



# GLOBAL YOUNG ACADEMY

Technological Innovations for Discovering Solutions to  
the World's Greatest Current Challenges

**13th International Conference  
of Young Scientists  
June 2023, Kigali, Rwanda**

## Member Lightning Talks

### Schedules and Abstracts

Member Lightning Talks – Technological Innovations for Solutions to the World's greatest challenges

Wednesday 7 June 11:45 – 13:15

*Each member lightning talk will consist of a 4-minute presentation. After all members have presented, there will be some time for questions and discussion.*

*There will be two parallel sessions taking place in Marriott Kigali Hotel:*

**Session I (Kilimanjaro Ballroom)**

**Session II (Isaro Seminar Room)**

## Schedule - Session I (Kilimanjaro Ballroom)

Paulina Carmona	What can gene changes in our blood tell us about a disease?
Felix Moronta	Communicating the safe use of agricultural biotechnology
Andreea Molnar	Diversity in IT
Amarjargal Dagvadori	Same air
Praveen Kumar	Accelerating Pseudocapacitive Reactions via Lattice Strain Induced d-band Centre Engineering in Hypo-Hyper Electronically Coupled 2D V doped NiCo <sub>2</sub> O <sub>4</sub> for Asymmetric Supercapacitors
Velia Siciliano	Synthetic Biology: new opportunities in biomedicine
Udom Sae-Ueng	Bacteriophages for wilt disease and sustainable agriculture
Nova Ahmed	Supporting Minority Community with Technology Advancement
Shalini Arya	Connecting dots from traditional grains to novel synbiotic beverage
Wasim Sajjad	Vision 2030: Carbon Capture Technology and Sustainability
Mirjam Brusius	Repatriation on hold. Why are so many Artefacts and Scientific Objects in Europe's museums in Storage?
Nadia De Leon	Understanding Knowledge and Learning Systems in Panama and the Region
Jorge Rosales-Salas	Time Poverty: why measure it?
Chioma Daisy Onyige	Inequality, irregular female migration and human trafficking in Africa
Yensi Flores Bueso	Bacteria delivered proteins for cancer therapy
Hussam Hussein	Narratives and discourses of water scarcity
Anina Rich	Why can't I sustain my attention?! The challenge of modern environments.
Alma Hernández-Mondragón	Beyond the Divide: Collaborating for a Better Future
Ram Avtar	Geospatial data for implementation of Sustainable development goals (SDGs)
Antonia Morita Saktiawati	The potential of an electronic nose as a screening tool for infectious diseases

## Schedule - Session II (Isaro Seminar Room)

Sandra Lopez-Verges	Future treatments for possible next viral outbreaks thanks to the survivors
Carlo d'Ippoliti	Socio-economic causes of the support for populist parties in Europe
Monika Kedra	What do benthic animals do in the marine coastal ecosystems?
Filippo Rossi	Three dimensional biomimetic hydrogels for regenerative medicine
Sri Fatmawati	The Science of Jamu
Martin Dominik	You cannot hide your gravity
Myrtani Pieri	Do we eat gene regulators?
Muhammad Farooq	Sustainable Agriculture for Food Security in Changing Climate
Wataru Iwasaki	Bioinformatics: Bridging life science and computational science
Shymaa Enany	Proteo-Genomics of Microbes Endorses Health and Wellbeing
Siok Yee Chan	Stabilisation of sensitive pharmaceutical actives into next generation dosage forms: potential and opportunities
Chris Barrington-Leigh	Building a database of solved collective action problems
Jane Yau	Games, Climate Emergency and Transformation
Luisa Fernanda Ecxheverría King	Science diplomacy: decolonial perspectives
Hanjo Hamann	Distant Reading the Law
Heather Armstrong	A controversial topic: the double edge sword of dietary fibers in health and disease
Aram Simonyan	What factors shape how we perceive corruption in our country
Haruka Ono	Considering Urban Sustainability from African Cities
Maria Mercedes Caron	Forests stand tall (and short) against climate change
Mareli Claassens	Building inclusive infectious disease research capacity in Namibia

## Abstracts - Session I (Klimanjaró Ballroom)



**Paulina Carmona-Mora**

**University of California-Davis**

**USA**

### **What can gene changes in our blood tell us about a disease?**

Stroke is a neurological disease that occurs when there is a lack of blood flow in a region of the brain. Immediately after stroke, white blood cells start traveling to the injured brain region and they are actively recruited to cause inflammation and then support the resolution of the injury. Changes in gene profiles in white blood cells serve as a proxy to understand what is happening in the brain. Therefore, we can study molecular changes after stroke using an easily accessible sample, such as blood. We study these changes in blood cells and chase genes that would help us to make a quick diagnosis of a stroke, without the need of complex medical imaging, which is not easily accessible across the world. By studying the gene signatures of stroke patients, we are also able to distinguish different groups of patients apart, such as those that have different causes of stroke, those that respond to a certain treatment, or those patients that have a faster recovery. Using high throughput technologies, statistical and computational methods, it is possible to discover genes that help to improve disease diagnosis, support drug discovery, and predict the outcome of a patient.



**Felix Moronta**

**International Centre for Genetic Engineering and  
Biotechnology**

**Italy**

### **Communicating the safe use of agricultural biotechnology**

Genome editing aids in the development of plant varieties that address future agricultural challenges such as climate change adaptation, resource efficiency, and long-term productivity. Nonetheless, associated issues such as governmental regulation, intellectual property, and potential environmental and health consequences spark heated debate. To enable an informed public debate about genome editing and to prevent biased information from being provided, the science behind this emerging biotechnology must be effectively communicated. During this talk, using a particular case study, I will share five recommendations for the effective and strategic communication of this topic. Recommendations that, importantly, can be applied across all scientific disciplines.



**Andreea Molnar**

**Swimburne University of Technology**

**Australia**

## **Diversity in IT**

Despite increasing awareness and efforts made to attract women in computing, they are still poorly represented in information technology careers in most high-income countries. The number of females graduating with an IT degree has consistently declined since 1984 when women were 34% of computer science graduates and currently account for less than 20% of IT graduates in many countries. In this talk I will speak about the results of a qualitative study looking into what motivates young women to enrol in IT and compare these results with women enrolled in other degrees.



