

Research Project Titles for Semester 1 2018
SCI3990 Science in action research project

Supervisors	Titles and synopses
<p>Main supervisor: Dr Cheow Yuen Lin</p> <p>Co-supervisor: Dr Lee Sui Mae</p>	<p>Project 1 Title of project: Synthesis and anti-microbial properties of substituted imidazolium salts</p> <p>Project Description: The application of modern disinfectants goes back several decades. Two quaternary ammonium salts namely Benzalkonium chloride (BAC) and cetylpyridinium chloride (CPC) are still now widely used. 1 Imidazolium salts are often used as precursors to metal-NHC complexes. As recent as 2009, only a few groups have studied the antimicrobial and antifungal properties of imidazolium salts. 2 Our current strategy will focus on the synthesis of novel chiral pyridine imidazolium salts with various N-substituents. The antimicrobial activity of these salts will be evaluated against a few strains of microorganisms, such as <i>Bacillus subtilis</i> and <i>Escherichia coli</i>, by using broth microdilution assay and the minimum inhibitory concentration of the compounds will be determined. Skills acquired: Organic and Inorganic Synthesis, Chromatography, NMR Spectroscopy, Biological Assay.</p> <p>References: 1. D. Demberelnyamba et al. <i>Bioorganic and Medicinal Chemistry</i>, 2004 853-857. 2. a) Hindi, K. et al. <i>Chem. Rev.</i> 2009, 3859-3884. b) Pernak, J.; and Skrzypczak, A. <i>Eur. J. Med. Chem.</i>, 1996 901-903.</p> <p>Discipline of research area: Medicinal Chemistry (CHM)</p> <p>Project 2 Title of project: Synthesis and anti-microbial screening of Silver N-Heterocyclic Carbene Complexes</p> <p>Project Description: The application of silver as an antimicrobial agent can be dated back to ancient times. Silver nitrate was recognized as antiseptic in wound care for more than 200 years¹. In the past, silver nitrate eye drops were given to newborn babies to inhibit eye infections. Following the discovery of penicillin and other new antibiotics, silver compounds have been mostly replaced. The resurgence of silver antibiotics came with the discovery of silver sulfadiazine by Fox². Silver sulfadiazine has been found to be active against numerous gram-positive and gram-negative bacteria and is marketed as a water soluble cream Silvadene^R Cream 1%². Therefore we would like to explore the efficiency of other types of silver compounds as antimicrobial agents. This project aims to synthesize a few Silver (I) N-Heterocyclic Carbene Complexes and evaluate its antimicrobial properties. Skills acquired: Organic and Inorganic Synthesis, Chromatography, NMR Spectroscopy, Biological Assay.</p> <p>References: 1. J. C. Garrison, W. J. Youngs, <i>Chem. Rev.</i> 2005, 105, 3978-4008. 2. A. Kascatan-Nebioglu, M. J. Panzner, C. A. Tessier, C. L. Cannon, W. J. Youngs, <i>Coordination Chemistry Reviews</i> 2007, 251, 884-895. 3. See also: a) L. Oehninger, R. Rubbiani, I. Ott, <i>Dalton Transactions</i> 2013, 3269-3284. b) K. M. Hindi, M. J. Panzner, C. A. Tessier, C. L. Cannon, W. J. Youngs, <i>Chem. Rev.</i>, 2009, 109, 3859-3884. c) M. N. Hopkinson, C. Rithcer, M. Schedler, F. Glorious, <i>Nature</i>, 2014, 485</p> <p>Discipline of research area: Medicinal Chemistry (CHM)</p>

<p>Main supervisor: Dr. Pushpamalar Janarthanan</p>	<p>Project 1 Co-supervisor: Dr. Alice Chuah Lay Hong (School of Pharmacy)</p> <p>Title of project: Developing of control release system for anticancer drugs</p> <p>Project description: The interest in controlled release technology for oral drug delivery is largely driven by the prospect of increasing the efficacy of medicine with reduced side effects, maximizing patient compliance and good methods of approaching the management of the disease. The advantages of oral drug administration can be enhanced if the dosage form can be presented in a way that offers a reduction in the dose frequency or can be used to target a particular section of the gastro-intestinal tract (stomach, small intestine and colon). The hydrogels can be formed by crosslinking using various mixtures of polymers (biodegradable or synthetic) by different crosslinking methods. The anticancer drug can be loaded into hydrogels that consist with many pores and shaped into beads/tablets/films that swell or disintegrate to release the drug. The control release pattern will be studied. Besides that, the biocompatibility of the hydrogel is also studied.</p> <p>Discipline of research area: Medical Bioscience</p> <p>Project 2 Title of project: Developing of Carboxymethylcellulose (CMC) polymer coated with modified magnetic iron oxide (Fe₃O₄) nanoparticles for metal ions and dye removal.