THE UNIVERSITY OF THE WEST INDIES
CAVE HILL CAMPUS, BARBADOS

The University of the West Indies
Cave Hill Campus

Department of Biological and Chemical Sciences

RESEARCH PROJECTS

2025-2026

BIOC3290

BIOC3990

BIOL3990

CHEM3950

ECOL3990

MICR3990

First Edition

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PLEASE SUBMIT YOUR COMPLETED **APPLICATION FORM** AND **LABORATORY SAFETY REGULATIONS AGREEMENT** TO THE BIOLOGICAL & CHEMICAL SCIENCES DEPARTMENT OFFICE, GROUND FLOOR, BIOLOGY BUILDING

Course (s)	BIOC3290 / BIOC3990
Title	Investigation of Tauropine dehydrogenase activity in intertidal organisms
Supervisor (s)	Dr. Shane Austin

Background:
Tauropine dehydrogenase (TaDH) is one of a group of opine dehydrogenases found in marine organisms (Harcet, Perina, and Pleše 2013). TaDH catalyses the conversion of pyruvate, taurine, and NADH into an opine- tauropine (Harcet, Perina, and Pleše 2013). TaDH enzyme activity has been identified in sponges (Harcet, Perina, and Pleše 2013), marine snails (Gäde 1986), starfish (Kan-no et al. 1998), sandworms (Kanno et al. 1996) and algae (Sato et al. 1993) to date; some bacteria also have TaDH activity. Methods for TaDH purification are varied, though most methods tend to utilise the same purification tools with minor modifications. Equally, taurine, like other amino acids, may have the capacity to inhibit other opine dehydrogenases or mechanisms of anaerobic respiration; this potential function, however, has not been extensively studied.

Objectives:
For BIOC3990: To determine if taurine dehydrogenase can be found in marine gastropods of the intertidal in Barbados **AND** assess if taurine can inhibit anaerobic metabolism enzymes (e.g. lactate dehydrogenase and alanopine dehydrogenase).

For BIOC3950: Assess if taurine can inhibit anaerobic metabolism enzymes (e.g. lactate dehydrogenase and alanopine dehydrogenase).

Methods:
The prospective student will (1) collect the snails from the marine environment, (2) perform homogenization of snail tissue, and enzyme purification by column chromatography. Spectrophotometric assays will be used to determine enzyme activity, and targeted assays with varying substrate concentrations will determine inhibition.

Requirements:
Must be comfortable working with gastropods and be able to ambulate comfortably in a marine environment.

References:

- Gäde, G. 1986. "Purification and properties of tauropine dehydrogenase from the shell adductor muscle of the ormer, Haliotis lamellosa." Eur J Biochem 160 (2): 311–8. https://doi.org/10.1111/j.1432-1033.1986.tb09973.x.

- Harcet, Matija, Drago Perina, and Bruna Pleše. 2013. "Opine Dehydrogenases in Marine Invertebrates." Biochemical Genetics 51 (9): 666–676. https://doi.org/10.1007/s10528-013-9596-7. https://doi.org/10.1007/s10528-013-9596-7.

- Kan-no, N., M. Sato, T. Yokoyama, E. Nagahisa, and Y. Sato. 1998. "Tauropine dehydrogenase from the starfish Asterina pectinifera (Echinodermata: Asteroidea): presence of opine production pathway in a deuterostome invertebrate." Comp Biochem Physiol B Biochem Mol Biol 121 (3): 323–32. https://doi.org/10.1016/s0305-0491(98)10114-1.

- Kanno, N., M. Sato, E. Nagahisa, and Y. Sato. 1996. "Tauropine dehydrogenase from the sandworm Arabella iricolor (Polychaeta: Errantia): purification and characterization." Comp Biochem Physiol B Biochem Mol Biol 114 (4): 409–16. https://doi.org/10.1016/0305-0491(96)00072-7.

- Sato, Minoru, Masaaki Takeuchi, Nobuhiro Kanno, Eizou Nagahisa, and Yoshikazu Sato. 1993. "Purification and properties of tauropine dehydrogenase from a red alga, Rhodoglossum japonicum." Hydrobiologia 260 (1): 673–678. https://doi.org/10.1007/BF00049087. https://doi.org/10.1007/BF00049087.

Course (s)	BIOC3990
Title	Taxonomic and Functional Profiling of viral communities associated with fermented foods
Supervisor (s)	Dr. Angela Alleyne & Dr. Tara Spencer-Drakes

Background:
Fermented foods, such as alcoholic beverages and yogurt, have long formed a cornerstone of the diets of cultures around the world [1]. Their associated microbial communities are highly diverse and dynamic, and early evidence suggests their role in the formation and function of the human microbiome [2-3]. Consequently, over the last ten years, fermented food microbiomes have been established as tractable systems to investigate microbial diversity, ecology and evolution using *in vitro* cultivation and molecular community typing [4]. While bacterial and fungal communities are frequently examined, the viral populations associated with these foods remain largely overlooked, despite their critical ecological and evolutionary roles within these communities, as well as their global abundance and diversity, which far surpass those of larger cellular microbes [5]. Overall, the outcome of this study will further highlight fermented foods as an emerging tool for the study of global microbial diversity and function.

Objectives:
In this study, we utilize the curated Food Metagenomic Data (cFMD) resource to investigate the diversity of viral communities present in 100 fermented foods from around the globe and examine their impact on the human microbiome [6].

Methods:
Using modern metagenomics tools, such as metaviralSPAdes, VirSorter2, and VITAP, we will functionally and taxonomically profile the viral communities associated with fermented foods. This data will be used to probe patterns of viral geographical presence, abundance, and community association [7-9].

Requirements:
Must be comfortable working with Bioinformatics software

References:

- Jay, J.M., Loessner, M.J., and Golden, D.A. (2005). History of Microorganisms in Food. *Modern Food Microbiology (Springer)*, 3–9.
- Pasolli, E., De Filippis, F., Mauriello, I.E., Cumbo, F., Walsh, A.M., Leech, J., Cotter, P.D., Segata, N., and Ercolini, D. (2020). Large-scale genome-wide analysis links lactic acid bacteria from food with the gut microbiome. *Nature Communications, 11*(1), 2610. https://doi.org/10.1038/s41467-020-16438-8.

- Tomofuji, Y., Kishikawa, T., Maeda, Y., Ogawa, K., Otake-Kasamoto, Y., Kawabata, S., Nii, T., Okuno, T., Oguro-Igashira, E., Kinoshita, M., et al. (2022). Prokaryotic and viral genomes recovered from 787 Japanese gut metagenomes revealed microbial features linked to diets, populations, and diseases. *Cell Genomics*, *2*(12), 100219. https://doi.org/10.1016/j.xgen.2022.100219.
- Wolfe, B.E. & Dutton, R.J. (2015). Fermented foods as experimentally tractable microbial ecosystems. *Cell*, *161*(1), 49-55. https://doi.org/10.1016/j.cell.2015.02.034.
- Spencer-Drakes, T.C.J., Sarabia, A., Heussler, G.E., Pierce, E.C., Morin, M., Villareal, S. & Dutton, R.J. (2024). Phage resistance mutations affecting the bacterial cell surface increase susceptibility to fungi in a model cheese community. *ISME Communications*, *4*(1), ycae101. https://doi.org/10.1093/ismeco/ycae101.
- Carlino, N., Blanco-Míguez, A., Punčochář, M., ..., Cotter, P.D., Segata, N. & Pasolli E. (2024). Unexplored microbial diversity from 2,500 food metagenomes and links with the human microbiome. *Cell*, *187*(20):5775-5795.e15. https://doi.org/10.1016/j.cell.2024.07.039.
- Antipov, D., Raiko M., Lapidus, A. & Pevzner P.A. (2020). Metaviral SPAdes: assembly of viruses from metagenomic data. *Bioinformatics*, *36*(14):4126-4129. https://doi.org/10.1093/bioinformatics/btaa490.
- Guo, J., Bolduc, B., Zayed, A.A., Varsani, A., Dominguez-Huerta, G., Delmont, T.O., Pratama, A.A., Gazitúa, M.C., Vik, D., Sullivan, M.B., Roux, S. (2021). VirSorter2: a multi-classifier, expert-guided approach to detect diverse DNA and RNA viruses. *Microbiome*, *9*(1):37. https://doi.org/10.1186/s40168-020-00990-y.
- Zheng, K., Sun, J., Liang, Y., Kong, L., Paez-Espino, D., Mcminn, A. & Wang, M. (2025). VITAP: a high precision tool for DNA and RNA viral classification based on meta-omic data. *Nature Communications*, *16*(1):2226. https://doi.org/10.1038/s41467-025-57500-7.