**Amarjargal Dagvadori**

**Parliamentary Research Institute**

**Mongolia**

## **Same air**

I am implementing the "Let's take action" project funded by AstraZeneca through Breathe Mongolia Clean air Coalition non-profit organization. The project's primary goal is to reduce the number of smoke-emitting chimneys in Ulaanbaatar, Mongolia, and increase citizen engagement in accessing, collecting, and communicating air quality data, thus providing tools to take action against air pollution issues.

Let's take action! The project features technological solutions that reduce children's chronic carbon monoxide (CO) exposure. By getting involved in the project, 25 families can monitor the air quality in their homes. Monthly workshops will be conducted by associated experts such as pediatric neurologists, environmental engineers, and green finance experts. Families can express their opinions and contribute to the project's effectiveness. Their children will be considered for neurodevelopmental examinations by a specialist, who will check whether their mental and other developmental indicators are on track since it has already been extensively proven that air pollution affects children's brains. At the lightning talk session, I plan to introduce results driven by the children's neurodevelopmental examinations and how the results changed with the proposed intervention.



**Praveen Kumar**

**Indian Association for the Cultivation of Science,  
Kolkata-700032**

**India**

## **Accelerating Pseudocapacitive Reactions via Lattice Strain Induced d-band Centre Engineering in Hypo-Hyper Electronically Coupled 2D V doped NiCo<sub>2</sub>O<sub>4</sub> for Asymmetric Supercapacitors**

Understanding the role of fundamental structural engineering of materials to unravel the underlying fundamental electronic structure-dependent charge storage mechanisms is crucial for developing new strategic approaches toward high-performance electrochemical energy storage devices. Here we explore the role of strain developed by V doping-induced lattice contraction in NiCo<sub>2</sub>O<sub>4</sub> for increasing the energy density of aqueous asymmetric hybrid supercapacitors. The influence of electron-deficient V<sup>4+/5+</sup> doping in electron-rich Ni<sup>2+</sup> sites results in the formation of a hypo-hyper electronically coupled cation pair causing a shift in the d-band and O-2p band centers and distortion of CoO<sub>6</sub> octahedra, thereby affecting the d-orbital e<sub>2g</sub> occupancy. Optimization of V doping to 3 mol %, achieved by a binder-free one-step hydrothermal method, has yielded a 68.3% increase in specific capacitance of up to 2136 F g<sup>-1</sup> from 1396 F g<sup>-1</sup> in pristine materials at 1 A g<sup>-1</sup> in a three-electrode configuration with a columbic efficiency ( $\eta$ ) of 93% and a 24% increase in rate capacity. A 66.7% increase in specific capacitance in the pouch cell device, built with a functionalized carbon nanosphere counter electrode, has been observed for the doped samples at 1 A g<sup>-1</sup> with a  $\eta$  of 97% and a maximum energy density of 141.3 W h Kg<sup>-1</sup> and a maximum power density of 8033.6 W Kg<sup>-1</sup> which are 44% and 39% higher than the pristine device respectively. Excellent cycling stability of 97.6% capacitance retention has been observed after 6000 cycles. DFT calculations have been carried out to understand the precise role of lattice strain and V dopant on charge transport, quantum capacitance, and energy storage faradaic reaction mechanisms have been investigated revealing the role of lattice strain and d-band center tailoring in enabling pseudocapacitance.



**Velia Siciliano**

**Istituto Italiano di Tecnologia**

**Italy**

### **Synthetic Biology: new opportunities in biomedicine**

Synthetic biology, is a field of bioengineering that aims at reprogramming cells to confer new properties and functions or to study mechanisms underlying biological pathways. Mammalian synthetic networks build on the conjugation of efforts to design “smart interfaces” that are activated when specific endogenous or exogenous inputs are sensed. I will give an overview of my lab efforts towards the design of novel therapeutics.



**Udom Sae-Ueng**

**National Center for Genetic Engineering and  
Biotechnology (BIOTEC)**

**Thailand**

### **Bacteriophages for wilt disease and sustainable agriculture**

The economic loss in major crops caused by pathogenic bacteria is estimated to be one billion USD annually. As a result, hazardous chemical and pesticide usage has almost doubled during the last 30 years, resulting in massive environmental degradation. One health also raises concern about antimicrobial resistance from excessive pesticide use. This is not a path we want. We need sustainable alternatives to ensure a safe food supply for future generations, as reflected in the European Green Deal. An alternative is to control these bacteria in crops with bacteriophages (phages). They are viruses that can kill bacteria. They are highly specific to their host cells and generally considered as safe. The phages can be isolated from natural sources – soil, water, and sewage, where the bacteria inhabit. Here we show an example of bacterial wilt disease in chili and tomato. The phages were isolated from soil samples in Thailand. In the laboratory and greenhouse, we demonstrated that phages effectively killed *Ralstonia solanacearum*, causing the wilt disease. We are now developing the phage formulation. The formulations involve finding the “right” ingredients and compositions for phage storage in solution and freeze-drying forms. We also investigate the stabilizing mechanisms of phages that regulate their stability in environments using interdisciplinary methods, including genomics, proteomics, structural biology, and biophysics. Due to the strength of biodiversity worldwide, phages have tremendous potential for utilization in agriculture. Collaborative efforts and both fundamental and translational research are urgently needed for phage usage and the future of safe and secure food.





**Nova Ahmed**

**North South University**

**Bangladesh**

## **Supporting Minority Community with Technology Advancement**

The Covid-19 pandemic has created a major health, economic and social damage, particularly, in developing countries such as Bangladesh. The strict social distancing requirements during the various stages of pandemic has created challenges while it opened up opportunities for innovative technology usage. Technology platforms were heavily used for keeping the communications alive during the strict lockdown periods; there were payments through technology such as mobile banking and mobile wallets, technology based continuation of education at primary, secondary and tertiary levels. Moreover, there were innovative technology adaptation among minority communities who faced severe economic or social difficulties. An 18 month long study all across Bangladesh covering urban, semi-urban and rural regions starting from December 2020 spanning through three windows of lockdown periods showed the resilience of various marginal communities. The transgender communities, various indigenous communities and communities under economic difficult situations used technology based innovations for their survival during the difficulties of the pandemic being concerned to receive minimal support from local or national level authorities. There were online markets developed instantly to accommodate the country-wide restrictions, there were families where young ones came together to teach the elderly family members about technology and beyond that, technology was widely used to show the care and support for each other. I have led a project funded by Bill and Melinda Gates Foundation and have travelled our country during the difficult time and the resilience among the marginal communities were very humbling which will be shared here.



