The Student Conference in Science and Technology — October 14, 2020

Program and abstracts

13.15-13.20
Welcome and introduction. Zoomlink will be sent out to all that have registered to the conference.

13.20-13.40
Invited speaker:
Ingrid Ahnesjö, professor in biology:
Mysteries of the sea, when females and males reproduce

Student presentations
Available at https://diana.ibg.uu.se/studentkonferensen/

Carlos Enrique Torres Méndez, Masterstudent in Chemistry:
New organoclayes for the removal of pollutants in water: Experiences in a developing country

Elias Waagaard, Masterstudent in Physics:
Benchmarking a Cryogenic Code for the FREIA Helium Liquefier

Ilinca Petre, Masterstudent in Chemistry:
Analysis of teargas metabolite in urine using GC-MS

Margaret Ojochide Aligbe, Masterstudent in Sustainable Development:
Managing Nigeria's Hunger Pandemic through scaling of interventions (Seeds of Good Anthropocene)
Roseline Awoga, Masterstudent in Biology:
Developmental neurotoxicity testing and the disruption of estrogen, androgen and thyroid hormone signalling

Sona Hakhverdyan, Masterstudent in Biology:
Looking for new sponge species in the Indo-Pacific ocean

Victor Hellgren, Masterstudent in Chemistry:
Mechanochemical generation and capturing of arynes

Yannick Hajee, Masterstudent in Chemistry:
Smart Hydrogels in Tissue Engineering and Regenerative Medicine

Watch the presentations and vote for best student presentation: menti.com (code will be sent out separately)

Voting closes on Thursday October 15, 12:00.

Thursday October 15, 16:00-17:00
Feedback session for presenters and feedback providers

The Student Conference at the Faculty of Science and Technology, Uppsala University, is arranged by DiaNa Communication Training. The goal of DiaNa is to prepare students for their future careers by offering subject integrated training in communication skills. Oral and written presentations as well as group interaction is part of the training. The Student Conference offers an opportunity to listen to exciting talks and also the chance to talk in front of a larger audience and to get feedback afterwards. Next year it may be your turn to accept the challenge!

Read more on: http://www.diana.ibg.uu.se/
New organoclays for the removal of pollutants in water: Experiences in a developing country

Carlos Enrique Torres Méndez, Masterstudent in Chemistry

Triclosan (TCS) is a chemical compound used as an antibacterial in a wide range of personal care products, and it can accumulate in trophic chains if discharged into aquatic environments. The evidence so far suggests that it is a disruptor of the endocrine system in aquatic organisms and in humans. In Sweden, this compound has been found in aquatic environments, fish, human milk, and blood samples in different studies from 2002. Nonetheless, the use of TCS was regulated in the European Union during 2016 and therefore can only be used in a limited number of products and in concentrations below 0.2%. The situation is different for developing countries, where the use of TCS remains unregulated. In this regard, this study presents the development and characterization of organoclays and the performance of these materials toward the removal of triclosan from water as a low cost alternative that can be employed in developing countries. In general terms, the prepared organoclays showed enhanced affinity toward triclosan and can remove between 90 and 98% of TCS from water in comparison to the unmodified natural clay that can remove up to 60% of TCS.

Benchmarking a Cryogenic Code for the FREIA Helium Liquefier

Elias Waagaard, Masterstudent in Physics

Liquid helium is often used as coolant to achieve very low temperatures, and is used in many areas of science and industry. In the FREIA Laboratory at the Uppsala University, many experiments in instrumentation and accelerator physics need liquid helium. However, the liquefaction of helium requires large machinery with many thermodynamic steps. The liquefier inside the FREIA Laboratory still contains many unknown quantities, such as temperatures and mass flows, not specified in the manual of the manufacturer. The purpose of this project was to develop a theoretical model and simulate the helium liquefaction of the FREIA liquefier in MATLAB, in order to find these unknown parameters. We started from the principle of enthalpy conservation, meaning that energy must be conserved in closed systems such as liquefaction cycles. We developed mathematical models in MATLAB code for each cycle component and put these together into the thermodynamic cycle of the real helium liquefier. We found that the result of the thermodynamic simulations of the code was very similar to the performance of the real liquefier. These results can be used to optimize liquid helium production with lower costs and higher output, with better knowledge of what happens inside the liquefier.
Analysis of tear gas metabolite in urine using GC-MS

Ilinca Petre, Masterstudent in Chemistry

Tear gas is a riot control agent used by the military with specific purposes. It is illegal to be used by law enforcement in war zones, but it can be used for equipment testing and calming a rioting crowd. The exposure happens once the container the CS is stored in, is activated. CS is easy to ventilate so the only way to test for it is by collecting blood or urine samples from the exposed people. The metabolite of the tear gas, 2-chlorohippuric acid can be found in the body after metabolization and eliminated through urine. The aim of the project was to develop a rather fast and successful derivatization method for urine which then be further analyzed by GC-MS. The derivatization of the analyte was done by isolating the metabolite using SPé methods. From there different concentrations were tested and the limits of detection and limits of quantitation were calculated. Through a full factorial, multivariable software the optimization of the derivatization was performed using the 1-diazomethyl-2,3,4,5,6-pentafluorobenzene reagent. The time, temperature and volume of reagent were used to generate the best response. The best response was obtained when high concentration of reagent and a temperature of 80°C was used, excluding “time” as a parameter in the optimization. The LOD and LOQ for the urine samples containing the 1-diazomethyl-2,3,4,5,6-pentafluorobenzene reagent were higher than anticipated due to large variation in intensity. The reagent MTBSTFA was also tested and it provided a limit of detection of 3 ppb in urine using the SRM method.

