

GYA

connections

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Innovative Technologies for Improved Well-being

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Editorial

by Jane Yau and Tomislav Meštrović
GYA Connections Editors-at-Large, 2022-2024, GYA Members 2022-2027

We witnessed technology’s full power when the COVID-19 pandemic brought unprecedented challenges to societies worldwide, triggering a wave of technological innovations aimed at mitigating the impact of the virus and its spread. From contact tracing apps to vaccine development, technology has indeed played a critical role in the fight against COVID-19.

But the use of technology for human well-being is not limited to medicine. Technology has enabled people to access information and resources from anywhere in the world, breaking down geographical barriers and promoting knowledge-sharing. Moreover, technology has allowed for the more efficient and sustainable use of resources, thereby contributing to environmental well-being.

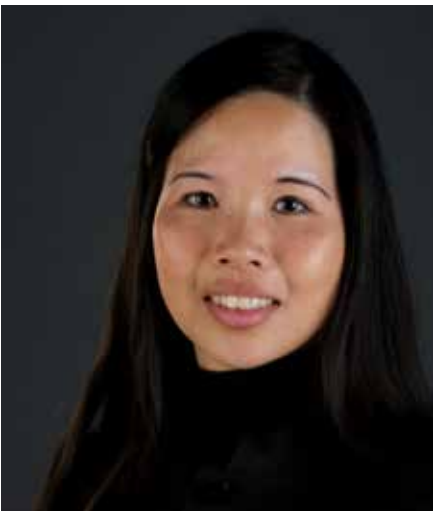
This issue of Connections aims to reflect on the exciting possibilities that lie ahead. We invite you to read important articles on the use of technology to address antimicrobial resistance, as well as transder-

mal medicine delivery without needles. From a wider environmental perspective, we invite you to read very intriguing pieces on reducing children’s chronic carbon monoxide exposure and highlighting innovations in food processing.

As with all tools, the use of technology for human well-being has not been without challenges and risks. The digital divide, for instance, can create disparities in access to technology and exacerbate existing inequalities. Additionally, concerns around privacy and security of personal information must be addressed in the development and implementation of novel technologies.

As we continue to navigate the complexities of a rapidly changing world, it is important to recognize and leverage the power of technology to promote the well-being of us all.

Together, we hope to use its power to create a healthier, more connected world!



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Tackling antimicrobial resistance through optimisation of high-throughput technologies: A focus on developing countries

Chika Ejikeugwu

Antimicrobial resistance (AMR) is a public health menace occurring in both the hospital setting and general environments of every country around the world. Even more worrisome, AMR has the ability to launch a post-antibiotic era. That is, no antibiotics will be efficacious enough to handle infectious diseases of microbial origin if nothing is done to mitigate it early on.

AMR occurs when bacteria change over time and no longer respond to antibiotics; thus, infections become untreatable, leading to severe illness, long hospitalisations, death and economic loss.^{1,2}

According to a recent report by Hooban et al., by 2050, 10 million deaths per year will be caused by AMR.³

Antibiotics are used in both human and animal medicine, and in most cases, they are used at sub-inhibitory levels that are not lethal enough to kill the infecting bacteria. This can happen, for example, when patients do not finish their course of treatment.

Consequently, the surviving bacteria strains go on to develop resistance mechanisms against the exposed antimicrobial agents. AMR bacteria and genes evolve continuously as a natural mechanism to ward off the antimicrobial onslaughts of antimicrobial agents. The irrational use in both hospital milieus and the general environment makes it easy for AMR bacteria and genes to evolve and spread between humans and animals and the environment.

More worrisome is the fact that the rate at which bacteria evolves resistance to available antibiotics is faster than the development of novel antimicrobial agents in countering this global crisis of AMR.

Self-medication is one major factor driving the spread of AMR in most parts of the world, especially in places where there is less-controlled use of antibiotics in human or animal health.