**Shalini Arya Subash**

**Institute of Chemical Technology, Food Engineering  
and Technology**

**India**

## **Connecting dots from traditional grains to novel symbiotic beverage**

Millet is a traditional grain that provides numerous health benefits due to the presence of several bioactives such as dietary fiber, good quality protein, balanced amounts of minerals, antioxidants etc. They are also gluten-free, good for diabetes, and more sustainable. Despite the presence of nutrients, there are challenges during its processing. The presence of a high amount of fat reduces its shelf life, and high tannin, polyphenol reduces its bioavailability and digestibility. Therefore it is necessary that novel, as well as traditional processing techniques, are rediscovered and used during millet consumption. The research discusses fermentation to improve the digestibility and quality of probiotic drinks made from minor millets. A minor millet-based, non-dairy symbiotic beverage was prepared by using barnyard millet, foxtail millet, and brown top millet optimized by Design Expert software (ver 7.0). The symbiotic beverage had a



probiotic count of 9.87 log CFU/mL which is well above the recommended number of probiotics (8 log CFU/mL) as per FSSAI and had a shelf life of 15 days under refrigeration. Thus, the current study has successfully produced a functional synbiotic non-dairy-based beverage that would be helpful for people with lifestyle disorders like diabetes, and obesity, and people who are health conscious.



**Wasim Sajjad**

**National University of Medical Sciences**

**Pakistan**

## **Vision 2030: Carbon Capture Technology and Sustainability**

Human emit 50Gt of CO<sub>2</sub> /year data from the IPCC shows that we must remove 10 billion tons of CO<sub>2</sub> each year. To get to that scale world carbon removal market must grow > 55% annually. Just like CO<sub>2</sub>, nitrogen & phosphorus are invisible pollutants causing serious ecological damage. Together, these pollutants can cause harmful algal growth in rivers, leading to the death of fish and other animals. These pollutants can also lead to conditions that cause disease and death in humans. Bioremediation restores the balance and biodiversity. The goal is to selectively cultivates the dominant native diatom/microalgae species of a river system. 1kg of Frustula (microalgae) can sequester CO<sub>2</sub> for 1M+ years equivalent to 30,000 trees per month. Microalgae are microscopic organisms found in seawater and freshwater that convert atmospheric carbon dioxide into organic matter and oxygen using sunlight. Like plants, microalgae need nutrients to grow, such as nitrogen and phosphorus, and use them to build their biomass. By sampling and measuring microalgae biomass, carbon, nitrogen and phosphorus content in the water and at the river bed, we can determine the efficiency of pollutants removal. By removing excess N and P, and sequestration of CO<sub>2</sub> we prevent the prevalence & proliferation of Harmful algal blooms (HABs). There are companies working of pond-based technology for microalgae CO<sub>2</sub> removal (CDR) and selling these carbon credits which is a sustainable and viable business. There is an= 1 billion USD global voluntary market of carbon off-sets/ CO<sub>2</sub> credits.

Some other benefits of microalgae-based bioremediation are:

- Cost-effective technology
- Low energy consumption
- Low environmental impact
- Simplicity of operation and maintenance
- No waste generation
- Integrated into the landscape
- Solar-powered technology
- Ability to grow on wastewater
- Removal of trace pollutants
- No fertile land use requirement



**Mirjam Brusius**

**German Historical Institute London**

**United Kingdom**

## **Repatriation on hold. Why are so many Artefacts and Scientific Objects in Europe's museums in Storage?**

Western Museums put only a fraction of their collections – sometimes as little as 2% – on display. This kind of discourse leaves out from our museum histories millions of objects that have been gathered but seldom or perhaps never been shown. It presents the museum as an organized and stable space, in which only museological ‘results’ are visible, not the intermediate stage of their coming into being. As a result, important historical, epistemological and semantic aspect of the history of these collections are eliminated from our discussions.

In the age of repatriation, turning attention to the vast reserve collections of artefacts, scientific instruments and objects, botanical specimens and human remains of Europe's museums can cause a shift in our deeper understanding of the scope and meaning of museum collections from colonial contexts in storage, including those still used for scientific research. The talk will explore whether holding on to these unshown collections can be considered a symbol of power per se, or also open up opportunities for the question of what museums are and can be in the future. Museum storage not only re-enacts and perpetuates imperial possession but also challenges us to rethink questions around repatriation.



**Nadia De Leon**

**Centro de Investigación Educativa de Panamá**

**Panamá**

## **Understanding Knowledge and Learning Systems in Panama and the Region**

Local and international statistics document low educational results and wide social inequality in Panama, including access to technology. Socioeconomic status has a larger impact in Panama than in many other countries on educational achievement, perpetuating and exacerbating social injustice. Considering this, a study comparing the reading performance of 4th and 6th graders showed a significant decrease, only in the public system, who also interacted online with their teachers significantly less than their private schools’ counterparts. This is evidence of the widening of existing educational gaps during the pandemic (Cubilla-Bonnetier et al, 2023). Such differences between public and private schools were also documented in a study evaluating, through classroom observations with a rubric, the practices for teaching computer science and

computational thinking in comparison to international standards. Little evidence was found of the use of best practices. There was a noticeable difference between public and private schools, with polarized scores mostly in the lowest or higher end of the spectrum that evidence inequity (D'Alfonso et al, 2021). Finally, school dropout is an important challenge faced by public schools. A qualitative study on perceptions of teachers, principals, students and parents, found that the regions that demonstrated the most concern were not necessarily those with highest dropout rates. Among intervention efforts schools described communication with parents, motivating students, offering food, and visiting homes. These were not entirely coherent with identified causes: economic and family problems. There was little to no mention of academic challenges (De León et al, 2021). I continue to look into challenges in access to digital education worldwide; student, teacher and school characteristics related to student learning in LAC education systems; ECRs and women in LAC science systems; and the history of educational inequality in Panama.



