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Nazrul I. Khandaker
CUNY York College

Stanley Schleifer
CUNY York College

Krishna Mahabir
Grover Cleveland High School

Erik Menjivar
Queens High School for the Sciences at York College

Ality Aghedo
CUNY York College

See next page for additional authors

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Authors

Nazrul I. Khandaker, Stanley Schleifer, Krishna Mahabir, Erik Menjivar, Ality Aghedo, Dennis Baidoo, Tenzin Choeying, Vanessa Erwin, Jonathan Xavier, Laboni Molla, and Akeed Alrubay

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KHANDAKER, Nazrul I.1, SCHLEIFER, Stanley1, MAHABIR, Krishna2, MENJIVAR, Erik3, AGHEDO, Ality1, BAIDOO, Dennis4, CHOHEYING, Tenzin1, ERWIN, Vanessa5, XAVIER, Jonathan6, Molla, Laboni7 and ALRUBAY, Akeed1, (1)Geology Discipline, Earth and Physical Sciences, York College of CUNY, 94-20 Guy R. Brewer Blvd, Jamaica, NY 11451, (2)Science and Robotics Dept., Grover Cleveland High School, 2127 Himrod Street, Ridgewood, NY 11385, (3)Queens High School for the Sciences at York College, 94-20 Guy R. Brewer Blvd, Jamaica, NY 11451, (4)Chemistry, York College (CUNY), 94-20 Guy R. Brewer Blvd, Jamaica, NY 11451, (5)Asian Studies, High School for Dual Language and Asian Studies, 350 Grand Street, NY, 10002, (6)Science Department, St. Francis Preparatory School, 6100 Francis Lewis Blvd., Queens, NY 11365, (7)Science Department, Queens High School for the Sciences at York College, 94-20 Guy R. Brewer Blvd, Queens, NY 11451, nkhandaker@york.cuny.edu

Project Summary

To evaluate compositional and textural differences among the samples collected from York College (YC) campus (Queens), Montauk Point (MP) and Hither Hills (HH), Long Island, emphasis is given to the general geologic setting, overall grain size distribution, and relative abundances of light and heavy mineral assemblages. Geologic setting encompasses outwash plains (York College), fluvioglacial and glacial (Montauk Point) and beach and dune complex (Hither Hills). YC samples were collected from depth ranging 40 cm to 250 cm and are mostly an assortment of medium to coarse sand, granule to cobble sized, minor silt, and clay. Presence of low angle cross bedding was noted within the sandy unit located around 150 cm from the surface and melt-water dominated transport can also be associated with this feature. MP sand samples largely collected from the beach were mostly free of finer fraction and preponderance of coarse-sand sized grains is highly noticeable. Scattered presence of purple sand often containing garnet, magnetite, rutile, monazite, and tourmaline is suggestive of hydraulic sorting due to wave action and provenance of purple sand is presumed to be intermediate to mafic clasts associated with coastal bluff. Magnetite abundances within the purple sand range from 5% to 20%. HH sands are representative of both beach and dune complex and showing prominent cross bedding with foresets accentuated by heavy minerals. Dominant grain size is medium to fine-grained and well sorted sand. Subtle differences in terms of mineral assemblages including quartz, feldspar, muscovite, biotite, garnet, zircon, monazite, rutile, and tourmaline within the YC, MP, and HH samples suggest slight variation of the source rock composition and overall grain size trends also point to a particular sedimentary environment of deposition. These locations are easily accessible and form a great field geology sites for understanding surficial geology of Queens and Long Island and recent glacial activity that sculptured the landscapes. K9-16 earth science students can greatly benefit by having this opportunity located close to the urban setting of New York.

Department of Education (DOE) Grant titled Enhancing Talents of African American Students funded this research project.

Lab Investigation

Sand samples were washed thoroughly to get rid of the salt. Oven-dried, sieved, and plotted on probability paper to determine textural parameters following Folk (1962). Representative sand samples, based on individual mesh, were investigated for mineral and trace element distributions by using microscope and X-ray fluorescence (XRF), respectively.

York College (Google Earth)

York student Corey Goddard and USGS geologist are investigating water samples from the monitoring wells.

Thakur Chaturgan (left) and Dorean Flores (right) inspecting split spoon samples.

Cross-stratification within Stratified Drift suggesting fluvi-glacial deposition. 45 cm below the surface, subcrop suggesting kame.

Test Pit showing dark gray, organic-rich Topsoil capping Stratified Drift.

Grain Size Distribution of sediment samples, York College and its vicinity.

Montauk Point Lighthouse (Google Earth)

Purple Sand with selective concentration of garnet and magnetite - largely derived due to hydraulic sorting.

Beach sand and dune complex, Hither Hill and adjacent areas.

An overview of the coastal bluff, located in Montauk Point showing differential erosion of till and stratified drift due to wave action.

Lithologically assorted Rip Rap protecting Montauk Point Light House from wave erosion. An ideal place for field identification of important rock types.

Stratified Drift Capping Tills, Montauk Point.

Hither Hills State Park (Google Earth)

Purple sand rich in magnetite; concentration ranges from 5 to 20%.

Generalized bedrock geology of New York City and Long Island.

Conclusion
Montauk Point (MP), Hither Hills (HH), and York College (YC) campus as described in our current geoscience outreach research initiative funded by NASA MUREP Aerospace Academy and DOE certainly are great educational resources for incoming freshman and K9-12 students to become aware of the outstanding geological and environmental examples that are easily accessible in the NYC area. They represent a great opportunity for students to be exposed to geosciences content and applied knowledge-based vital resources.

For most of our urban K9-16 students, geoscience-related information seems to be primarily based on generalized descriptions as seen in most of the earth sciences curricula which we often find mostly theoretical and lacking hands-on, field based understanding of the chemical, physical and biological processes and, as such, missing an important element of experiential learning opportunity (ELO).

Bear in mind, students from New York City or most of the urban locations consider geology as a soft science and therefore not quite favorable to choose as a career path or to pursue a degree in geosciences. Giving them an opportunity to visit these sites, and challenging them to come up with some viable research questions and reasonably acceptable scientific explanations, will allow them to appreciate their content and knowledge since they are prepared to test hypotheses, conduct experiments, and draw conclusions.

Student-led geoscience research is an important venue where a sense of belonging and appreciation can be achieved since content knowledge and field-based information are compared and students learn about multiple working hypotheses which are appropriate for most geological phenomena.

MP has tremendous resources when it comes to imparting coastal processes (tombolo), wave erosion, hydraulic sorting, recognizing past glacial activities-based characteristic sedimentary deposits (tills, moraines, stratified drift), eolian activities (beach and dune complex), and geoenvironmental stabilization of shoreline by using rip-rap which often carries the signature of local geology and provenance. Ideally, these rip-raps are known to have bedrock information and close inspection of these rip-raps suggest sources from the Palisades (Jurassic Diabase), Precambrian rocks from the New England and New York City (granites, gneisses, schists, marble, amphibolite, slate, and quartzite), and lower to middle Paleozoic shale/argillite, red sandstone, siltstone and conglomerate.

It is certainly a region extremely suitable for inspecting lithologies and becoming proficient in basic rock identification which to us, is quite remarkable and truly applied geoscience-based field application tool for both undecided and incoming freshman.

Ality (far right) is ready to conduct grain size analysis via US Standard Sieve set.

L-R: Tenzin, Dennis, Erik, and Akeed preparing samples for grain size analysis.