," she is mechanically/physically manipulating cells to document the cell's behavior. "The mechanical stimulus and how that affects cell function or organizing of chromatin is much less well characterized than biochemical factors," and these experiments could help answer questions about how we can understand what makes cells able or unable to function for possible use of cell-based therapies for demyelinating diseases.

Emily's experiences at the ASRC have been mostly positive, especially the aspect of interdisciplinary collaboration which they champion. "I like the idea of interdisciplinary work as it's easier to make progress that way" she says. Her work has used the Atomic Force Microscope at the Nanoscience Lab, and she has second authorship on a paper with fellow doctoral student Ipek Selcen titled *"The epigenetic landscape of oligodendrocyte lineage cells,"* and a structural biology-based paper in collaboration with fellow doctoral student Priyasha Deshpande which is "under review."

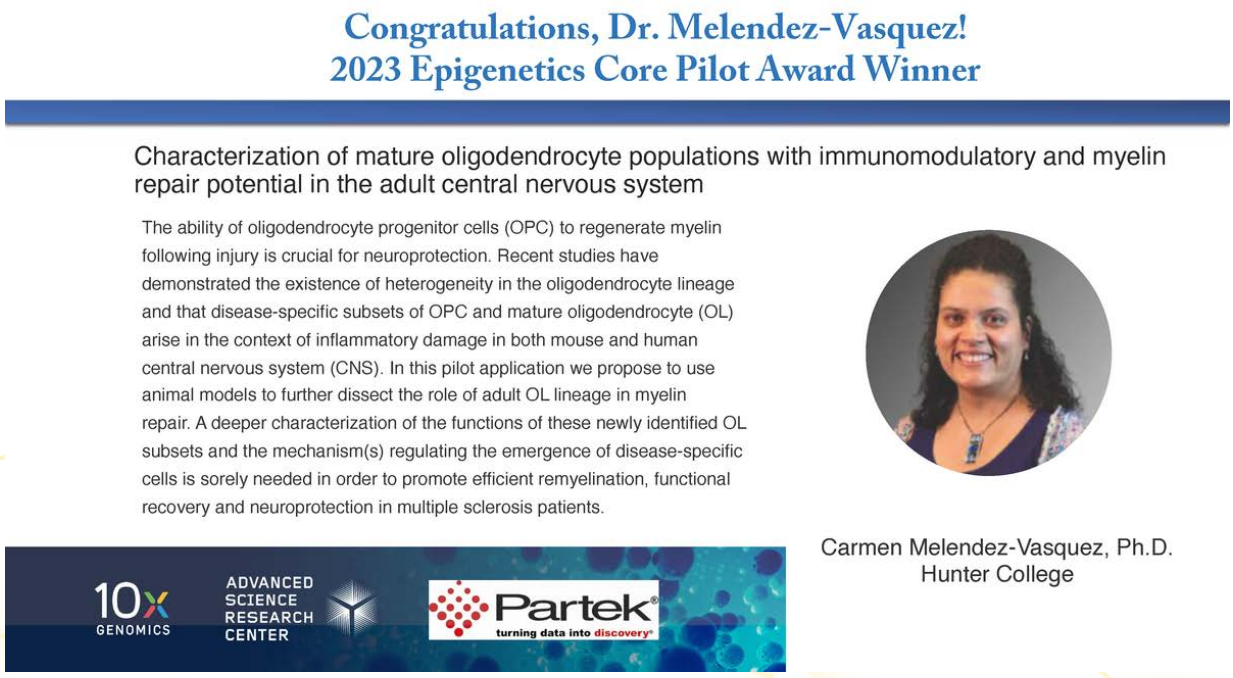
When Emily isn't in the lab, she enjoys the arts including painting, drawing and most recently, making resin coasters. " Science is art because it's all about design," she states. Emily hopes that her research will "help inform decisions about therapeutic targets by people who work in pharmacology to address disorders like MS, genetic disorders like local dystrophies, or diseases where myelin is impaired or damaged and where the mechanical properties of the brain are playing a role in preventing healing." You can check out some of her art to the right!