**Jorge Rosales-Salas**

**Universidad Mayor**

**Chile**

## **Time Poverty: why measure it?**

Time is a fundamental aspect of our lives, shaping our daily routines, work schedules, and personal activities. The distribution of time is a critical social issue, as it affects our well-being, health, and relationships. Many people struggle to balance work and personal life, leading to a growing interest in working time reduction, the redistribution of domestic labor, and the recognition of the importance of leisure time. Despite these efforts, the distribution of time remains highly unequal across gender, class, and race. Women, minorities, and low-income individuals tend to have less leisure time and more domestic responsibilities than men and higher-income individuals. This time poverty can have detrimental effects on mental health, physical health, and social connections. In this lightning presentation, I present the results of my research on time use, working time reduction, domestic labor and leisure, time poverty, and time value. My research has important implications for policymakers, employers, and individuals who seek to promote a more equitable distribution of time. By recognizing the value of time and its impact on our lives, we can design policies and practices that promote work-life balance, reduce time poverty, and enhance well-being. In conclusion, my research highlights the importance of time use and the need to address the unequal distribution of time across gender, class, and race. By valuing time and promoting a more balanced distribution of work, domestic labor, and leisure, we can create a society that values well-being, health, and happiness for all.



**Chioma Daisy Onyige**  
**University of Port Harcourt**  
**Nigeria**

## **Inequality, irregular female migration and human trafficking in Africa**

According to the international labour organisation (ILO), there are estimated over 169 million migrant workers globally. These migration pattern has been attributed to economic inequalities, and unemployment. Migration has always been considered a common household strategy in Africa to diffuse risk of wars, conflicts, violence, flooding, drought etc. Over time we are seeing the changing demographics of migrants from Africa, as we see more female migrants now migrating independently. Due to extreme poverty and loss of livelihood, many people in Africa see irregular migration as the only feasible choice to getting an alternative means of livelihood. They may seek the help of human smugglers to migrate to other regions or countries. Often times, smuggled migrants end up being victims of human trafficking because due to their desperation to migrate to another country or region, they are usually exploited by the smugglers, who often extort more money from the migrants. People are often trafficked in order to channel them into exploitive forms of labour. For close to eight years, my study has sought to explore particular kinds of relationships between migration and inequality that emerge through human trafficking. In other words, my work has been exploring the challenges of inequality that emerges from the nexus of migration and human trafficking.



**Yensi Flores Bueso**  
**Institute for Protein Design, University of Washington**  
**United States of America**

## **Bacteria delivered proteins for cancer therapy**

Conventional cancer therapies have many limitations that could potentially be overcome using engineered tumour targeting bacteria as cancer therapeutics. These bacteria have been shown to selectively grow in tumours where they can produce and deliver therapeutic biomolecules (proteins) extracellularly in the tumour microenvironment. However, the delivery of these biomolecules into the cytoplasm of targeted tumour cells remains a challenge, limiting the clinical translation of these therapies. This project will address delivery challenges by designing multi-part, multifunctional proteins that transport themselves from the interior of the bacterium into the cytoplasm of cancer cells where they can exert therapeutic action. These proteins will integrate protein motifs for transport (using novel cell penetrating peptides) and anticancer

activity. The viability of each of protein motif has been demonstrated in vitro. These motifs will be assembled using recently developed computational protein design workflows and a modular design-build-test synthetic biology approach, which will facilitate measurability and experimental throughput. The resulting novel proteins will be tested in vitro and in vivo with high-throughput methods available at host labs. This interdisciplinary approach is enabled by leveraging cutting-edge expertise and technologies in computational protein design from the Bhardwaj and Baker Lab at the Institute for Protein Design, UW (USA) and in bacterial cancer therapy available at the Tangney Lab, UCC (Ireland).



**Hussam Hussein**

**Royal Scientific Society**

**Jordan**

## **Narratives and discourses of water scarcity**

Jordan is the second most water scarce country in the world. Most research has focused on water management and on the technical aspects of the problems and of the solutions. This lighting talk will showcase why we need to also consider discourses and narratives of water scarcity. The framings of water scarcity are important as they shape how we understand the problem, and therefore how we will act to solve the problem. In other words, they are a reflection of the political economy of the water sector, as they will shape water policies in the country.



**Anina Rich**

**Macquarie University**

**Australia**

## **Why can't I sustain my attention?! The challenge of modern environments.**

Modern environments pose new and potentially devastating challenges to attention, which is the cognitive process that allows us to select relevant information and ignore distractions. My work focuses on two main areas. First, automation of high-risk industries such as transport and power generation has changed the role of the operator to monitoring for rare computer errors. Unfortunately, people are very poor at monitoring for rare events: if a target is infrequent, we tend to miss it, resulting in significant potential safety concerns for autonomous vehicles and high-risk environments. Second, notifications from multiple sources (e.g., smartphones) infiltrate every aspect of our lives, resulting in frequent disruptions from primary tasks. Interruptions have been found to be the cause of airline crashes, car accidents, and medical errors, and affect all

of us in our daily lives. My work focuses on the way changes to our ways of working, learning and travelling impact on our attention and performance. I use behavioural and brain imaging methods to understand attention, the impact of task factors on our performance, and how we can predict and prevent errors.



**Alma Hernández-Mondragón**

**Center for Research and Advanced Studies,  
Cinvestav**

**México**

### **Beyond the Divide: Collaborating for a Better Future**

In recent years, we have seen an increase in the politicization of science in many countries around the world. From debates about climate change and vaccination to the response to the COVID-19 pandemic, science and politics often seem to be at odds. However, science and politics do not have to be enemies. We can gain a lot if we work together. Science can provide valuable, evidence-based information that can help inform and improve political decision-making. On the other hand, politics can provide the necessary resources to carry out important scientific research and support the implementation of science-based solutions to social and environmental problems. For science and politics to work together effectively, it is important to establish and maintain trust relationships between scientists, politicians, and the general public. In addition, scientists and politicians must recognize that their perspectives and objectives may be different, but that both parties can work together constructively to address the most pressing challenges of our time. There are many tools required throughout the ecosystem, but let's talk about ourselves as scientists. Should we be more concerned about training the next generation with better tools than we had? In the talk, we will discuss a proposal.



**Ram Avtar**

**Hokkaido University**

**Japan**

### **Geospatial data for implementation of Sustainable development goals (SDGs)**

The Sustainable development goals (SDGs) with 17 goals and 169 targets with aims to ensure that no one is left behind. Each country has its own priority to achieve these goals and targets, therefore it is necessary to first check “who is currently being left behind. It has been seen that geospatial information plays a significant role in measuring some of the targets of SDGs, hence it is relevant in the implementation of SDGs and monitoring of their progress. Synoptic view and repetitive coverage of the Earth’s features and phenomenon by different satellites is a powerful and propitious resource for improving data collection. Geospatial data helps in monitoring the



effectiveness of the SDGs indicators from global to local levels by providing location based information. Geospatial techniques can fulfill the data gap by providing timely and accurate information in the data-poor countries. It can help decision-makers to make the evidence-based decisions that are required to make sure sustainability of the region.