</p> <p>Project description: The nano-enhanced polymeric membrane was prepared by addition of different types of modified iron oxide (Fe₃O₄) nanoparticles. Fe₃O₄ nanoparticles were coated by silica or amine and then subjected to form matrix membranes. The prepared membranes were characterised by morphology (FESEM and TEM images), hydrophilicity, and sizes of the pores, swelling and metal ions removal. Subjecting appropriate organic/inorganic modifiers for inorganic nanoparticles like iron oxide could promote removal of metal ions and dyes.</p> <p>Discipline of research area: Biotechnology</p> <p>Project 3 Title of project: Green biosynthesis of silver/ferrous nanoparticles using plant extract and investigate the antimicrobial properties</p> <p>Project description: Green biological synthesis of metallic nanoparticles is an important method in improved techniques of eco-friendly nanoparticles production. Silver and ferrous nanoparticles have been widely used during the past few years in various applications due to their well-known effectiveness in biomedical, electronic, catalysis and optical applications. Apart from antimicrobial activities, Ag-NPs are also known to possess antifungal, anti-inflammatory and antiviral properties. Moreover, the biologically active molecules involved in plant extract are well-known as functional food for their richness in lipids, minerals and certain vitamins, and also several bioactive substances like polysaccharides, proteins and polyphenols. These bioactive substances are potential medicinal uses that can serve both as effective metal-reducing agents and as capping agents to provide a robust coating on the metal nanoparticles in a single step.</p> <p>Discipline of research area: Medical Bioscience</p>
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	<p>Project 4 Co-supervisor: Dr. Pooria (School of Engineering)/ Dr. Alice Chuah Lay Hong (School of Pharmacy) (School of Pharmacy)</p> <p>Title of project: Developing of control release transdermal patch for drug delivery system by electrospinning</p> <p>Project description: Electrospinning is a technique to transform polymer solutions (hydrophobic/hydrophilic) to non-woven fibrous membranes with fibre diameter as small as to the nanometer range. Membranes produced exhibits high surface/volume ratio, enhanced mechanical strengths, and highly open porous structures. A typical setup for electrospinning consists of a syringe loaded with dissolved polymer solution, a needle, a power supply which forms the negative and positive terminals, and a collector . Electrospun Membranes can be applied for various purposes such as water filtration, drug delivery carriers, and scaffolding. In the field of electrospun fibre membranes for drug delivery carriers, the most common hindrance to a sustained drug release is the initial burst release of loaded drugs due to the degradation of the membranes and the diffusion of surface drugs. A combination of hydrophobic and hydrophilic polymer membranes could be expected to result in a good biocompatibility and able to delay in vitro hydrolysis due to its intrinsic water repellent capabilities.</p> <p>Discipline of research area: Medical Bioscience</p> <p>Project 5 Co-supervisor: Dr. Alice Chuah Lay Hong (School of Pharmacy)/ Dr. Pooria (School of Engineering)</p> <p>Title of project: Developing of control release microcapsules for drug delivery system by electro-spraying</p> <p>Project description: Spray drying has widely used the method in the pharmaceutical industry to prepare microcapsules for loading and administration of various biomedical drugs. In the electro-spraying technique, the dissolved polymer/s is homogenised under high-speed and sprayed with high power to result in atomization that leads to the formation of the small droplets or the fine mist from which the solvent evaporate instantaneously leading the formation of the microspheres in size range 1-100µm. Fibre polymer materials such as plant gums, modified celluloses and dextrans can all be used as the components of an encapsulant matrix. Spray-drying microencapsulation can both protect the drug from environmental pressures as well as mask the unpleasant taste of drugs through the encapsulant physical barrier. Cytotoxic drugs could be encapsulated until it reaches to the targeted sites and drugs molecules are being released without harming the normal cells along the gastrointestinal passages.</p> <p>Discipline of research area: Medical Bioscience</p>