Epigenetics Core User Group Meeting w/ 10X Genomics & Partek

Epigenetics Core Director **Jia Liu** hosted the core's first user group meeting with **10X Genomics** and **Partek** on June 13, 2023. For this hybrid event, users learned how Chromium Single Cell solutions from 10x Genomics and the ASRC Epigenetics Core can help you dissect cell-type differences, detect novel subtypes and biomarkers, and map the epigenetic landscape cell by cell with **Suma Jaini, PhD**. How to easily analyze Single Cell and multiomics data in Partek Flow from start-to-end with **Alex Rutkovsky, PhD**, and heard from users on their latest research using single cell gene expression and multiome applications.

Lastly, users learned about the FIRST Epigenetics Core Pilot Research Award which could help develop pilot data to support the award winner's future grant applications. During the application period, which ran from June 14 - July 31, 2023, 19 fantastic submissions proposing important and profound experiments were received and reviewed.

On August 31, 2023, the winner of the 2023 Epigenetics Core Pilot Award was announced:



As winner, she will receive project consultation with CUNY ASRC Epigenetics Core and 10X Genomics; one Chromium single cell transcriptome 3' gene expression profiling (up to 4 samples) performed at the Epigenetics Core, recovering up to 10,000 cells/nuclei per sample; library preparation and paired-end sequencing with minimum 50,000 reads/cell; and one month usage of Partek CUNY server and Bioinformatics support from Partek Inc.

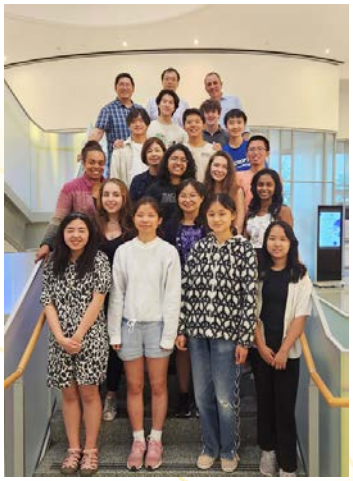
Thank you to all who participated!

Initiative
News & Updates

Hot Neuroscience Summer!

The Spring/Summer semester at the Neuroscience Initiative of the Advanced Science Research Center was full of fun and exciting activities, starting with an enticing discussion on *"Climate Change and Health"* as part of the *"City of Science Event Series"* at the Graduate Center. The Neuroscience Initiative Director **Dr. Patrizia Casaccia** was one of the featured speakers along with **Dr. Reginald Blake** professor of Earth and Environmental Sciences and **Dr. Hamid Norouzi**, professor of Construction Management and Civil Engineering Technology at New York City College of Technology; and **Dr.Yoko Nomura**, professor of Psychology at Queens College. The talks addressed the impact of Climate Change on overall physical and mental wellbeing and child psychological development, identifying stressors and discussing resilience strategies.

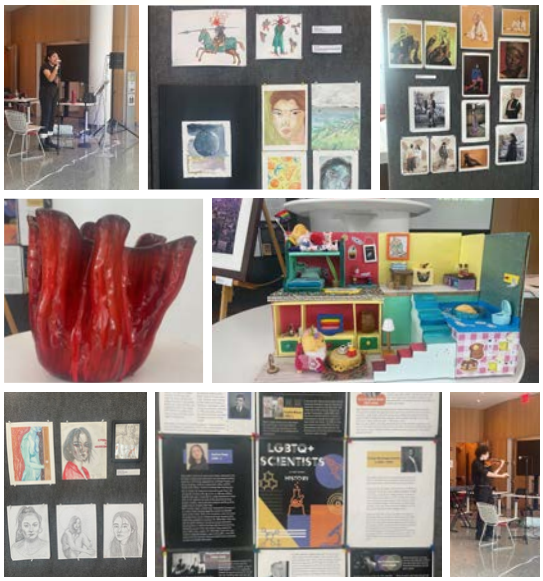
Next, **Dr. Orie Shafer**, professor of Neuroscience and circadian rhythm researcher, was a live guest at the science lecture, art, and performance series called **"Secret Science Club"** in Brooklyn. For their May 15th, 2023 event, Orie discussed how circadian rhythms guide everything from sleep to digestion and daily changes in body temperature; the accuracy of our biological clocks and what can throw it off-kilter; where in the body the biological clock is located, and whether or not night-owls and early birds have different circadian rhythms.