**Antonia Morita Iswari Saktiawati**

**Universitas Gadjah Mada**

**Indonesia**

## **The potential of an electronic nose as a screening tool for infectious diseases**

Our body or breath odor doesn't always mean we forget to put on deodorant or brush our teeth. Instead, it can be a sign of any disease, such as cancer, infection, or diabetes. Therefore, we developed an electronic-nose to diagnose or screen disease through smell. It works like our nose, with artificial intelligence as an analogy to our brain. We investigated it to detect tuberculosis also COVID-19, two of the deadliest infectious diseases in the world.

We trained the e-Nose to differentiate people with those diseases from people who were healthy or had other respiratory diseases (controls). Afterward, we tested the e-Nose on people who were presumptive of tuberculosis or COVID-19. The subject breathed into a disposable air-collecting bag. The bag was then connected to the e-Nose, while the e-Nose was connected to a laptop, and the breath data was analyzed. We calculated the diagnostic accuracy of the breath test in comparison with the reference standards.

We trained the e-Nose to 43 COVID-19 patients, 27 TB patients, and 64 controls. We tested it on 1383 people screened for TB and 859 for COVID-19. In the training phase to detect tuberculosis, the e-Nose had a sensitivity of 95% and specificity of 82%, while for COVID-19, it had a sensitivity of 95% and specificity of 96%. The analysis for the testing phase is in progress. This result shows that the e-Nose has the potential as a screening tool for tuberculosis or COVID-19. It needs to be further developed for a wide-used.





**Sandra Lopez-Verges**

**Gorgas Memorial Institute for Health Studies**

**Panama**

### **Future treatments for possible next viral outbreaks thanks to the survivors**

Emergent viruses generally come from regions with high diversity that are being impacted by ecological changes due to human activity. Madariaga virus is an emergent alphavirus that has been causing small outbreaks in rural deforested regions in the Darien tropical forest in Panama at the frontier with Colombia. Madariaga can cause severe neurological disease in children with fatalities or permanent sequelae. The increase of the rural population as well as the illegal migrant populations crossing the jungle, home of mosquitoes and animal reservoirs for this virus and many others. This suggests possible emergence of this virus, that has no current treatment or vaccine. We are working with the community, explaining what is currently know about this virus and what is still to discover (a lot!). Importantly, the next treatment that could save their children in future possible outbreaks, come from the community itself: the neutralizing protecting antibodies from the survivors that could protect against Madariaga virus and against another virus from the same family: Venezuelan equine encephalitis virus, already responsible of big epizootics in humans and horses in the 70s and 80s. We have now a lab in the small town of Meteti, where we can process the blood of survivors that we will follow for 5 years, and in less than 72h, be back at the capital to analyze the antibodies properties and the immune cells in our new cytometry core, with the goal to identify the more protective antibodies that are stable through time. This project has been well accepted by the community that is highly excited.



**Carlo d'Ippoliti**

**Sapienza University of Rome**

**Italy**

### **Regional inequality and the role of a development bank**

The reduction of inequalities is a crucial sustainable development goal, and tackling geographical inequalities in particular - between regions of the world, or between areas of a same country - is a necessary step for justice and fairness. Traditional economic theory assumes that all economic areas should converge toward similar levels of income per capita, but in practice this often does not happen. For this reason, governments and supranational institutions rely among other things on development banks. In this talk, I describe my work on trying to estimate what has been the impact of one of the largest development banks globally, the European Investment Bank (EIB), in reducing geographical inequality in Europe. Empirically, the European Union regions have stopped converging toward similar income levels since at least the Global

Financial Crisis. However, this does not necessarily imply that public intervention has been fruitless: on the contrary, without the EIB lending, regional convergence could have been even less.

To address this issue, I will briefly describe a “counterfactual approach” in the continuous treatment framework, which estimates the impact on economic growth due to different levels of EIB lending in “peripheral” and “core” regions. With this method, we estimate a strong impact of the EIB on Europe’s regions, and an even stronger one when lending is directed to the less developed and transition regions. Furthermore, we find a spill-over effect, that is, EIB lending contributes too to the growth of EU regions other than the ones in which it directly intervened, due to trade linkages between the regions.

In conclusion, the European case shows that there is ample room for active intervention aimed at reducing geographical inequalities, and that lending in the relatively poorer areas of a country could spearhead growth elsewhere too.



**Monika Kedra**

**Institute of Oceanology and Polish Academy of Sciences**

**Poland**

### **What do benthic animals do in the marine coastal ecosystems?**

Sea floor ecosystems, including sediments and organisms living on and in the sediment (benthos), play pivotal role in many biogeochemical processes in the ocean, including carbon and nutrient (such as phosphorus, nitrogen, silica) cycling. These biogeochemical processes are controlled by both environmental parameters and by activities of marine organisms. Their dynamics vary across the water column, bottom water and sediment and are further changed by natural variability of marine environments and human activities. The way benthic organisms and environmental conditions influence carbon and nutrient cycling vary depending on the natural and anthropogenic gradients on seasonal and annual scales. Yet, the characteristics and drivers of these exchange processes between the different compartments are not fully understood. Using the example of the southern Baltic Sea and its shallow coastal areas I will present the role of the benthic communities and environmental factors in shaping biogeochemical processes that have further implications for the ecosystem functioning, and, as a consequence, on provided services and human well-being. This presentation will include results obtained during Polish National Science Centre project “Coastal Ecosystem functioning under different anthropogenic pressure - linking Benthic communities And biogeochemical Cycling in the southern Baltic Sea (COmEBACK)” (project number: 2017/26/E/NZ8/00496).