Course (s)	BIOC3990
Title	Investigation of glycine inhibition of lactate and alanopine dehydrogenase in nerite snails
Supervisor (s)	Dr. Shane Austin

Background:
Opine dehydrogenases are enzymes found in several organisms that facilitate their survival in harsh habitats (Harcet, Perina, and Pleše 2013). Previous research has identified opine dehydrogenases in three snail species commonly found in the intertidal zone of Barbados' east coast (St. John 2018). These snails, which are all of the genus Nerita (*Nerita peloronta, Nerita tessellata, Nerita versicolor*) (Lewis 1960), possess alanopine dehydrogenase. To date, a graduate student has devised a method for the partial purification and assay of the enzyme. Alanopine dehydrogenase utilises alanine along with pyruvate and NADH to produce the opine- alanopine (Plaxton and Storey 1982). This process is a fundamental anaerobic metabolic process for these snails, as it recycles NADH during anaerobic respiration. Previous studies have demonstrated without robust replication that physiological glycine concentrations may inhibit lactate dehydrogenase.

Objectives:
To determine if lactate dehydrogenase is inhibited by glycine at physiological concentrations in nerite snails. Furthermore, establish if glycine can inhibit alanopine dehydrogenase activity or contribute as a possible substrate.

Methods:
The prospective student will (1) collect the snails from the marine environment, (2) perform homogenization of snail tissue, and enzyme purification by column chromatography. Spectrophotometric assays will be used to determine enzyme activity and targeted assays with varying substrate concentration will determine inhibition.

Requirements:
Must be comfortable working gastropods and be able to ambulate comfortably in a marine environment.

References:

- Harcet, Matija, Drago Perina, and Bruna Pleše. 2013. "Opine Dehydrogenases in Marine Invertebrates." Biochemical Genetics 51 (9): 666–676. https://doi.org/10.1007/s10528-013-9596-7. https://doi.org/10.1007/s10528-013-9596-7.
- Lewis, John B. 1960. "THE FAUNA OF ROCKY SHORES OF BARBADOS, WEST INDIES." Canadian Journal of Zoology 38 (2): 391–435. https://doi.org/10.1139/z60-043. https://cdnsciencepub.com/doi/abs/10.1139/z60-043.
- Plaxton, William C., and Kenneth B. Storey. 1982. "Alanopine dehydrogenase: Purification and characterization of the enzyme fromLittorina littorea foot muscle." Journal of

comparative physiology 149 (1): 57–65. https://doi.org/10.1007/BF00735715. https://doi.org/10.1007/BF00735715.

- St. John, Spencer. 2018. "Metabolism of Tropical Intertidal Species." B.Sc. Undergraduate Research Project, Department of Biological and Chemical Sciences, The University of the West Indies, Cave Hill Campus.

Course (s)	BIOC3990
Title	Isolation and Characterization of Lytic Bacteriophages Against Extended-Spectrum Beta-lactamase (ESBL)-Producing *E. coli*
Supervisor (s)	Dr. Shane Austin & Dr. Kelly Brathwaite

Background:
The emergence of extended-spectrum β-lactamase (ESBL)-producing *Escherichia coli* (*E. coli*) is a significant public health concern due to their resistance to many β-lactam antibiotics. This has resulted in limited treatment options and contributed to the rise in global antimicrobial resistance (AMR) (WHO, 2022). Bacteriophages are increasingly being explored as alternatives or adjuncts to antibiotics (Faruk et al., 2025). While numerous studies have isolated and characterized phages targeting ESBL-producing *E. coli* from wastewater in developed countries (Vitt et al., 2024; Shamsuzzaman et al., 2025), no published work exists for Barbados or the wider Eastern Caribbean. The current research therefore represents a unique opportunity to explore local phage diversity, assess their therapeutic potential, and contribute to regional AMR mitigation strategies.

Objectives:
The objectives of this project are to (i) isolate bacteriophages from raw sewage in Barbados targeting ESBL-producing *E. coli*; (ii) determine host range against a panel of clinical ESBL *E. coli* isolates; (iii) extract phage genomic DNA and perform whole-genome sequencing, and (iv) annotate and analyze genomes to assess taxonomy, safety (absence of virulence and AMR genes), and unique genetic features.

Methods:
Raw sewage samples will be collected from the Bridgetown Sewage Treatment Plant. Phages will be enriched and isolated using clinical ESBL-producing *E. coli* strains. Host range will be determined by spot assays against a panel of ESBL-producing *E. coli* clinical isolates. Multiple rounds of purification will be done to achieve high-titre lysates, which will then be used for DNA extraction. Sequencing will be performed externally using Illumina short-read technology, and bioinformatic analysis will include de novo assembly, annotation and screening for virulence and AMR genes.

References:

- Faruk, O., Jewel, Z.A., Bairagi, S., Rasheduzzaman, M., Bagchi, H., Tuha, A.S.M., Hossain, I., Bala, A. & Ali, S. (2025). Phage treatment of multidrug-resistant bacterial infections in humans, animals, and plants: The current status and future prospects. Infectious Medicine (Beijing), 4(1):100168. https://doi.org/10.1016/j.imj.2025.100168

- Vitt A.R., Sørensen, A.N., Bojer, M.S., Bortolaia, V., Sørensen, M.C.H. & Brøndsted, L. (2024). Diverse bacteriophages for biocontrol of ESBL- and AmpC-β-lactamase-producing *E. coli*. iScience, 27(2):108826. https://doi.org/10.1016/j.isci.2024.108826

- World Health Organization (2022). Global Antimicrobial Resistance and Use Surveillance System (GLASS) Report. https://www.who.int/publications/i/item/9789240062702

- Shamsuzzaman, M.D, Kim, S. & Kim, J. (2025). Therapeutic potential of novel phages with antibiotic combinations against ESBL-producing and carbapenem-resistant *Escherichia coli*. Journal of Global Antimicrobial Resistance, 43, 86-97. https://doi.org/10.1016/j.jgar.2025.04.005

Course (s)	BIOC3990/BIOL3990
Title	Investigation of Mosquito Bloodmeals in Barbados
Supervisor (s)	Dr. Shane Austin & Dr. Darren Browne

Background:
Mosquitoes are arthropods commonly found in tropical regions; they act as vectors for several known and novel viruses. Recent work in Barbados has indicated that many of these viruses have been previously unidentified [1]. Female mosquitoes can obtain bloodmeals from multiple sources and research has identified domesticated animals, livestock and birds as bloodmeal sources. These bloodmeals are necessary for the reproductive process of mosquitoes, specifically for egg-laying. To date and to the best of available knowledge, bloodmeal analyses of female mosquitoes in Barbados have only been conducted by previous project students. This project seeks to build on this prior work and provide further information to the Ministry of Health and Wellness.