The ***Advanced Bio-Imaging Camp*** began on June 12th. This week-long summer program for high school students and undergraduates offered an opportunity for immersion in cutting-edge imaging technologies, neuroscience research, and interdisciplinary research. Hosted by the **Live Imaging Core** and jointly by the **MRI Suite, MALDI Imaging Core, Surface Science Core, and Nano Imaging Suite**, the 2023 Imaging Camp (June 12-16) featured lectures, seminars and laboratory hands-on. Participants included students from New York, New Jersey, Connecticut, Massachusetts, Maryland, North Carolina & South Carolina; lecturers from CUNY, Columbia, Rockefeller, Princeton, Johns Hopkins SUNY, University of Massachusetts, NIH, Duke, Novant Health Medical Center, Yale and Shanghai Institute of Immunology.

Initiative
News & Updates

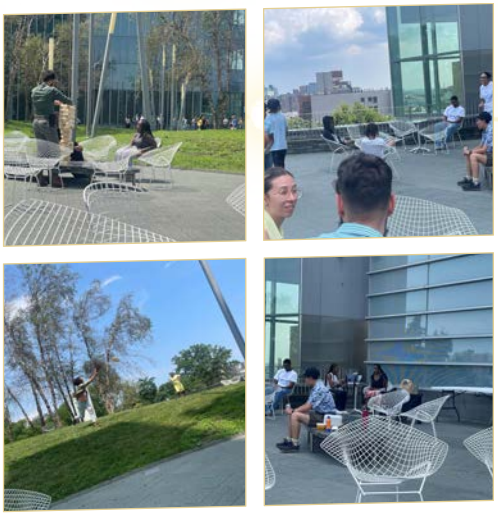
Hot Neuroscience Summer!



Several members of the Neuroscience Initiative took part in the ***ASRC PRIDE Open Mic & Art Show*** on June 15th. The event, in celebration of PRIDE month, showcased the contributions to science from the LGBTQIA community. They included: singing performances by Muniyat (He Lab) and Lillian (Ayata Lab); a violin performance by Dvir (Ayata Lab); and visual art submissions by Thi and Nastya (Ayata Lab), Malia (He Lab), Susana and Grace (Mingote Lab), Emily (Casaccia Lab), and our administrative coordinator Sabrina.

The City College of New York hosted a three-week research camp for 36 outstanding students from two of war-torn Ukraine's top specialized high schools for physics and mathematics. The ***Science For Ukraine*** program, pioneered by **Dr. Alexander Khanikaev** at CCNY Grove School of Engineering, was supported by the Simons Foundation and the Office of Naval Research, as well as by funds from The City College and the Graduate Center.

Professor Orie Shafer hosted two of the students, **Prykhodko Vitalii** and **Nevinskyi Oleksandr** who carried out short projects in the lab to demonstrate that the fruit fly *Drosophila Melanogaster* is a good model for sleep research. In a short span of two to four weeks, Prykhodko and Nevinskyi learned to separate male and female fruit flies from a mixed culture, to build locomotor activity tubes, use the Drosophila Activity Monitor systems , and analyze