**Filippo Rossi**

**Politecnico di Milano**

**Italy**

### **Three dimensional biomimetic hydrogels for regenerative medicine**

Stem cell therapy with human mesenchymal stem cells (hMSCs) represents a promising strategy many different pathologies. However, both systemic and parenchymal hMSCs administrations

show significant drawbacks as a limited number and viability of stem cells in situ. Moreover, cell therapy delivered systemically (intravenous injections) could lead to a limited efficacy due to the unfeasibility of the cells to cross the blood brain barrier. In this study, we evaluate a new agarose/carbomer based hydrogel that combines different strategies to optimize hMSCs viability, density and delivery of paracrine factors. The three-dimensional polymeric networks chosen correspond to a library of chemical nanostructured hydrogels, highly tunable in terms of molecular structure and biocompatibility. In addition, we combined RGD tripeptide and 3D extracellular matrix deposition to increase the capacity to attach and maintain healthy hMSCs within the hydrogel over time. In order to optimize and evaluate the hMSCs adhesion and viability several hydrogel compositions and different loading protocols were developed and tested. We first seeded hMSCs into HG RGD and we measured the ECM deposited over time. A progressive ECM deposition was observed from 1 up to 14 days, where ECM deposition reaches a “plateau”. Thus, for a second hMSCs seeding, we decided to deposit ECM up to 14 days and then we lyophilized the HG RGD + ECM to allow a new encapsulation of hMSCs by a sponge-like loading. This hydrogel with ECM is able to maintain hMSCs viable for a longer period and to maintain their stemness during time.



**Sri Fatmawati**

**Institut Teknologi Sepuluh**

**Indonesia**

### **The Science of Jamu**

Indonesian herbal medicine, so-called Jamu, is formulated based on traditional knowledge of local people for prevention and treatment of various diseases. There has been a significant rise on demand of high impact Jamu for global need. These give an opportunity and challenge at the same time as evidence-based medicine is required to standardize and support ethnobotanical use. Research on bioactivities of various medicinal plants used in Indonesian herbal remedies has been widely studied, such as antioxidants, antidiabetic, antibacterial, and antifungal and thus becomes our main focus in the Laboratory of Natural Product and Synthetic Chemistry at Institut Teknologi Sepuluh Nopember (ITS), which include medicinal plants from genus Garcinia, Curcuma and others. Our extensive projects studying the biological properties and chemical constituents of those plants revealed that they are useful in increasing immunity, preventing several diseases, and increasing stamina, which give us an insight for further development.



**Martin Dominik**

**University of St Andrews**

**United Kingdom**

### **You cannot hide gravity**

Albert Einstein referred to the gravitational bending of light as a “most curious effect”, not so much for the arising apparent magnification of a background light source becoming infinite if it is perfectly aligned with the deflector from the position of the observer, but since with increasing

distance of the observer not only does it not decrease, but even increases. While dark or very faint objects can hide from our view, they cannot hide their gravity. Consequently, so-called gravitational microlensing events have given us unprecedented insight into the inventory of the Milky Way, including planets and black holes, and will continue to do so.



**Myrtani Pieri**

**University of Nicosia**

**Cyprus**

### **Do we eat gene regulators?**

Every time we consume food, we not only take in essential nutrients such as carbohydrates, proteins, fats, vitamins, and minerals, but we also ingest the nucleic acids, such as DNA and RNA, of the organisms we consume. While it is commonly believed that these nucleic acids are completely broken down in the consumer's gastrointestinal tract by the process of digestion, recent evidence suggests that some small RNA molecules, known as microRNAs, may behave differently. MicroRNAs from plants and animals that we consume have been found in the blood and serum of consumers, contrary to the general belief that nucleic acids are completely broken down during digestion. This raises the possibility of a new way of looking at nutrition, as these microRNAs can act as "switches" that have the ability to turn genes on or off.

My work focuses on this brand new and rather controversial field of "cross-kingdom regulation" by exogenous microRNAs and their potential protective or pathogenic effects on the consumer.

Is it time to consider nutrition not just as the intake of nutrients, but also as the intake of information?

Do we eat gene regulators?



**Muhammad Farooq**

**Sultan Qaboos University**

**Oman**

### **Sustainable Agriculture for Food Security in Changing Climate**

An increase in global food demand, declining natural resources, deteriorating natural ecosystems, and changing climate are threatening the sustainability of agriculture and food security. The major challenges to agriculture and food security, due to climatic changes, include the occurrence of un-predicted temperature fluctuations, heat waves, drought episodes, floods, and epidemics of biotic stresses, etc., The climatic changes and intensive tillage have also increased soil erosion causing a decline in soil organic matter, deteriorating soil structure, and giving rise to soil salinity resulting in a loss of overall soil fertility and productivity. In addition to

environmental pollution, pesticide use has resulted in the development of resistant pest biotypes. Sustainable agriculture, the system of harvesting better crop yields with minimal adverse environmental impact and without bringing non-agricultural land under cultivation, is the pragmatic option to ensure food security for future generations in the changing climate. With a focus on environmental sustainability through an ecosystem approach, sustainable agriculture aims to maximize options for crop production through the management of biodiversity and ecosystem services.



**Wataru Iwasaki**

**The University of Tokyo**

**Japan**

### **Bioinformatics: Bridging life science and computational science**

The field of biology has expanded from the traditional approaches of focusing on specific organisms and phenomena to utilizing data science approaches in the pursuit of obtaining a comprehensive understanding of life. Under this context, I employ interdisciplinary approaches, including but not limited to: bioinformatics, laboratory experiments, mathematics, and field samplings to study the evolution and ecology of diverse life forms and to develop novel biotechnological methods.



**Shymaa Enany**

**Suez Canal University**

**Egypt**

### **Proteo-Genomics of Microbes Endorses Health and Wellbeing**

I was one of the first Arab scientists who applied the proteomics techniques for the analysis of the microbial proteins. Analyzing the proteome of different microbes which responsible for many diseases like pneumonia, tuberculosis, skin infection, and many others helping in understanding the microbes' determinants at a functional level. In addition, my research is concerned with genome as well as proteome. I analyzed the molecular characteristics of *Staphylococcus aureus* isolated from Africa for the first time comparing them with that from worldwide. Investigating the whole genome sequencing of many bacteria spreading in Middle East that led to a discovery of some novel antibiotic resistance determinants.

My research contributes to goal 3 in the SDGs: "Good Health and Well Being". Studying microbe's genomics and proteomics help in revealing good markers for these microbes which in turn aid in future treatment and development of vaccines. Thus, reducing the number of diseases and deaths due to microbial infections and improving people quality of life.