<p>Main Supervisor: Dr Thoo Yin Yin</p>	<p>Project 1 Co-supervisor: Dr Chang Wei Sea (School of Engineering)</p> <p>Title of project: Extraction, structure and emulsifying properties of pectin from banana peel</p> <p>Project description: Banana peel represent 40% of the total weight of fresh banana. The large amount of this waste incur disposal cost for banana processing industry.</p>

	<p>Hence, this study aim to extract pectin from banana peel to increase their added value and to study the structure and emulsifying properties of pectin extracted from banana peel.</p> <p>Discipline of research area: Food Science and Technology (FST), Biotechnology (BTH)</p> <p>Project 2 Co-supervisor: Dr Pushpamalar Janarthanan</p> <p>Title of project: Preparation and characterisation of biopolymer-based palm oleogel</p> <p>Project description: Organogelation is an alternative processing method to structure lipid oil. Through organogelation, liquid edible oil can be changed into plastic fat without any change in fatty acid compositions or isomers yet maintaining an adequate sensory profile. This study aims to identify suitable combination of biopolymer (carboxymethylcellulose and pectin) and organogelator in forming palm oleogel emulsion followed by characterisation of the prepared palm oleogel.</p> <p>Discipline of research area: Food Science and Technology (FST), Biotechnology (BTH)</p> <p>Project 3 Title of project: <i>In vitro</i> gastrointestinal digestion of palm olein based organogel</p> <p>Project description: The information on digestion behaviour of organogel when they are ingested and pass through gastrointestinal tract is limited. Hence, present work is to study the effect of gastric and intestinal digestion using simulated gastric fluid (SGF) and simulated intestinal fluid (SIF). Both SGF and SIF are <i>in-vitro</i> models to mimic biological conditions of human bodies.</p> <p>Discipline of research area: Food Science and Technology, Medical Bioscience and Biotechnology</p> <p>Project 4 Title of project: Effect of oils on in vitro release of beta-carotene loaded organogel</p> <p>Project description: B-Carotene is one the natural occurring carotenoids that beneficial to human health. However, the utilization of β-carotene is strictly restricted due to its poor solubility in water and high susceptibility to isomerization, oxidation and degradation by light, oxygen and heat. The bioavailability of β-carotene improved with the decrease in particle size and β-carotene absorption promoted with the use of dietary fat. Hence, this study aim to investigate the effect of oil type (palm oil, canola oil, corn oil and coconut oil) on β-carotene bioaccessibility of in organogel.</p> <p>Discipline of research area: Food Science and Technology (FST), Biotechnology (BTH)</p> <p>Note: Students are welcome to discuss other potential projects.</p>
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<p>Main supervisor: AP Lim Yau Yan</p>	<p>Project 1 Title of project: Effects of ambient air drying of selected herbal plants on the phenolic content and polyphenol oxidases activity</p> <p>Project description: Drying of herbal plants will help to preserve the antioxidants content of herbal plants. The aim of this project is to investigate how ambient air-drying would affect the phenolic contents of the plants and the relationship between change in phenolic content and polyphenol oxidases activity. It is hoped that a trend can be observed between these two parameters</p> <p>Discipline of research area: Biotechnology (BTH)/Food Science and Technology (FST)</p> <p>Project 2 Co-supervisor: Dr. Ashwini Gengatharan</p> <p>Title of project: Effects of convectional and vacuum drying on the polyphenolic content and qualitative characteristics of drumstick leaves (<i>Moringa oliefera</i>)</p> <p>Project description: Drying is a vital process to extend the post-harvest life and to retain vital antioxidant contents of plants. <i>Moringa oliefera</i>, also known as the drumstick tree is medicinally important due the abundance of vital phenolics, vitamins and minerals. This study will focus on the effect of two drying methods on the polyphenolic composition and qualitative characteristics of Drumstick leaves. Subsequently, the potential use of dried drumstick leaves in food will be established.</p> <p>Discipline of research area: Biotechnology (BTH)/Food Science and Technology (FST)</p>