Objectives:
Determine the bloodmeals of various mosquito species captured in collaboration with the Ministry of Health and Wellness mosquito aspiration activities.

Methods:
The project will require (1) identification of mosquitoes species using a provided guide based on morphological features (2) isolation of DNA from the captured mosquitoes (3) PCR analysis using the isolated DNA [2] (4) PCR clean-up and preparation of PCR amplicons for sequencing as needed (5) Analysis of PCR amplicons by gel electrophoresis.

Requirements:
Must be comfortable working with mosquitoes daily.
Availability for early mornings on campus is desirable.

References:

- Thannesberger, J., et al., Viral metagenomics reveals the presence of novel Zika virus variants in Aedes mosquitoes from Barbados. Parasites & Vectors, 2021. 14(1): p. 343.

- Ngo, K.A. and L.D. Kramer, Identification of Mosquito Bloodmeals Using Polymerase Chain Reaction (PCR) With Order-Specific Primers. Journal of Medical Entomology, 2003. 40(2): p. 215-222.

Course (s)	BIOL3990
Title	Farmer-Friendly Approaches to Enhance Papaya (*Carica papaya* L.) Seed Germination and Early Seedling Vigor
Supervisor (s)	Dr. Fradian Murray & Dr. Linton Arneaud

Background:

Papaya (*Carica papaya* L.) is an important tropical fruit crop valued for its nutritional composition, which includes carbohydrates, proteins, lipids, vitamins, minerals, and antioxidants, as well as for its diverse medicinal properties (Kumar and Devi PS 2017). In Barbados, it is increasingly viewed as a symbol of enhanced food security, with expansion in its cultivation seen as a strategy to reduce food imports (Barbados Today 2024). Despite its importance, papaya cultivation faces challenges due to the irregular and slow germination of its seeds. Several factors contribute to this problem, including harvest season, postharvest fruit storage, the presence of the sarcotesta, and inhibitory compounds associated with the seed coat and pulp (Dias et al. 2014). The thick seed coat protects the embryo but also restricts water uptake and radicle protrusion, while abscisic acid (ABA) further suppresses germination. External environmental factors together with internal regulators like gibberellic acid (GA_3) and ethylene, strongly influence germination outcomes. Conventional methods such as hot-water soaking can improve germination to 70–80 percent, while chemical priming with GA_3 and potassium nitrate (KNO_3) has been shown to accelerate germination and enhance seedling vigor (Xi et al. 2023). However, these chemical-based approaches are often impractical for farmers due to handling requirements and additional costs. This underscores the need for simple, scalable, low-cost, and farmer-friendly strategies that can improve papaya seed germination, seedling establishment, and overall crop productivity.

Objectives:

1. To examine seed internal morphology and density and relate these to germination success.
2. To evaluate the effects of physical, biochemical, and biological seed treatments on papaya seed germination.
3. To compare germination rate, time to germination, and seedling vigor across different papaya cultivars.
4. To identify practical, low-cost treatments suitable for farmer adoption in greenhouse and shade house production.

Methods:

The project involves (1) obtaining seeds of multiple papaya cultivars from commercial sources, (2) analyzing seed internal structure and density, (3) applying treatments including abrasion, hot-water

soaking, biological inoculation and chemical priming (4) sowing seeds in pots or trays under shade house conditions, and (5) monitoring germination and recording seedling vigor traits.

Requirements:

This project requires working in the lab, shade house and possibly the field. A willingness to work on weekends to monitor plants is expected.

References:

- Barbados Today. 2024. "Papaw in food security drive – IICA." *Barbados Today*, February 03. https://barbadostoday.bb/2024/02/03/papaw-in-food-security-drive-iica/.
- Dias, Maristela Aparecida, Denise Cunha Fernandes dos Santos Dias, Francisco Guilhien Gomes Junior, and Silvio Moure Cícero. 2014. "Morphological changes and quality of papaya seeds as correlated to their location within the fruit and ripening stages." *IDESIA* 32: 27-34.
- Kumar, Neethu S, and Sreeja Devi PS. 2017. "The surprising health benefits of papaya seeds: A Review." *Journal of Pharmacognosy and Phytochemistry* 6(1): 424-429.
- Xi, Deng-Ke, Seong Ling Yap, Nitturi Naresh Kumar, Chian Cheng Toh, Kenji Ishikawa, and Masaru Hori. 2023. "Plasma-Assisted Priming: Improved Germination and Seedling Performance of Papaya." *Sains Malaysiana* 52(2): 599-611. doi:http://doi.org/10.17576/jsm-2023-5202-21.

Course (s)	BIOL3990
Title	Evaluating the Effects of Organic Soil Amendments on Sweetpotato Growth and Yield
Supervisor (s)	Dr. Fradian Murray & Mr. Bret Taylor (Ministry of Agriculture and Food Security)

Background:

About 38% of soils in Latin America and the Caribbean are classified as unhealthy, with clear implications for agricultural productivity and sustainability (Poppiel, et al. 2025). In Barbados, alkaline soils with poor structure and fertility constraints demand innovative yet practical solutions for soil restoration, particularly under the national "25 by 25" initiative (now "25 by 30") to reduce food imports. Organic amendments such as manure and compost are recognized for their capacity to improve soil physicochemical and biological properties, building long-term soil health while supporting crop productivity (Markos and Gurmu 2023). In this study, amendments were applied to soils more than three months ago, with monthly monitoring of the physicochemical and biological properties, providing insights into amendment-driven changes. At month four, sweetpotato (*Ipomoea batatas* (L.) Lam.) will be planted as the test crop in the treated plots, serving as a biological assay to evaluate how improvements in soil conditions translate into crop establishment, growth, and yield.

Objectives:

1. To evaluate the effects of poultry manure, sheep manure, and compost on sweetpotato establishment, vine growth, and storage root yield and quality.
2. To compare the effects of different organic amendments on soil physicochemical and biological properties at planting and harvest of sweetpotato.
3. To assess the relationship between soil health improvements and sweetpotato performance under different amendment treatments.

Methods:

After four months of amendment incorporation and soil monitoring, sweetpotato will be planted across the treatment plots located at the Ministry of Agriculture and Food Security in Graeme Hall. Plant growth will be assessed biweekly during the early stages and then monthly, with data collected on establishment rates, vine growth, and biomass accumulation. Soil samples will also be collected at planting and harvest to evaluate physicochemical and biological properties. At harvest, storage root yield and quality will be measured to determine treatment effects. The trial will be conducted twice.

Requirements:

Students undertaking this project will be required to work in the field under hot/sunny conditions to establish experimental plots, maintain treatments, and collect growth and soil data. In addition, laboratory work will be necessary for the analysis of both soil and plant material to assess treatment effects.

References:

- Markos, Daniel, and Fekadu Gurmu. 2023. "Effects of soil amendments on growth and biomass yield of early generation seeds of sweet potato (Ipomoea batatas (L.) Lam) grown in net tunnels." *PLoS ONE* 18 (11): 1-14. doi:https://doi.org/10.1371/journal.pone.0290585.
- Poppiel, Raul Roberto, Maurício Roberto Cherubin, Jean J. M. Novais, and José A. M. Demattê. 2025. "Soil health in Latin America and the Caribbean." *Communications Earth & Environment* 6 (141): 1-11. doi:https://doi.org/10.1038/s43247-025-02021-w.