**Siok Yee Chan**  
**Universiti Sains Malaysia**  
**Malaysia**

### **Stabilisation of sensitive pharmaceutical actives into next generation dosage forms: potential and opportunities**

Combining fundamental principles of physical chemistry, polymer science and nanotechnology with the design and development of drug delivery systems is crucial to better utilise medicines and to ensure that they are released from the dosage form at the appropriate rate and at the appropriate site in the body. In this talk stabilised pharmaceutical formulations for sensitive drugs using heat free manufacturing method via solid dispersion strategies will be introduced which involve the molecular dispersion of drugs in water-miscible polymeric matrices such that the (thermodynamically favoured) coalescence of the molecules back into the crystalline state does not occur over the lifetime of the product, an issue that is a major challenge to the pharmaceutical industry at present. This is also applicable to the specific patient population of paediatric and geriatric that unpleasant taste of medication could be masked in conjunction with production of conducive dosage form that improve patient acceptance will solve the consistent clinical problem of non-compliance.



**Chris Barrington-Leigh**  
**McGill University**  
**Canada**

### **Building a database of solved collective action problems**

Collective action problems (CAPs) occur when individual incentives lead us to bad collective outcomes. In these situations, individuals can feel powerless to avoid the degradation of a shared resource or to collectively create a new public good, even if everyone deeply understands the nature of the problem. Solutions to CAPs therefore typically involve, paradoxically, either removing a freedom from everyone or coercing everyone to pay a tax. The result is a preferred outcome for everyone. This is the “mutual coercion, mutually agreed on” of Hardin (1968). This project goes beyond the case study paradigm (e.g. Feeny et al, 1990; Ostrom, 2000) that has characterized the literature on solutions to managing the commons and collective action problems more generally. In particular, we will explore the idea that intervening with mutual coercion and in the context of CAPs is a primary activity of government (Heath, 2002; Heath and Potter, 2004) and a good way to think about the advancement of civilization so far. We have begun to build up a broad database of CAPs that have already been solved by reducing liberties, laying the groundwork for a broad research program analyzing their typology and content to gain insights relevant to solving remaining and newly arising CAPs faced by society.



**Jane Yau**

**DIPF Leibniz Institute for Research and Information  
in Education**

**Germany**

## **Games, Climate Emergency and Transformation**

On 1.2.2023, a significant initiative being co-funded by the European Union and Innovate UK is the research and innovation project – games realizing effective and affective transformation in societal and cultural domains (2023-26) started. With partners in Spain, Austria, Germany, UK, Denmark, Cyprus, China and South Africa, the team will investigate the potential of digital games and the application of games/playful techniques to support the social engagement of citizens in establishing priorities for policy makers involved in addressing the most pressing global challenge of our time, Climate Change. Using collaborative design and citizen science methods, it brings together researchers with expertise in digital games, data analytics, and policy in an integrated investigation, articulated by case studies of the application of games, leveraging the central role games occupy in contemporary culture. The project will generate new knowledge of the actual and potential impact of games on European society and new understandings of the innovative uses of games to support the social engagement of citizens. It combines academic studies and practical experimentation with novel applications of games. Each case study is a research cycle addressing a policy issue and research questions, with multiple pilots and quantitative and qualitative research activities. Two types of games will be used – short games deployed at scale in hit mobile games, generating quantitative data and reaching 3 million players, and longer collaborative games based around social dilemmas with small groups, generating in-depth qualitative data. As the project coordinator, I will highlight the innovation of this project in the talk. Final research outcomes will include open-access publications, an open-sourced method for using games to rapidly obtain data and insight for policy stakeholders, technical open resources and guidance for adoption, implementation of the method, and an open analytics module.



**Luisa Fernanda Ecxheverría King**

**Corporación Universitaria del Caribe (CECAR)**

**Colombia**

## **Science diplomacy: decolonial perspectives**

Decolonial perspectives on science diplomacy focus on the decolonization of knowledge and the promotion of just and egalitarian scientific collaboration between countries of the Global North and the Global South. These approaches challenge the way in which scientific knowledge and technology have historically been used by colonizing nations to impose their domination and



exploitation on colonized nations. These approaches also seek to promote a more egalitarian and just scientific collaboration between countries of the Global North and South, based on dialogue and cooperation rather than domination and exploitation. Furthermore, these approaches focus on the construction of science and technology that address global and local problems from a perspective of social and environmental justice. This involves questioning the hierarchies of knowledge that have been imposed by colonialism, and recognizing that the knowledge and experience of local communities and indigenous peoples are as valuable as scientific knowledge produced in the Global North. Another important element of decolonial approaches to science diplomacy is the building of networks and partnerships between scientists and local communities in countries of the Global South, in order to develop sustainable and culturally appropriate solutions to local problems. This implies a reorientation of scientific research towards the needs of local communities, rather than the interests of colonizing countries or large corporations.



**Hanjo Hamann**

**EBS University of Business and Law**

**Germany**

## **Distant Reading the Law**

Digitalisation changes The Law and legal studies. Where lawyers used to work qualitatively, intensely studying authoritative text not unlike Bible exegists ("close reading"), the advent of big data and huge text corpora require new methods of pattern-recognition from a bird's eye view ("distant reading"). Lawyers are now starting to adapt methods from digital humanities and empirical social sciences, with various interlocking consequences: (1) We realize how little of The Law is even available in digital (or any) formats. (2) We realize how insufficient our traditional methods are in dealing with the new reality of hypertext and large corpora. (3) We realize that despite advances in statistical methods (such as machine learning and Natural Language Processing, including ChatGPT/BingBot), the complexities of legal regulation are irreducibly qualitative. The practice and research of Law will have to contend with these challenges, and our education will need to balance these opposing forces.