<p>Main supervisor: AP Adeline Ting Su Yien</p>	<p>Project 1 Title of project: Endolichenic fungi for removal of toxic metals and dyes</p> <p>Project description: Endolichenic fungi are a special group of fungi that co-exist with lichens. Their potential in metal and dye removal is not clearly understood. This study aims to explore the potential of this rare group of microorganism for bioremediation of metals and dyes in the environment.</p> <p>Discipline of research area: Biology (BIO), Biotechnology (BTH), Medical Bioscience (MBS)</p> <p>Project 2 Title of project: Bioactivities of rare endolichenic fungi</p> <p>Project description: Endolichenic fungi are a special group of fungi that co-exist with lichens. In an earlier study, several rare species have been reported and the potential of these species in producing beneficial compounds are not known. In this study, endolichenic fungi are investigated for their antimicrobial and antioxidant activities.</p> <p>Discipline of research area: Biology (BIO), Biotechnology (BTH), Medical Bioscience (MBS), Food Science and Technology (FST) or Medicinal Chemistry (CHM)</p> <p>Project 3 Title of project: Exopolymeric substances from bacteria for dye removal</p>

	<p>Project description: Exopolymeric substances (EPS) are long known for their roles in chelating metals and other cations. Nevertheless, not much is understood on the potential of EPS in dye removal. This study will examine the potential of EPS in removing dye molecules from aqueous solutions.</p> <p>Discipline of research area: Biology (BIO), Biotechnology (BTH), Medical Bioscience (MBS)</p>
<p>Main supervisor: Prof. Sunil K. Lal</p>	<p>Project 1 Title of project: Cloning a foreign viral gene of interest into bacterial and mammalian gene expression vectors.</p> <p>Project description: Use modern recombinant DNA technologies and genetic engineering to clone and express foreign genes in bacteria and mammalian cells.</p> <p>Discipline of research area: Biotechnology</p> <p>Project 2 Title of project: Transforming and Expressing a foreign viral gene in mammalian cells and detecting the expression.</p> <p>Project description: <i>Apply immunological detection techniques to genetically engineered mammalian cells with a cloned foreign gene and detect its protein expression.</i></p> <p>Discipline of research area: Biotechnology/Medical Bioscience</p> <p>Project 3 Title of project: Immunological detection of protein-protein interactions in mammalian cells.</p> <p>Project description: Use modern technologies to perform co-Immunoprecipitation to detect protein-protein interactions.</p> <p>Discipline of research area: Medical Bioscience</p> <p>Project 4 Title of project: PCR based cloning of different viral proteins in mammalian expression vector (cloning of IAV M1, M2, NS1 genes in pCDNA vector and detection of expression in mammalian cells after transfection).</p> <p>Project description: Use modern technologies to grow mammalian cells, transform them with a foreign gene and detect the expression of the foreign viral protein.</p> <p>Discipline of research area: Medical Bioscience</p> <p>Project 5 Title of project: Molecular imaging studies on cellular localization of proteins using confocal microscopy.</p> <p>Project description: Use modern technologies to grow mammalian cells, transform them with a foreign gene and detect their expression using the latest imaging techniques.</p>

	<p>Discipline of research area: Medical Bioscience / Biotechnology</p> <p>Project 6 Title of project: Molecular detection of proteins using modern Fluorescence-Activated Cell Sorting techniques.</p> <p>Project description: Understand and apply new fluorescence based technologies to molecular biology applications of detecting heterologous protein expression inside or on cell surface of genetically engineered / recombinant DNA transformed cells.</p> <p>Discipline of research area: Medical Bioscience</p> <p>Project 7 Title of project: Molecular biology and biochemical studies on cell-cycle progression.</p> <p>Project description: Use cell cycle markers to detect cell cycle progression. Detect cell cycle arrest under varying cellular physiological conditions and miRNA.</p> <p>Discipline of research area: Medical Bioscience</p> <p>Project 8 Title of project: Systems biology approach to infectious disease biology.</p> <p>Project description: Use innovative wet-lab experimentation in combination with in-silico bioinformatics coupled with other inter-disciplinary methodologies to a more holistic approach to studying infectious diseases.</p> <p>Discipline of research area: Medical Bioscience / Biotechnology</p> <p>Project 9 Title of project: Protein-protein interactions using the new Duolink® technology.</p> <p>Project description: Get hands on training on a new state-of-the-art technique for in-vivo detection, quantification and cellular localization of protein-protein interactions using the new Duolink®-proximity ligation assay (PLA) technology.-proximity ligation assay (PLA).</p> <p>Discipline of research area: Medical Bioscience / Biotechnology</p>