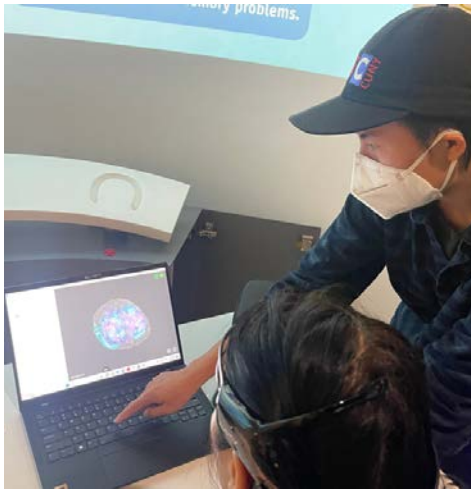


Drosophila sleep. They reported that flies sleep in two episodes under light/dark cycles, with one episode during the day and the other during the night. They also found that male flies sleep more than female flies. These experiments essentially recapitulated previous findings and taught both Prykhodko and Nevinskyi how flies can be used as a model for studying sleep."

Lastly, we closed out the Summer with fun in the sun, play and good eats at our BBQ on the grounds of the ASRC !

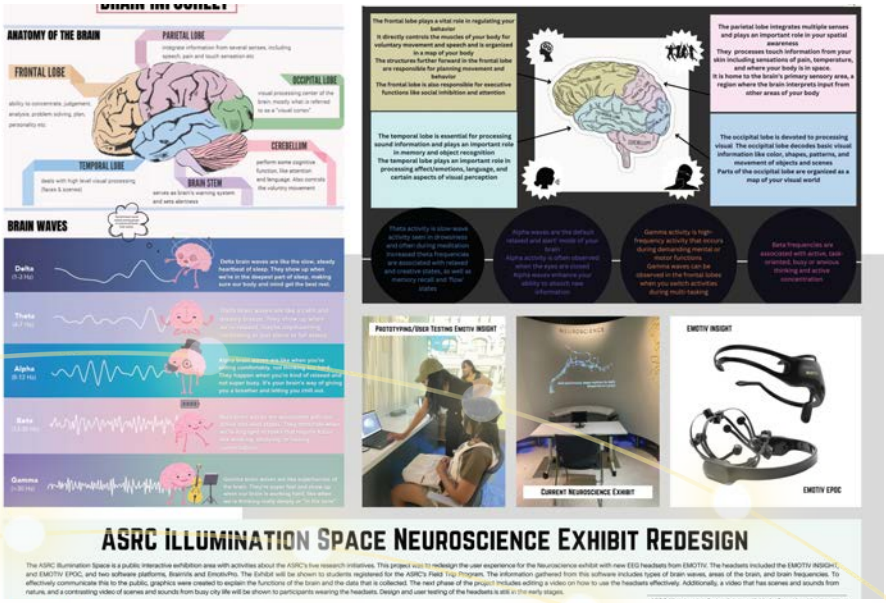
Initiative
News & Updates

Work in Progress: Revamping of the Neuro Booth at the Illumination Space



Thanks to a generous donation from **Ms. Amie James**, we were able to revamp the Neuroscience exhibit booth at the ASRC **Illumination Space**. We purchased 2 computer stations, 5 EEG recording headsets and related software. Over the Summer, we hired **Gigi Nieson**, a wonderful Program Coordinator whose expertise in industrial design and training of young people in public speaking was instrumental to provide an experiential design for the Neuro Booth. Her assistance with facilitating and coordinating field trips has allowed us to expand capacity and reach a total of 284 high and middle school students from local schools, since the beginning of the summer.

Together with Sabrina and the summer interns **Martina Hove** and **Nathaly Martinez** (who also made a poster for the ***CCNY Summer Research Symposium***, where they described their experience in the Neuroscience Project Development) Gigi contributed to the creation of an informational video explaining the neuroscience behind the EEG recording of brain waves, including their frequency and regional distribution. The video also included an introduction to the research question on the impact of sound (from natural landscapes to urban settings) on brain alertness/relaxation, as measured by brain waves.



Now that the initial setup is complete, we intend to expand our outreach program highlighting the connection between mental health and neuroscience by organizing additional events such as: visits to local schools, organization of local science teacher training and hosting “Community Night” events. These initiatives to attract young audiences and promote mental health awareness in local communities awaits for support.