Course (s)	BIOL3990 / ECOL3990
Title	Assessing the condition, survivorship, and growth of *Acropora palmata* (elkhorn coral) nubbins within the context of a coral restoration project in Barbados
Supervisor (s)	Dr. Henri Vallès

Background:
The BCS is currently leading the execution of a coral restoration project (the WANSEC project) seeking to restore populations of elkhorn coral (*Acropora palmata*) at two sites in Barbados. The elkhorn coral is an important reef builder species that used to be dominant in the shallow fringing reefs of Barbados hundreds of years ago, forming dense thickets of interlocking branching colonies that acted as a barrier against wave action and coastal erosion. Although this coral is now functionally extinct, there is evidence that its populations are slowly and naturally recovering in Barbados.
This project seeks to assist and accelerate this natural recovery by using novel coral nubbin outplant generation techniques and operating at relatively large scales at two sites designated for restoration.
The project is currently at the nursery phase and will transition to the outplanting phase during the 2025 fall period. To assess the effectiveness of the project, periodic monitoring of the coral nubbins will be required during the nursery and outplanting phase as well as after the outplanting phase (fall 2025 and winter 2026).

Objectives:
The project aims to quantify mortality and growth rates of elkhorn coral nubbins obtained from different coral lineages during the nursery and outplanting phase as well as after the outplanting phase at one site designated for restoration. The ultimate goal is to help identify the elkhorn coral lineages that best perform throughout these restoration phases in Barbados and to identify potential environmental and methodological factors affecting coral restoration success.

Methods:
The student will periodically collect growth, survivorship and condition data from coral nubbins obtained from different lineage colonies during the nursery phase, outplanting phase, and thereafter.
The student will also monitor the health status of the populations of Elkhorn coral at the sites from which the coral nubbins were obtained, which will serve as baseline.
The student is also expected to assist during the outplanting activities.

Requirements:
This project requires SCUBA diving. A SCUBA diver certificate and willingness to work during weekends if needed.

References:

- Johnson, M.E., Lustic, C., Bartels, E., Baums, I.B., Gilliam, D.S., Larson, L., Lirman, D., Miller, M.W., Nedimyer, K., Schopmeyer, S., 2011. Caribbean Acropora Restoration Guide: Best Practices for Propagation and Population Enhancement. . The Nature Conservancy, Arlington, VA.
- Macintyre, I.G., Glynn, P.W., Toscano, M.A., 2007. The demise of a major *Acropora palmata* bank–barrier reef off the southeast coast of Barbados, West Indies. Coral Reefs 26, 765-773.
- MacLean, R., Oxenford, H.A., 2016. Mapping the return of acroporid corals on fringing reefs along the west coast of Barbados, CERMES Technical report 80. Centre for Resource Management and Environmental Studies (CERMES) Faculty of Science and Technology, The University of the West Indies, Cave Hill Campus, Barbados, p. 61.

Course (s)	BIOL3990 / ECOL3990
Title	Abundance and resource use of the monarch butterfly (*Danaus plexippus*) at Walkers Reserve
Supervisor (s)	Dr. Henri Vallès

Background:
The monarch butterfly is one of the most familiar butterflies of the Americas. Some of its populations on the northern range can migrate considerable distances to overwintering sites, whereas other populations do not migrate. Monarch butterfly larvae feed on a wide range of latex-producing milkweeds and the adults are important pollinators. Some of its populations can be found as far south as the eastern Caribbean, including Trinidad and Tobago. In Barbados, they can be regularly observed at the Walkers Reserve, on the northeastern side of the island. However, little is known about the factors that drive the abundance and distribution of this iconic species in Barbados over time.

Objectives:
This project will seek to (1) map the distribution of food plants used by both the adults and larvae of monarch butterflies and (2) assess changes over time in the abundance of monarch butterfly larvae and adults at the Walkers reserve. These data will be used as baseline to assess changes in the future.

Methods:
This project will entail regular georeferenced field surveys at the study site to quantify the abundance of monarch butterfly adults and larvae and their food plants.

Requirements:
This project will require a student with good data handling and analysis skills. The student will spend considerable time in the field collecting data. Although not required, it would be advantageous if the student had access to his/her own means of transportation.

References:

- Walker, A.; Thogmartin, W. E.; Oberhauser, K. S.; Pelton, E. M.; Pleasants, J. M. (2022). "*Danaus plexippus*". IUCN Red List of Threatened Species. 2022: e.T159971A806727. doi:10.2305/IUCN.UK.2022-1.RLTS.T159971A806727.en.
- Nail, Kelly R. (2019). "Butterflies Across the Globe: A Synthesis of the Current Status and Characteristics of Monarch (*Danaus plexippus*) Populations Worldwide". Frontiers in Ecology and Evolution. 27: 362. doi:10.3389/fevo.2019.00362.

Course (s)	BIOL3990 / ECOL3990
Title	Building and ground truthing a species distribution model for the Barbados velvet worm, *Epiperipatus barbadensis*
Supervisor (s)	Dr. Darren Browne

Background:
The study of rare, cryptic organisms often requires extensive field surveys and significant survey effort. Species distribution models, based on observed occurrences, can help to improve the selection of survey sites by predicting zones with a high likelihood of containing suitable habitat (Groff et al., 2014; Rhoden et al., 2017). The Barbados velvet worm, *Epiperipatus barbadensis*, is a small soil-dwelling invertebrate and produces protein secretions with the potential to inspire future biomaterials. Although finding these animals can be extremely difficult in the field, understanding their distribution is key to securing specimens for protein analysis and aligns with the current focus of Barbados' Government on developing our understanding of the island's biodiversity. This project aims to field validate a species distribution model built using the Maxent machine learning algorithm (Phillips et al., 2017; Phillips et al., 2017, April).

Objectives:

Develop a Maxent model for the Barbados velvet worm.
Ground truth the Maxent model.
Iterate upon the initial Maxent model.
Produce a map of *E. barbadensis* habitat suitability for the island of Barbados.

Methods:
This project will involve (1) building a species distribution model using known presence locations of *E. barbadensis* and environmental data (2) selection of survey sites based on the initial model (3) field surveys in collaboration with the Biodiversity Survey Team of the Ministry of Environment and National Beautification (4) improvement of the initial model using new confirmed locations.

Requirements:
Must be comfortable working in gullies and wooded areas
Must be comfortable working with and handling invertebrates and their secretions
Experience with R is desirable
Experience with GIS is desirable

References:

- Groff, L. A., Marks, S. B., & Hayes, M. P. (2014). Using ecological niche models to direct rare amphibian surveys: a case study using the Oregon Spotted Frog (*Rana pretiosa*). *Herpetological Conservation and Biology*, *9*(2), 354–368.

- Phillips, S. J., Anderson, R. P., Dudík, M., Schapire, R. E., & Blair, M. E. (2017). Opening the black box: an open-source release of Maxent. *Ecography*, *40*(7), 887–893. https://doi.org/10.1111/ecog.03049
- Phillips, S. J., Dudík, M., & Schapire, R. E. (2017, April). *Maxent software for modelling species niches and distributions (Version 3.4.1)*. In http://biodiversityinformatics.amnh.org/open_source/maxent/
- Rhoden, C. M., Peterman, W. E., & Taylor, C. A. (2017). Maxent-directed field surveys identify new populations of narrowly endemic habitat specialists. *PeerJ*, *5*, e3632. https://doi.org/10.7717/peerj.3632

Course (s)	BIOL3990 / ECOL3990
Title	Describing spatial and temporal patterns of crustacean settlement to the west coast of Barbados and identifying their environmental correlates
Supervisor (s)	Dr. Henri Vallès

Background:
Most coral reef organisms spend their larval stage in the open ocean. At some point, they will make their way back to a coral reef. The transition between the larval pelagic stage and the juvenile reef stage is called settlement and represents a key, but poorly known, phase in the population dynamics of all reef organisms. Between June 2003 and November 2004, the settlement of crustaceans was periodically monitored using standard units of habitat deployed along the west coast of Barbados. These data represent one of the longest uninterrupted time series of crustacean settlement anywhere to date.