<p>Main supervisor: Dr Irene Ling</p>	<p>Project 1 Co-supervisor: Dr Low May Lee (IMU)</p> <p>Title of project: Comparative study of antibacterial activity for selected N-heterocyclic compounds</p> <p>Project description: N-Heterocyclic compounds are attractive in the area of life sciences. These compounds commonly possess positive potential in biological related activities. The aim of this project is to evaluate antibacterial activity by determining the minimum inhibitory concentrations (MICs) for different types of N-heterocyclic compounds against both Gram-negative and Gram-positive bacteria.</p> <p>Discipline of research area: Biology (BIO), Biotechnology (BTH), Medical Bioscience (MBS), Medicinal Chemistry (CHM)</p>

	<p>Project 2 Co-supervisor: Dr Shahrul Ainliah (UPM)</p> <p>Title of project: Systematic studies of deep eutectic solvents</p> <p>Project description: Deep eutectic solvents (DES) are a type of ionic liquids (IL) comprised of two components and that have a melting point lower than that of any of its individual components due to the generation of intermolecular hydrogen bonds. DES can be simply prepared via combining a hydrogen bond donor (HBD) and a hydrogen bond acceptor (HBA). DES can be easily prepared with high purity at an economical cost and mostly are synthesized from biodegradable components. There are four different types of DES and in the present work, we focus on Type II (quaternary salt and hydrated metal halide) and Type III (quaternary salt and hydrogen bond donor) DES. Selected physical properties will be investigated.</p> <p>Discipline of research area: Medicinal Chemistry (CHM)</p>
<p>Main supervisor: Dr. Ken Yeong Keng Yoon</p>	<p>Project 1 Title of project: Nitrobenzoates as cholinesterase inhibitors for Alzheimer's Disease</p> <p>Project description: To date, only four cholinesterase inhibitors, namely donepezil, rivastigmine, tacrine and galantamine are clinically approved as AD drugs. Based on the prevalence of the disease and limited options of drugs available, the search for novel cholinesterase inhibitors is one of the major therapeutic strategies employed to combat AD. This project enables student to master the basic techniques involved in organic synthesis chemistry. Furthermore, student will also learn to carry out cholinergic bioassays. This is part of an on-going project to add to the library of nitrobenzoate cholinesterase inhibitors.</p> <p>Discipline of research area: Medicinal Chemistry (CHM)</p> <p>Project 2 Co-supervisor: Dr Lee Wai Leng</p> <p>Title of project: Cellular investigation of a putative sirtuin inhibitor</p> <p>Project description: Part of a larger project with external collaborators. Interested students are encouraged to discuss this project directly with the main supervisor.</p> <p>Discipline of research area: Medicinal Chemistry (CHM)</p>
<p>Main supervisor: Dr Michelle Yap</p>	<p>Project 1 Title of project: Molecular docking of toxin-receptor interactions: Unveiling the molecular mechanism of cytotoxicity of venom cytotoxin.</p> <p>Project description: Cytotoxin is a member of three-finger toxin which present only in cobra venoms. The cytotoxicity of cytotoxin is determined by the functional domain located in the hydrophobic three-finger loop by penetration into cell membrane. However, the actual mechanisms of cytotoxicity remains controversial as few competing mechanisms were proposed and sequence variations found in the functional domains, attributed to different isoforms, species and geographical origins. The current project aims to elucidate possible interactions of cytotoxin with membrane-bound protein receptors instead of perforation of toxin into phospholipid membrane which causes direct cell-lysis.</p>