**Heather Armstrong**  
**University of Manitoba**  
**Canada**

## **A controversial topic: the double edge sword of dietary fibers in health and disease**

The benefits of a high-fibre diet are well supported yet, many people with inflammatory bowel diseases (IBD) and other chronic illnesses describe a sensitivity to high-fibre foods, for reasons that remain poorly understood. Dietary fibres are not digested in the bowel; they are fermented by microbes, typically promoting gut health. However, many people globally experience alterations in their gut microbiota community, and decreased ability to ferment specific dietary fibres. Our previous findings offered the first mechanistic evidence that if specific dietary fibres are not fermented by gut microbes in IBD patients, these fibres can induce inflammation and gut damage. This diet-induced inflammation could have serious repercussions as chronic inflammation creates a mutagenic environment that promotes progression to colorectal cancer (CRC). Interestingly, other chronic inflammatory diseases, such as rheumatoid arthritis (RA) and multiple sclerosis (MS) display similar changes in the gut microbiota, although there are only limited studies of these topics to date. Furthermore, evidence suggests that some individuals with MS and RA also display sensitivity to consumption of dietary fibres, and even worsened disease symptoms following a high-fibre diet. Our team have utilized a variety of biochemical, animal, ex vivo and clinical models to help uncover how the gut microbiota mediate the diverse impacts of dietary fibres in the gut during health and disease settings. Our findings suggest that intolerance and avoidance of specific high-fibre foods in select disease settings occurs specifically in patients whose gut microbiota do not support fermentation of these dietary fibres and in-turn, promotion of inflammation. Together these findings highlight the need to investigate the disease-specific mechanisms underlying response to select dietary fibres to promote development of disease-specific biomarkers of response and personalized dietary and microbe-altering interventions.

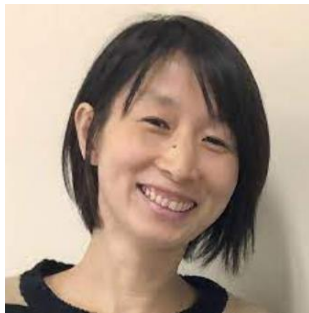


**Aram Simonyan**  
**Kiel University**  
**Germany**

## **What factors shape how we perceive corruption in our country**

According to Transparency International's Corruption Perception Index, more than two-thirds of 180 countries score below 50, while 26 countries have fallen to their lowest scores yet. Corruption is a complex phenomenon that has existed throughout the centuries all over the globe. Historically, corruption has been a challenge on all continents to a different extent. Because of its clandestine nature, measuring actual corruption is a Sisyphean task. Hence,

corruption perception indices, such as Transparency International's Corruption Perception Index, are conventionally used as a proxy for mirroring the actual corruption level in a country. But how the corruption perception is formed among individuals? What are the factors shaping citizens' corruption perception? Here, I will highlight the potential impact of the perception of institutional factors on corruption perception. It turns out that economic perception and trust in institutions, directly and indirectly, influence corruption perception by undermining individuals' satisfaction with the country's overall situation. Therefore, further satisfaction with the country's overall condition is the cornerstone, linking corruption perception with economic perception and trust in institutions. Simply speaking, if you are dissatisfied with the country's economic situation and overall situation, you will perceive more corruption in your country.



**Haruka Ono**

**Toyohashi University of Technology**

**Japan**

## **Considering Urban Sustainability from African Cities**

We are living in the age of the city: in 1900, only 10% of the world's population lived in cities, but in the 21st century, for the first time in human history, this percentage has exceeded 50% and is projected to increase to 70% by 2050. At the same time, one out of four urban populations lives in informal settlements, more commonly called slums, which are formed outside the official urban planning framework. Both scientists and practitioners have long addressed this situation as the issue of human settlements. However, the reality is that cities are increasingly being formed outside the urban planning framework.

As a specialist in urban engineering, my research question is whether there are any principles of a spatial generation when cities spontaneously emerge. And should such cities be incorporated entirely into governmental urban planning, or can they take advantage of the role of the people who have formed and maintained them? If so, what roles can governmental urban planning and the people living there play in managing cities sustainably?

To answer these questions, I have studied African cities, where most of the urban population lives in informal settlements. Unfortunately, little data on such settlements exist because of their informal nature. Thus, by interviewing people about the origins of settlements, conducting surveys on people's attributes and lifestyles, and measuring and observing buildings and outdoor spaces, I analyze and discuss how spatial order is maintained in each settlement and what commonalities and uniqueness exist among them.



**Maria Mercedes Caron**

**National Scientific and Technical Research Council  
(Argentina) & European Forest Institute (Spain)**

## **Forests stand tall (and short) against climate change**

Global warming and the associated changes in precipitation are strongly impacting forest systems and their interlinked biodiversity with deep consequences in the forests' contributions to the quality of life of people (e.g. food, medicine and material provision, water purification, flood control, artistic inspiration). Forest understories, where most of forest diversity is present and forest tree species regenerate, are dominated by environmental conditions close to the ground that are different to the ones outside the forest or at the canopy making the regeneration process difficult to study. However, understanding the impacts of climate change on forest regeneration is essential as it has long lasting impacts on forest composition and structure. My studies of the impacts of climate change on the regeneration of forests in Europe and South America demonstrated that climate change will affect all the phases of the regeneration process of forest tree species but with different intensities. Moreover, I proved that juveniles are more susceptible but are responding more than adults of the same species to changes in climatic conditions thus juveniles are lagging less behind climate change. Finally, I showed that forests, mainly through they regeneration, are changing their composition in favour of warm adapted species. This information is essential to better develop management and conservation plans for forest around the world aiming to make them more resilient and adapted to better face future climatic conditions protecting in this way forests' contributions to people.



**Mareli Claassens**

**University of Namibia**

**Windhoek**

**Namibia**

## **Building inclusive infectious disease research capacity in Namibia**

In a Pubmed literature search, we found seven articles published from Namibia during the last ten years, with search terms “infectious diseases”, “clinical trials” and “humans”, exponentially fewer than any of the surrounding southern African countries per population. None of these articles had Namibian first or last authors. We aim to build inclusive infectious disease research capacity by focusing on clinical, epidemiological, and laboratory-based training in infectious diseases, with a special focus on tuberculosis, HIV/AIDS and Covid-19. This talk will focus on how we promote inclusivity, using a current research project as an example. Project.

Our current project is entitled, “Collision of three global pandemics: the effect of tuberculosis and HIV on the epidemiological, clinical, virological and immunological trajectory of COVID-19 in Botswana and Namibia (Core-NB).”

### Ways to increase inclusivity:

1. Local research capacity building through sequencing (laboratory) and ultrasound (clinical) training at UNAM, working with project and other healthcare workers.
2. Collaboration with a local implementing partner, Health Poverty Action, which employs field assistants and work with community leaders from the communities where the project is implemented.
3. Nesting the project within, and not in parallel to the health system.
4. Working with the National TB programme.
5. Giving opportunities to a Namibian to do her doctoral studies on the project.

We are working towards a model where all implemented projects have local expertise and investigators, in which outputs are locally driven (i.e., manuscripts are authored primarily by Namibians) and where we have community feedback and input mechanisms.