Objectives:
In this project the student will use the aforementioned data to (1) describe spatio-temporal patterns of crustacean settlement along the west coast of Barbados, and (2) identify environmental factors (e.g. lunar phase, temperature, site location) associated with such patterns.

Methods:
This project will require handling and analyzing a large and complex dataset that is already available. It will also involve a desk review of the most recent relevant literature. No field work is anticipated.

Requirements
Proficiency in the use of Excel software and a willingness to learn biostatistics and quantitative methods is required. Students will learn how to use R environment for statistical analyses and are expected to be proficient in the use of R and several statistical methods by the end of the project.

References:

- Vallès H, Kramer DL, Hunte W (2006) A standard unit for monitoring recruitment of fishes to coral rubble. J Exp Mar Biol Ecol 336:171-183
- Vallès H, Kramer DL, Hunte W (2008) Temporal and spatial patterns in the recruitment of coral-reef fishes in Barbados. Mar Ecol Prog Ser 363:257-272
- Vallès H, Hunte W, Kramer DL (2009) Variable temporal relationships between environment and recruitment in coral reef fishes. Mar Ecol Prog Ser 379:225-240

Course (s)	CHEM3950
Title	Computational study of model binary complexes of XCN (X = H, Li, F)
Supervisor (s)	Prof. Sean McDowell

Background: The nitrile-containing molecules X−C≡N can function as either Lewis acids (via the X atom) or Lewis bases (via the N atom) or both. The proposed project is a computational study of model binary complexes where the Lewis acid and Lewis base potentialities of XCN are investigated. The work involves a search for optimized structures, from which selected properties are determined. The properties of interest, besides the optimized geometry and the interaction energy, are the dipole moments, harmonic frequencies of selected vibrational modes and their relative infrared intensities. We also envisage evaluation of the atomic and molecular charge distribution in the optimized complexes for elucidation of the bonding features and energetic trends.

Main Objectives: To characterize the molecular complexes of XCN, some of which may not have been studied before, but primarily to consider whether the *relative infrared intensity* of the C≡N stretching mode can be used to probe the energetic trends in related sets of complexes.

Methods: Standard *ab initio* computations (using Gaussian/GaussView software) will be used to optimize and determine the properties of the model binary complexes in this study.

Course (s)	ECOL3990
Title	Cataloguing The UWI Museum Invertebrate Collection
Supervisor (s)	Dr. Linton Arneaud

Background:

Barbados, situated within the Caribbean Biodiversity Hotspot (Profile, 2019), holds significant ecological importance, particularly, with reference to its invertebrate fauna. These invertebrate species are critical to ecosystem stability, serving critical roles as primary consumers, decomposers, and as a vital food source (eggs, larvae, and adults) for numerous economically important vertebrate species (Peck, 2009). Despite their ecological significance, a comprehensive taxonomical inventory of Barbadian invertebrates remains largely uncompiled. This project addresses this gap by compiling curated list of the invertebrate specimens housed within the University of the West Indies (UWI) Cave Hill Campus Museum Collection.

Objectives:

The project aims to catalogue The UWI Museum Invertebrate Collection and compare it to established databases, conducting rigorous taxonomic validations.

Methods:

This project will systematically catalogue the UWI Cave Hill Campus invertebrate collection by meticulously transcribing and digitizing existing specimen data. Each entry will undergo taxonomic verification, updating nomenclature and resolving synonyms using current scientific resources and expert consultation. High-resolution digital photographs will document representative specimens (where available). Spatial data from specimen localities will be georeferenced and projected for distribution mapping. Finally, a comprehensive species list will allow comparative analysis against databases like the Global Biodiversity Information Facility (GBIF) and Darwin Core Archive (DwC-A) to assess the collection's completeness and identify new records for Barbados.

Requirements:

A strong understanding of Barbados' invertebrate biodiversity and its ecology. Additionally, computer literacy (including database management) and proven photography skills are essential for this project.

References:

- Peck, S. B. (2009). The beetles of Barbados, West Indies (Insecta: Coleoptera): diversity, distribution and faunal structure. *Insecta Mundi*, 1-51.

- Profile, E. (2019, December). *The Caribbean islands biodiversity hotspot*. Caribbean Natural Resources Institute (CANARI), 1-520.

Course (s)	ECOL3990
Title	Developing an Effective Mangrove Rehabilitation Technique
Supervisor (s)	Dr. Linton Arneaud

Background:
In Barbados, the Graeme Hall Swamp Sanctuary is critical for providing ecological services, preserving biodiversity, and providing essential habitats for numerous species. Given the significant historical loss of mangrove cover in Barbados due to development (Mahon et al, 2025), research focused on identifying cost-effective, and sustainable methods for restoring degraded mangrove ecosystems is crucial. This project explores one such innovative technique for mangrove establishment under changing environmental conditions.

Objectives:
The project aims to observe survival and growth rates of mangrove species in potential restoration sites using a novel technique, while evaluating cost-effectiveness of the technique.

Methods:
This project will involve implementing an innovative mangrove seedling establishment technique in a degraded area. The cost-effectiveness will be evaluated using comparative techniques.

Requirements:
A strong understanding of Barbados' mangrove species, vegetation types and proven field experience are essential for this project.

References:

- Mahon, R., S. Carrington, L. Edghill, J. Horrocks, A. Hutchinson, H. A. Oxenford, D. Riven Ramsey & T. Yarde. (2025). Graeme Hall Swamp Barbados: studies, surveys, plans and development up to 2025. Centre for Resource Management and Environmental Studies, The University of the West Indies, Cave Hill Campus, Barbados. CERMES Technical Report No 110, 88 pp.

Course (s)	ECOL3990
Title	Feasibility Study for a Demonstration Pollination Garden at BCS
Supervisor (s)	Dr. Linton Arneaud

Background:
Pollinators are globally crucial for agriculture and ecosystem biodiversity, integral to plant reproduction, genetic diversity, and food production, contributing an estimated $235–$577 billion annually to the agricultural economy (Sawe et al., 2020). Their decline due to habitat loss, pesticides, and climate change threatens agricultural output and biodiversity (Dorian et al., 2025). In Barbados, increasing pollinator gardens can enhance agricultural productivity by fostering diverse pollinator communities, including the strategic use of late-flowering native and exotic plants.

Objectives:
The project aims to catalogue existing plant species and pollinators within a green plot next to the department of Biological and Chemical Sciences, while recommending techniques to increase pollinator density and diversity.

Methods:
This project will involve site assessment and mapping, alongside soil and other environmental condition analyses. Plant species identification and inventory, followed by pollinator observation and identification techniques.

Requirements:
A strong understanding of local plant species, particularly those attractive to pollinators, familiarity with common pollinator species in Barbados and experience collecting biological data are essential for this project.

References:

- Dorian, N. N., Murphy, A. W., Iler, A. M., & CaraDonna, P. J. (2025). Setting goals for pollinator gardens. *Conservation Biology*, e70009.

- Gallai, N., Salles, J. M., Settele, J., & Vaissière, B. E. (2009). Economic valuation of the vulnerability of world agriculture confronted with pollinator decline. *Ecological economics*, 68(3), 810-821.