	<p>Discipline of research area: Biotechnology (BTH), Medical Bioscience (MBS)</p> <p>Project 2 Title of project: The possible mechanism of cytotoxicity as elicited by venom cytotoxin.</p> <p>Project description: Cytotoxin belongs to 3FTx family which present only in cobra venoms at about 40-60%, thus it plays crucial role in pathophysiology of cobra envenomation. The cytotoxicity of cytotoxin is determined by the functional domain located in the hydrophobic three-finger loop by penetration into cell membrane. The degree of cytotoxicity is concentration dependent, the cell death pattern rapidly transform from apoptosis to necrosis when the toxin concentration increases. However, the limited range of toxin concentrations which causes apoptosis remained unknown due to diversity of cytotoxin attributed to species and geographical variation. Owing to this, the present work is proposed to investigate the possible concentration of toxins which transform the cell death pattern from apoptosis to necrosis. Some of the works to be undertaken include toxin purification, cell viability assay, membrane integrity assay etc.</p> <p>Discipline of research area: Medical Bioscience (MBS)</p>
<p>Main supervisor: AP Siow Lee Fong</p>	<p>1. Physicochemical properties of commercial cocoa butter substitutes (CBS) and cocoa butter equivalent (CBE) Triacylglyceride composition, texture, melting properties, bloom resistance and oxidation of several commercial CBS are compared to that of CBE.</p> <p>2. Physicochemical properties of commercial dark chocolates Texture, melting property, bloom resistance, oxidation and antioxidative activity of several commercial chocolates are compared to understand the quality and stability of the chocolates and factors affecting the quality and stability.</p> <p>3. Effect of sugars on the physical behaviour of palm oil and palm kernel oil Crystallization, melting and rheology of palm oil and palm kernel oil are determined in the presence of monoglyceride, diglyceride and sugar alcohols to understand if sugars affect the physical behaviour of palm oil and kernel oil.</p> <p>4. Effect of processing and storage on the physicochemical properties of fruits/vegetables/juices i. Fruits and vegetables are minimal processed and stored at chill or frozen temperature in order to extend their shelf life. This study examines pre-treatments and chilling and freezing conditions on the physicochemical, nutritional, antioxidant properties and shelf life of fruits/vegetables/their juices/concentrate. ii. This study examines the effect of pre-treatments and drying on physicochemical, nutritional, antioxidant properties and shelf life of fruits/vegetables.</p> <p>5. Physicochemical and nutritional properties of Okara powder Okara is waste product resulted from soy bean processing. Okara is dried using convection oven and converted into powder. Physicochemical and nutritional properties of the Okara powder are determined in this study. The Okara powder is added into food systems and nutritional properties of the Okara-enriched food systems are examined.</p> <p>6. Microencapsulation of plant extracts</p>

	<p>Functional plant extracts are microencapsulated using spray drying technique and the physicochemical, nutritional, antioxidant properties of the encapsulated plant extracts are characterised.</p> <p>Discipline of research area: Food Science and Technology (FST)/Biotechnology</p>
<p>Main supervisor: Dr. Choo Wee Sim</p>	<p>Title of project: Enzymatic catalyzed reaction of structured lipids using ionic liquids</p> <p>Project description: Structured lipids are lipids that have been modified from their natural form for specific nutraceutical or pharmaceutical applications. This modification involves a change in the chemical structure of the lipid brought about by addition or rearrangement of fatty acids on the glycerol backbone. Enzymatic catalyzed reaction of structured lipids usually require a solvent as a medium. There have been development in seeking substitute for organic solvents. The use of room-temperature ionic liquids can be a good strategy to meet the increasing demand for the introduction of clean technologies in industrial processes.</p> <p>Discipline of research area: Biotechnology (BTH), Food Science and Technology (FST) or Medicinal Chemistry (CHM)</p>