Managing Nigeria's Hunger Pandemic through scaling of interventions (Seeds of Good Anthropocene)

Margaret Ojochide Aligbe, Masterstudent in Sustainable Development

Nigeria ranked poorly at 159th position out of 162 countries in the 2019 Sustainable Development Report with a score of 46.4%. The report measures global achievement of the Sustainable Development Goals’ targets, reinforces the need to make well being and equality top priority in policymaking and planning. With a Hunger Index of 27.9% according to the Global Hunger Index, Nigeria ranks 93rd out of 119 qualifying countries. The outbreak of the novel coronavirus has resulted in the collapse of economies worldwide. According to the United Nations Development Program (UNDP), human development is on the major decline for the first time in 30 years as poor countries are severely affected. Despite trillions of naira and dollars in donations for COVID-19 intervention, very little impact is reflected in the lives of millions of Nigerians. Some of these interventions, like the Lagos Food Bank Initiative best described as an example of a resilient Seed of Good Anthropocene, have proved successful and consistent. The organizational model includes providing relief materials particularly food and empowerment opportunities. The possibility of scaling to other parts of Nigeria during this pandemic and post-pandemic is recommended.
Developmental neurotoxicity testing and the disruption of estrogen, androgen and thyroid hormone signalling

Roseline Awoga, Masterstudent in Biology

Hormone signaling plays an essential role during fetal life and it is vital for brain development. Some chemicals (e.g. dioxins, bisphenol A, phthalates), known as endocrine disrupting chemicals (EDCs), interfere with normal hormonal signaling of living organisms. Important life processes such as reproduction, metabolism, growth and development can be affected when exposure to EDCs occurs. Exposure to these chemicals has been associated with adverse health outcomes such as obesity, breast and prostate cancer, diabetes, asthma and early puberty. In the case of brain development, altered hormonal signaling has been associated with disorders such as autism, attention deficit hyperactivity disorder (ADHD) and decreased intelligence quotient (IQ) in humans. Thus, there is an urgent need for novel testing and screening tools to address the neurotoxic effect of EDCs. For this purpose, we are developing a method where the potential of neural progenitor cells to differentiate into neurons after exposure to EDCs can be tested. This project aims at optimizing this cell-based test system for the detection of neurodevelopmental toxicity induced by EDCs with emphasis on the disruption of the estrogen, androgen and thyroid hormone pathways.

Looking for new sponge species in the Indo-Pacific ocean

Sona Hakhverdyan, Masterstudent in Biology

Sponges play an important role in many marine habitats and are crucial for maintaining the deep-sea marine ecosystems. However, there is a knowledge gap in the field of sponge biodiversity due to insufficient exploration of the deep-sea, and the probability of finding new species is fairly high. The deep waters of the Indian and Pacific Oceans are particularly poorly explored, and their sponge diversity is barely known. During an expedition (KANADEEP 2) in the south of New Caledonia a large collection of sponges belonging to the classes Demospongiae and Hexactinellida was gathered to assess the sponge biodiversity. In this project 110 Demosponges were investigated morphologically in order to find new species. Twenty-one of these were selected for further identification and description in terms of shape and geometry of the sponge skeleton (spicules) using light microscopy. The DNA was extracted from eight specimens and subjected to sequencing for the confirmation of new species on molecular level. The twenty-one specimens were assigned to the genera Tethya, Craniella and Geodia belonging to the order Tetractinellida, which was found to be the dominant order in the deep waters in the New Caledonia region. There are potentially six new species amongst the studied specimens. However, it has to be confirmed using molecular biology methods.
Mechanochemical generation and capturing of arynes

Victor Hellgren, Masterstudent in Chemistry

Organic synthesis is an area which explores how molecules can be combined under different conditions in order to construct other molecules of interest. During my bachelor thesis I focused on the conditions under which a particular group of molecules known as “arynes” could be generated. Arynes are short lived aromatic intermediates containing a triple bond. The simplest one in benzyne which basically is a benzene molecule with a triple bond in its structure. Arynes can be used in the synthesis of a vast range of molecules making them very useful as synthetic tools. Typically, they are generated in solution under mild conditions. More specifically, my thesis explored the possibility of generating arynes under mechanochemical conditions meaning you perform the reaction in a closed vessel with a metal ball without any solvent. The idea is that by providing mechanical force, through for example shaking, the activation energy will be provided by the impact of the ball with the added chemicals. Mechanochemistry is considered a green method since it can omit the use of solvent meaning less waste and thus smaller impact on the environment. My results indicated that this is possible, however with a somewhat limited number of reactants.

Smart Hydrogels in Tissue Engineering and Regenerative Medicine

Yannick Hajee, Masterstudent in Chemistry

Hydrogels are water-based gel-like substances. They are made of hydrophilic (water-loving) polymers that are linked together to form a network which interacts with and traps water. Hydrogels have many properties that mimic the natural environment outside of cells and allow incorporation of cells and bioactive molecules. This means they can be used to promote the growth of cells in specific structures and ways, with the ultimate goal of regrowing lost or damaged tissues or whole organs. We may be able to avoid waiting lists for organ transplants and problems of organ rejection in the future by using the patient's own stem cells to grow a new kidney for example! Hydrogels can be used not only for regenerative medicine but also for other applications such as controlled drug delivery, sensors, micro-engineering products and protecting implants from the immune system. So-called 'smart' hydrogels can respond to external stimuli such as light, temperature, ionic strength, pH, electric or magnetic fields or certain biological molecules. This further increases their possible applications. One example is using a glucose-sensitive hydrogel as an 'artificial pancreas' to regulate blood glucose by releasing insulin at the right times. This talk will give a brief overview of hydrogels and smart hydrogels and their current and future applications.