Course (s)	MICR3990
Title	An Evaluation of Fresh Produce as a Potential Reservoir of Foodborne Pathogens and Antimicrobial Resistance Genes
Supervisor (s)	Dr. Kelly Brathwaite

Background:
Fresh fruits, vegetables and herbs are increasingly consumed raw, making them potential vehicles for foodborne pathogens and antimicrobial resistance (AMR) genes. Contamination can occur during cultivation, harvesting, processing and retail, through sources such as irrigation water, soil, manure and handling. Globally, fresh produce has been implicated in outbreaks caused by *Escherichia coli* O157:H7, *Salmonella* spp. and *Listeria monocytogenes* (Zhu et al., 2017*;* Elias et al., 2019). In the Caribbean, surveillance of produce for microbial hazards is limited, and there is little published data on AMR in produce. This study aims to address this knowledge gap in Barbados, where both locally grown and imported produce are widely consumed.

Objectives:
The objectives of this project are to (i) determine the prevalence of selected foodborne pathogens in locally grown and imported fresh produce in Barbados; (ii) detect and characterize antimicrobial resistance genes in isolates from fresh produce and (iii) compare pathogen and AMR gene occurrence between local and imported produce sources.

Methods:
Fresh produce (e.g., cucumber, bell pepper, lettuce, kale, cilantro, and parsley) will be collected from supermarkets, retail outlets and vegetable markets in Barbados. A total of at least 30 samples will be obtained over a 3-month period, with approximately equal representation of local and imported commodities. Samples will be processed using standard microbiological methods for the isolation and identification of *Salmonella* spp. Confirmed isolates will undergo antimicrobial susceptibility testing using the Kirby–Bauer disc diffusion method following CLSI guidelines. DNA will be extracted from isolates, and PCR assays will target common antimicrobial resistance genes. Data will be analyzed to determine the prevalence of *Salmonella* spp., the distribution of resistance profiles and differences between local and imported produce.

References:

- Zhu, Q., Gooneratne, R., & Hussain, M. A. (2017). *Listeria monocytogenes* in Fresh Produce: Outbreaks, Prevalence and Contamination Levels. Foods, 6(3), 21. https://doi.org/10.3390/foods6030021

- Elias, S., Noronha, T. B. & Tondo, E. C. (2019). *Salmonella* spp. and *Escherichia coli* O157:H7 prevalence and levels on lettuce: A systematic review and meta-analysis. Food Microbiology, 84, 103217. https://doi.org/10.1016/j.fm.2019.05.001

Course (s)	MICR3990
Title	Assessing the β-mannanase-producing ability of actinobiome of *Sargassum* waste
Supervisor (s)	Dr. Bidyut Mohapatra

Background: Mannan is a structural polysaccharide of plants and several species of green, red and brown algae, including the two bloom-forming pelagic species of *Sargassum* (*S. fluitans* and *S. natans*)[1]. Mannan is composed of a backbone of β-1,4-linked D-mannose (or in combination with D-glucose) and the side chains of α-1,6-linked D-galactose residues. β-Mannanase is the key enzyme, which hydrolyses randomly the β-1,4 linkage of mannan to bioactive manno-oligosaccharides[2]. β-Mannanase finds application in various industries, including biorefining, detergent, fodders, food processing, oil and gas, pharmaceutical, pulp and paper, textile and wastewater treatment[3]. In view of the potential industrial applications of β-mannanase, substantial research efforts have been directed for screening of the microorganisms from various environmental niches to be used as biocatalyst.

Objectives: The objectives of this research project are to (1) develop a culturomic approach, specifically for the difficult-to-grow actinobiome associated with *Sargassum* waste; and (2) assess the phylogenetic affiliation and functional gene(s) of the β-mannanase-producing actinomycetes inhabiting *Sargassum* waste.

Methods: The phylogeny and β-mannanase-producing ability of *Sargassum* associated actinobiome will be assessed via high-throughput screening, DNA sequencing and CAZy mapping tool[4].

References:

- Stiger-Pouvreau V, Bourgougnon N, Deslandes E. 2016. Carbohydrates from seaweeds. In: Fleurence J, Levine I, editors. Health and disease prevention. San Diego: Academic Press; p. 223–274.

- Yamabhai M, Ubol SS, Srila W, Haltrich D. 2016. Mannan biotechnology: from biofuels to health. Crit Rev Biotechnol. 36:32–42.

- Mohapatra BR. 2021. Characterization of β-mannanase extracted from a novel *Streptomyces* species Alg-S25 immobilized on chitosan nanoparticles. Biotechnol Biotechnol Equip. 35:150–161.

- Drula E, Garron ML, Dogan S, Lombard V, Henrissat B, Terrapon N. 2022. The carbohydrate-active enzyme database: Functions and literature. Nucleic Acids Res. 50: D571–D577.

Course (s)	MICR3990
Title	Assessing the Risk of Antimicrobial Resistance in Pet Owners through Contact with Companion Animals
Supervisor (s)	Dr. Kelly Brathwaite, Dr. Thea Scantlebury-Manning & Dr. Terrence Mayers (Veterinary Services Department, Ministry of Agriculture, Food and Nutritional Security)

Background:
The close relationship between humans and companion animals has raised concerns about zoonotic transmission of antimicrobial-resistant (AMR) bacteria. Pets such as dogs and cats can carry resistant pathogens including *Escherichia coli*, *Staphylococcus aureus* and Enterococci, which may spread to owners via direct contact, shared environments or contaminated surfaces (Guardabassi et al., 2004). The One Health framework emphasizes the interconnectedness of human, animal and environmental health, highlighting the need to investigate domestic settings as potential reservoirs for AMR (Robinson et al., 2016). In Barbados, where companion animal ownership is high, veterinary prescribing practices also play an important role in shaping AMR risks.

Objectives:
The objectives of this project are to (i) determine the prevalence of AMR bacteria in companion animals (dogs and cats) and their owners; (ii) assess the similarity of resistance profiles between animal and human isolates; (iii) evaluate potential risk factors for AMR transmission, including pet care practices and veterinary antibiotic use and (iv) document veterinary prescribing practices for companion animals in Barbados.

Methods:
In this study, swab samples will be collected from pets (oral/rectal) and owners (hand) under ethical approval and consent. Samples will be cultured for *E. coli* and *S. aureus*, followed by antimicrobial susceptibility testing using the Kirby–Bauer disc diffusion method according to the CLSI guidelines. Resistant isolates will be compared between humans and animals to identify overlaps. A short household questionnaire will collect data on pet health, antibiotic exposure and owner practices. In addition, structured surveys will be administered to practicing veterinarians to capture prescribing habits, choice of antimicrobials and perceptions of AMR risk.

References:

- Guardabassi, L., Schwarz, S., & Lloyd, D. H. (2004). Pet animals as reservoirs of antimicrobial-resistant bacteria. Journal of Antimicrobial Chemotherapy, 54(2), 321–332. https://doi.org/10.1093/jac/dkh332

- Robinson, T. P., Bu, D. P., Carrique-Mas, J., Fèvre, E. M., Gilbert, M., Grace, D., Hay, S. I., Jiwakanon, J., Kakkar, M., Kariuki, S., Laxminarayan, R., Lubroth, J., Magnusson, U., Thi Ngoc, P., Van Boeckel, T. P. & Woolhouse, M. E. J. (2016). Antibiotic resistance is the quintessential One Health issue. Transactions of the Royal Society of Tropical Medicine and Hygiene, 110(7), 377–380. https://doi.org/10.1093/trstmh/trw048

Course (s)	MICR3990
Title	Metagenomic insights into the plastic-degrading potential of *Sargassum* waste microbiome
Supervisor (s)	Dr. Bidyut Mohapatra

Background: Since 2011, two pelagic species of *Sargassum* (*S. fluitans* and *S. natans*) have been forming blooms annually in the coastal regions of subtropical and tropical Atlantic Ocean. This pelagic *Sargassum* bloom covered a distance of 9000 km with an estimated weight of 20 million tons[1]. Recent studies have reported the accumulation of microplastics in the tissue of stranded pelagic *Sargassum* biomass[2]. *Sargassum* is rich in carbohydrates, minerals, proteins and vitamins[3]. Decomposing *Sargassum* biomass (aka *Sargassum* waste) is an ideal niche material for harboring a diverse microbial population, which should facilitate the natural degradation process[4]. The significance of these microorganisms in degrading microplastics has not been assessed yet.