<p>Main supervisor: Dr Lee Yee Ying</p>	<p>Project 1 Title of project: Deep frying performance of tropical oil</p> <p>Project description: Coconut oil (CNO) belongs to a type of tropical oil that is most widely used as cooking oil and confectionary fat. Studies claimed that CNO is beneficial in suppressing the visceral fat accumulation in the body due to the presence of the medium-chain fatty acid. Nonetheless, the presence of medium-chain fatty acid hinders the application of CNO as a medium for deep frying. MCFA is prone to undergone hydrolytic oxidation and resulted in foam formation during frying. Looking at the beneficial effect of the CNO, this project aims to improve the frying performance of CNO via blending technique.</p> <p>Discipline of research area: Food Science and Technology (FST)</p> <p>Project 2 Title of project: Tocopherol and tocotrienol enriched margarine</p> <p>Project description: Red palm oil is extremely rich in phytonutrients such as carotenes, tocopherols, and tocotrienol which are essential in lowering the serum cholesterol level, halt the development of atherosclerosis and prevent the development of certain types of cancer. To date, the demand for red palm oil is increasing mainly due to its superior anti-oxidant properties of the phytochemicals. They are widely used in pharmaceutical sectors. In view of the aforementioned beneficial effect of red palm oil, the presence study aims to develop a red palm oil in margarine to increase the nutritional value as well as to extend the shelf life of margarine. The physicochemical properties of the red palm oil-enriched margarine will be evaluated. This study will also examine the storage stability of the margarine.</p> <p>Discipline of research area: Food Science and Technology (FST)</p>
<p>Main supervisor: Dr Wee Wei Yee</p>	<p>Project Title: Comparative whole genome analysis of <i>Mycobacterium immunogenum</i> to further reveal the pan-genome and characteristic of the species.</p>

	<p>Project description: Nontuberculous mycobacterium (NTM) infections have become a frequent cause of morbidity and mortality in immunosuppressed patients (Escalante, 2007). <i>Mycobacterium immunogenum</i> is one of the rapidly growing <i>Mycobacterium</i> (RGM) species that can cause central nervous system (CNS) infection and variety of surgical wound infections. With the increase of sequencing capacity in the past few years, many genomes have been sequenced and submitted to the database repositories. The availability of <i>M. immunogenum</i> sequences had given us the chance to further explore the pan-genome of the bacterium and predict the genome size for the species. Pan-genome refers to the full complement of genes within bacterial species. The pan-genome comprises the core genome made up of genes that are present in all strains and the accessory genome composed of genes that may be absent from one or more strains and genes that are unique to a particular strain</p> <p>In this study, we would like to study and characterize the pan-genome of <i>M. immunogenum</i> using Bioinformatics approaches. Besides that, different Bioinformatics analysis will also be performed to further unveil the genomic attributes of <i>M. immunogenum</i> by comparative genome approach. The pan-genome concept is significant for a better understanding of bacterial evolution, adaptation and population structure. This concept can also be applied in other issues such as identification of virulence genes or vaccine design. By completing this project, we should be able to identify the full complement of genes with assigned biological information for <i>M. immunogenum</i>. The identified core genes would enable us to find out the basic aspects of biology for <i>M. immunogenum</i> and the accessory genes would provide information on the subgroup-specific genomic regions which may allow us to identify novel regions (as well as genes) which may lead to improve diagnostic tests and the treatment of <i>M. immunogenum</i> infection.</p> <p>Discipline of research area: Biology (BIO) and Biotechnology (BTH)</p>
<p>Main supervisor: AP Qasim Ayub</p>	<p>Project 1 Title of project: <i>ABCA12</i> variation in South Asian populations and its association with gene expression.</p> <p>Project Description: ATP binding cassette (ABC) transporters are transmembrane proteins that translocate natural substrates across plasma membranes. One such protein, ATP-binding cassette, subfamily A (ABCA), member 12 (<i>ABCA12</i>), translocates lipids outside the cell and is responsible for forming the skin lipid barrier. A genomic scan of human populations identified a highly differentiated single nucleotide polymorphism between Africans and non-Africans that lay in the intron of <i>ABCA12</i>¹. Whole genome sequences have identified several additional sites in its vicinity that also show differentiation between Africans and non-Africans². We would like to examine the frequency of these sites in population samples from South Asia (mainly Pakistan³) and identify whether one of these (rs2970968) that is located in a putative promoter binding region is the most likely functional candidate responsible for the selection signal in this region in non-African human populations by examining <i>in-silico</i> gene expression data using the GTx catalogue⁴.</p> <p>Skills acquired: DNA genotyping and sequencing, Bioinformatics.</p> <p>References: 1. Colonna, V., Ayub, Q., Chen, Y., Pagani, L., Luisi, P., Pybus, M., Garrison, E., Xue, Y., Tyler-Smith, C., and Consortium, T.G.P. (2014). Human genomic regions with</p>

	<p>exceptionally high levels of population differentiation identified from 911 whole-genome sequences. <i>Genome Biol</i> 15, R88.</p> <ol style="list-style-type: none"> The 1000 Genomes Project Consortium. (2015). A global reference for human genetic variation. <i>Nature</i> 526, 68-74. Qamar, R., Ayub, Q., Mohyuddin, A., Helgason, A., Mazhar, K., Mansoor, A., Zerjal, T., Tyler-Smith, C., and Mehdi, S.Q. (2002). Y-chromosomal DNA variation in Pakistan. <i>Am J Hum Genet</i> 70, 1107-1124. The GTEx Consortium. (2015). The genotype-tissue expression (GTEx) pilot analysis: Multitissue gene regulation in humans. <i>Science</i> 348, 648-660. <p>Discipline of research area: Medical Bioscience (MBS)</p> <p>Project 2 Title of project: Structural analysis of human hair samples and its association with non-synonymous variants in the <i>PRSS53</i> gene.</p> <p>Project Description: Analysis of the continental 1000 Genomes Project populations identified two non-synonymous high frequency candidate variants in South and East Asian populations in the 1000 Genomes Project¹. Both exonic variants are population specific and lie in a gene called protease, serine, 53 (<i>PRSS53</i>) on human chromosome 16. Recent work suggests that these variants could influence hair morphology and distribution². The aim of this study is to structurally analyse hair samples from 20 individuals and determine if the phenotypic appearance, histological and structural characteristics of the sampled hair can be correlated with the non-synonymous variants in <i>PRSS53</i>.</p> <p>Skills acquired: Electron and/or confocal microscopy of hair samples, PCR based genotyping and DNA sequencing.</p> <p>References:</p> <ol style="list-style-type: none"> The 1000 Genomes Project Consortium. (2012). An integrated map of genetic variation from 1,092 human genomes. <i>Nature</i> 491, 56-65. Adhikari, K., Fontanil, T., Cal, S., Mendoza-Revilla, J., FuentesGuajardo, M., Chacon-Duque, J.C., Al-Saadi, F., Johansson, J.A., Quinto-Sanchez, M., Acuna-Alonzo, V., et al. (2016). A genome-wide association scan in admixed Latin Americans identifies loci influencing facial and scalp hair features. <i>Nat Commun</i> 7, 10815. <p>Discipline of research area: Biology (BIO)</p>
<p>Main supervisor: Prof Sadequr Rahman</p>	<p>Project 1 Title of project: Use of Western blotting to investigate isoforms of FATB in different tissues and developmental stages of rice</p> <p>Project description: Fatty Acyl Thioesterase B (FATB) is an essential protein of plant cells that is involved in the biosynthesis of fatty acids in the rice plant. Several different isoforms are believed to be produced from one gene by differential RNA processing. This project will use monospecific antibodies against different epitopes of the rice FATB protein to follow the accumulation of the various isoforms during the life-cycle of the rice plant. This project will give hands on experience in carrying out and interpreting Western blotting and using publicly available transcriptomics databases.</p> <p>Discipline of research area: Biology (Bio) or Biotechnology (BTH)</p>

	<p>Project 2 Co-supervisor: Dr Wee Wei Yee</p> <p>Title of project: Detection and characterization of non-nuclear DNA in mosquitoes.</p> <p>Project description: This project will characterize the non-nuclear DNA (organellar and foreign) in mosquitoes caught in Malaysia and abroad. Characterisation of such DNA may provide information about both the victims of mosquitoes and the potential diseases carried by mosquitoes. The project will involve bioinformatics, PCR and next generation sequencing.</p> <p>Discipline of research area: Biology (Bio)</p>
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- **Students are encouraged to discuss details of their prospective project with the potential supervisor. Please make an appointment and discuss further with the lecturer.**
- **Academic staff who are not on this list will not be offering projects for SCI3990.**

*Prepared by,
Dr Thoo Yin Yin
SCI3990 Coordinator (Sem 1, 2018)*