Objectives: The objectives of this research project are to (1) characterize the metagenome of *Sargassum* waste stranded on Barbados' coast; and (2) assess the resulting metagenome sequences for the prevalence of plastic-degrading microorganisms and functional genes.

Methods: The metagenome will be characterized via next-generation sequencing. The resulting metagenome sequences will be analyzed to assess the phylogeny and functional genes of plastic-degrading microorganisms via the KEGG and MG-RAST pipelines[5].

References:

- Wang M, Hu C, Barnes BB, Mitchum G, Lapointe B, Montoya JP. 2019. The great Atlantic *Sargassum* belt. Science 365:83–87.

- Pradas Del Real AE, Vantelon D, Catrouillet C, Khatib I, Tucoulou R, Rivard C, Schoeder S, Gigault J, Davranche M. 2025. Plastic debris accumulated on *Sargassum* algae stranded biomass are vectors for different As(V) and As(III) forms. J Hazard Mater. 482:136579.

- Miranda JLL, Celis LB, Estévez M, Chávez V, van Tussenbroek BI, Uribe-Martínez A, Cauich-Kantun C. 2021. Commercial potential of pelagic *Sargassum* spp. in Mexico. Front Mar Sci. 8:768470. https:\\doi:10. 3389/fmars.2021.768470.

- Mohapatra BR. 2023. Phylogenetic and functional characterization of the microbiome of *Sargassum* seaweed waste. Appl Phycol. 4:87–98.

- Kanehisa M, Goto S. 2000. KEGG: Kyoto encyclopedia of genes and genomes. Nucleic Acids Res. 28:27–30.

SOME ADVICE FOR STUDENTS

The Research Project courses afford students the opportunity to carry out research themselves and to add to our knowledge of the world. Research is time-consuming, often frustrating, but also exciting and undertaking a project gives you a chance to see whether a research career is for you. Several students before you have carried out projects to such a high standard and with novel results that these have been published in internationally referred journals!

CARRYING OUT THE PROJECT WORK

Before commencing work, it is important that you have a clear picture in your mind of what you are setting out to achieve. Discuss the project fully with your supervisor(s) and ensure you are clear as to the aim(s) of the project. Your research should not just be an open-ended exercise that finishes when you have a sizeable body of data but must have clear, realistic goals. It is you, not your supervisor, who will have to defend the project design so be prepared to be critical of any aspect of the planned study at this early stage. Your supervisor will help you plan your work schedule. **Regular consultation between the two of you on your progress is vital to project success.** You may need certain keys to the building and these can be obtained by paying a deposit to the Departmental Secretary and completing the necessary form. It is important you keep a record of all your project work in a notebook dedicated to the purpose, not scraps of loose-leaf paper. Success in this course is based on the effort you put in.

Your supervisor will advise you on the best way to commence writing up your research but you are encouraged to start writing the Methods (also termed Materials & Methods) section of the report as you go along. You will early on be directed to certain key references to help you understand the nature of the problem you are investigating. This literature review will also be vital to the writing of the Introduction section of your report. On completion of the experimental work, cleaning up of your area is mandatory. Your project will not be considered complete unless this has been done and you will receive a low mark for your quality of work. Also, your key deposit will not be refunded unless your supervisor indicates that you have cleaned your work space.

THE PROJECT SEMINAR

On completion of your practical work you will be required to present your findings to members of the department. This will be assessed and contributes 15% toward your final mark. In the case of year-long projects, you are also required to present an initial seminar outlining what you are setting out to do. This is not for credit but will help you build confidence for the final assessed seminar and may provide valuable feedback on your project intentions.

It is vital when presenting your work that you explain to the audience early on what is the aim of your project. Surprisingly, such a key aspect of a presentation is often overlooked. In the time available you should explain why this is a problem that needs investigating, e.g. by referring to previous studies. The methods you have used should be presented in sufficient detail to allow the audience to

understand what you have done. You should then present your results, interpret these and maybe suggest future work. The audience will then ask you questions arising out of what you have presented.

You should practice your talk beforehand ensuring you keep to the allotted time. Ideally, you should speak to your visual aids rather than read word for word from notes. Ensure you're your audience can easily read your slides. Simple with a single idea is best. Try to avoid complicated backgrounds. These can be distracting and/or make the slides difficult to read. Check that your presentation will run adequately on the system in the Demonstration Room and that your slides look good when projected. Colours do not always look the same as on your computer screen. A trial should be carried out the day before.

THE PROJECT REPORT

NB: This particular format might not be the best for your project. Your supervisors will advise you. This works for most biological projects.

The grade you receive in this course will depend largely on the quality of your Project Report since it accounts for 70% of your mark. Good presentation is important, but an attractive report that says nothing will not give you a passing grade. Likewise, fantastic results scrappily presented and shoddily written up will not give you even a passing grade. It will take time to compose and type the Report, prepare figures and have it bound. The submission deadline is final so ensure you budget 2-3 weeks for this. **THE PENALTY FOR LATE SUBMISSION IS 5% PER DAY.** Your report must be written in the format of a scientific paper and your supervisor will provide you with a sample paper and or previous report to guide you as to what is appropriate. Your supervisor will help you in planning how to write the report and will comment on draft portions to ensure you are on the right track. You must write in Standard English, carefully proof-reading the final draft. For all sections incorrect spelling and grammar will be penalised. Do not depend on a spell checker to find all spelling errors or a grammar checker to correct your grammar. Your Report will be graded in accordance with the enclosed marking scheme.

Abstract: The abstract summarizes your findings and possibly your interpretation of your results. Look at Abstracts from several papers related to your study and ensure you understand what constitutes an Abstract. It is usually about three-quarters of a page of your report. The most common fault here is that the student does not understand what an abstract is and writes what amounts to a mini-Introduction.

Introduction: The Introduction sets the scene. It provides a literature review of the area and explains the nature of the problem to be investigated. It will often include the socio-economic reasons why this investigation is warranted. It is important in reviewing the literature to get the balance right, e.g., an introduction to a project looking at the biochemistry of softening in mango fruit might have a sentence explaining that mango is but one species of the genus *Mangifera* but to spend a page reviewing the taxonomy of mango would be inappropriate in this case. Another common mistake is in the citing of the literature. Firstly, you must credit the sources of the information you present and you must do so correctly (see References section overleaf). Another common error is to cite the reference but then not list this in the reference section. If you have read about a study by Jones (1990) in a paper by Smith (1999) but not

actually read the Jones paper it is incorrect for you to cite the Jones paper directly. Instead, you should cite this as (Jones, 1990, cited by Smith, 1999). Remember plagiarism is a serious offence that can be avoided by citing sources correctly and paraphrasing what you have read. **Give the objectives of the experiments in the introduction.**

Materials & Methods: Anyone reading this section should be able to repeat what you have done (and get the same results). The focus for this section is therefore accuracy and completeness. Look at relevant scientific papers as a guide to how this section is written. Where you are following a published method cite the reference. It is normal in this section that the full scientific name of the organism being studied is given if it has not appeared first in the Introduction. At the first mention of the scientific name the authority for the name must also be included (but dropped thereafter). This last rule does not apply to prokaryotic organisms. Also avoid all sorts of abbreviations that you have not previously defined in the text.

Results: A Results section is not simply Figures or Tables of data. In this section the results obtained are stated, though usually not interpreted. For this reason there is not usually any citing of the literature in this section. In this section, where appropriate there should also be the results of statistical analysis of the data. Raw data is more appropriately included in an Appendix to the report. Your supervisor will guide you on this. Figures and Tables should each bear a legend which provides enough information to make the Figure/Table intelligible without reference to the text. The Figures and Tables are numbered in order of their appearance in the text, i.e. the first figure referred to, is Figure 1. Photographs are also considered Figures. The Figures and Tables should appear in the text rather than *en masse* at the end.

Discussion: This section constitutes your interpretation of your results, what the results suggest and how these relate to previous published studies. You will therefore be carefully citing the literature where appropriate in this section. Where there has been major experimental failure you will want to discuss here why this transpired and how you would repeat the study so as to actually get data. The supervisor may advise that you combine the Results & Discussion sections but even in such a case the foregoing comments apply. As a guide you could consider the following:

- **Give explanations for the results you obtained.**
- **Why did you obtain these results?**
- **How do these results satisfy the objectives of these experiments?**
- **What were the difficulties encountered?**
- **How would you proceed to get better results?**
- **What can you conclude from your results?**
- **What else could be done to support these conclusions?**
- **How could these experiments be improved?**
- **Compare your results with similar results in the literature**

References: The Reference section must list the References in a standard accepted format cite. References are usually arranged alphabetically by author and then by year but they may also be assigned a number and listed in the order in which they are cited in the text.

Consult with your supervisor as to what format you should follow. When you start using a format for your references, adhere to it. Students often do "copy-paste" of references from different journals that have different formats. Be careful to check that ALL your references are in the SAME format.

Acknowledgments & Appendices:

If you wish to acknowledge help given this should be done in an Acknowledgements section following the Discussion. If you have received substantial help from anyone this **must** be pointed out in the Acknowledgements section. If your project involved a survey you might want to include the Survey Form in an Appendix or if there are raw data that need including, the Appendix is an appropriate place for this. This optional Appendix will be the last section of the report.

SAFETY

General safety rules apply to all activities in laboratories. ***Food and drink must NOT be taken into any laboratory*.** Lab coats are mandatory for the experimental parts of most projects. If you are not certain, consult your supervisor.

SAFETY IN FIELDWORK

This section provides an outline of some of the issues that need to be considered when undertaking a project that includes an element of fieldwork. Further details can be found in the Department of Biological and Chemical Sciences Safety Manual.

DEFINITION OF FIELDWORK

Fieldwork is defined as any practical work carried out by staff or students of the University for the purpose of teaching and research in places which are not under University control but where the University is responsible for the safety of its staff and students and others exposed to their activities. The definition includes activities as diverse as archaeological digs, social survey interviews as well as more recognised survey/collection work.

GENERAL CONSIDERATIONS

Students with any medical condition likely to affect their ability to undertake fieldwork must inform in advance the member of staff in charge.

As a general rule, fieldwork by solitary individuals is **NOT** allowed. Exceptions to this rule **MAY** be permissible if the nature of the risks, degree of isolation, nature of the location and experience of the person involved allow. Undergraduate and Masters students will only be permitted to carry out fieldwork alone in exceptional, low risk, circumstances.

DO NOT go into the field without leaving contact details with a designated member of staff (usually the project supervisor) and preferably a map showing expected location and time of return. Report to this person on your return.

PREGNANCY

The Department of Biological and Chemical Sciences acknowledges that some laboratory environments may present possible medical hazards to an unborn child. The Department of Biological and Chemical Sciences is committed to the concept and principles of ALARA (as low as reasonably achievable) with respect to hazards that may be present in the course of instruction. As part of this effort, it is also the policy of The Department of Biological and Chemical Sciences to establish procedures to minimize the potential for adverse health effects to the unborn child of a mother who attends class in an environment in which reproductive hazards may be present.

It is important to note that certain chemicals and biological materials (such as viruses and bacteria) may pose a risk to an unborn child. A project student who works in an environment in which bio-hazardous materials or hazardous chemicals are used – or are suspected to be used - should **immediately** notify her Supervisor, Department Head or Dean once pregnancy is suspected. The Instructor, Head or Dean (with support from the Safety Committee) must evaluate the work environment for the presence of reproductive hazards and then determine and communicate the risks for the unborn child. Based on this evaluation, the Department of Biological and Chemical Sciences may recommend changes in the environment and activities of the pregnant student or an academic course, or other appropriate accommodation in which there is minimal exposure to the hazard.

PLAGIARISM

The University considers plagiarism a serious offence. The UWI Examination Regulations deal with this subject in section (B) Cheating under Regulation 97 as follows:

(i) Cheating shall constitute a major offence under these regulations.

(ii) Cheating is any attempt to benefit one's self or another by deceit or fraud.

(iii) Plagiarism is a form of cheating.

(iv) Plagiarism is the unauthorised and/or unacknowledged use of another person's intellectual efforts and creations howsoever recorded, including whether formally published or in manuscript or in typescript or other printed or electronically presented form and includes taking passages, ideas or structures from another work or author without proper and unequivocal attribution of such source(s), using the conventions for attributions or citing used in this University.

These conventions should be those appropriate for science in work produced for science courses.

In these regulations, examination refers to any written material to be assessed as part of the final mark for a course including project reports.

The penalties for plagiarism are stated in Regulation 103 as follows:

.... the Committee shall disqualify the candidate from the examination in the course concerned, and may also disqualify him/her from all examinations taken in that examination session; and may also disqualify him/her from all further examinations of the University, for any period of time, and may impose a fine ....

THE UNIVERSITY OF THE WEST INDIES - CAVE HILL CAMPUS
FACULTY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF BIOLOGICAL & CHEMICAL SCIENCES

APPLICATION FOR RESEARCH PROJECT

NAME: _____ **STUDENT ID NO:** _____

RESEARCH PROJECT APPLIED FOR:-

BIOL3990 ☐ BIOC3990 ☐ CHEM3950 ☐ CHEM3955 ☐ MIRC3900 ☐

ENSC3020 ☐ ENSC3900 ☐ ECOL3990 ☐ BIOC3290 ☐

PROJECT CHOICES: -

FIRST CHOICE	
Supervisor(s):	
Project Title:	
SECOND CHOICE	
Supervisor(s):	
Project Title:	

Signature_____ **Date** _____

FOR DEPARTMENTAL USE

ACCEPTED FOR: 1st Choice ☐ 2nd Choice ☐
STUDENT HAS NECESSARY PRE-REQUISITES: Yes☐ No ☐
COMMENTS:

RECEIPT NO: (For Summer Only) _____

APPROVAL: _____ _____
Course Co-Ordinator **Head of Department**

Laboratory Safety Regulations Agreement

Before proceeding to your first practical session, use the following link, or scan the following QR code on your smart device, to go online and complete the Laboratory Safety Regulations Agreement. Here you will indicate the course, your name, ID number and emergency contact information.

If you encounter any difficulties completing the form, please contact one of the following persons:

- your course/laboratory instructor,
- the discipline coordinator,
- the Head of Department, Dr. Thea Scantlebury-Manning (thea.scantlebury-manning@uwi.edu) or
- the Dean of the Faculty, Dr. Jeanese Badenock (Jeanese.badenock@uwi.edu) .

QR code:

PLEASE SUBMIT YOUR COMPLETED **APPLICATION FORM** AND **LABORATORY SAFETY REGULATIONS AGREEMENT** TO THE BIOLOGICAL & CHEMICAL SCIENCES DEPARTMENTAL OFFICE, GROUND FLOOR, BIOLOGY BUILDING.