In Nigeria, for example, a majority of people who are being treated for malaria (caused by Plasmodium – a protozoan) will most often be given antibacterial agents targeting the pathogen that causes typhoid fever (Salmonella) in addition to the anti-malarial drug.

Such phenomenon will result in the evolution of AMR that allows bacteria to become resistant following undue exposure of the pathogen to antibiotics.

In sub-Saharan Africa alone, AMR causes 27.3 deaths per 100,000 people, making it a super-region for



death due to AMR pathogens.² Low- and middle-income countries (LMICs), particularly those in the sub-Saharan West African region, are predominantly vulnerable to the fallouts of the AMR menace.

In most LMICs, healthcare facilities are in a deplorable state, and infection disease control practices are not as strong as in most developed countries. To further exacerbate the AMR crises in LMICs, environmental sanitation and water supply systems are still in a pitiable state, and the use of antibiotics, particularly in poultry, livestock and other agricultural practices, is not controlled.

The availability of pharmacies that dispense antibiotics to anyone willing to buy, even without a doctor's prescription backed with a good laboratory result of pathogen isolation and susceptibility test result, is another fundamental factor fueling the AMR crisis in LMICs.

A further major challenge to tackling AMR is understanding resistance burden and how AMR genes are mobilized.^{4,5} Mobile genetic elements such as plasmids that are present in pathogenic bacteria help to facilitate the transmission of AMR genes between organisms in a particular environment.

To be able to make informed, location-specific healthcare policy decision that are sustainable to tackle the menace of AMR, particularly in LMICs, it is important for all stakeholders in the healthcare sector to understand the disease burden of AMR in a "One Health" context. This is crucial if we are to win the war against AMR. After all, the health of humans, animals and the environment are interconnected.

To achieve this, we must build and develop sustainable, novel diagnostic interventions that could be easily implemented in LMICs to monitor/track and possibly mitigate the evolution and community spread of AMR.

To better understand the molecular mechanisms underpinning AMR in priority resistance patho-

gens (e.g., *Klebsiella*, *Pseudomonas*, *Acinetobacter*, *Escherichia coli* & *Staphylococcus*, etc.), novel and advanced high-throughput molecular biology techniques such as functional metagenomics approaches and whole genome sequencing must be developed and optimised to enable prompt detection and reporting of AMR from clinical and environmental samples by clinical microbiologists in LMICs. This is particularly the case in Africa, with the overarching goal being the reduction of the disease burden of AMR, as well as ensuring the optimisation of the use of antibiotics in human and animal health in LMICs and across the globe.

Most AMR genes and strains may be circulating in an unknown environment. The available culture and sensitivity techniques currently being used in most regions in LMICs needs an upgrade to include sustainable genomics techniques that could be optimized to meet the needs of various regions in terms of tracking and mitigating AMR early on.

High-throughput technologies such as functional metagenomics and whole genome sequencing are innovative but expensive. Despite their costs, these approaches both have the capacity to transform the face of healthcare research in the LMICs, particularly in the early detection and reporting of AMR occurring in the environment before they transform into a clinical problem.

Conclusions

With the optimisation and implementation of innovative high-throughput technologies to track and monitor AMR in LMICs, new insights into the trends of AMR in the various regions can be uncovered. Even more so, these innovative high-throughput technologies have the potential to help reveal hotspots of drivers of AMR in diverse milieus, as well as help scientists and healthcare professionals understand the abundance and diversity of AMR genes and

strains circulating in their regions.

This is particularly useful for tackling AMR in LMICs – where the disease burden of AMR is high and little to nothing is done to holistically address and possibly end the menace in the region.

The availability and widespread distribution and implementation of high-throughput technologies for the on-spot tracking and monitoring of AMR in LMICs will help to drastically reduce the disease burden of AMR and improve lives in the region.

Some of the notable direct benefits of these innovative technologies include improved health outcomes and saved lives, as well as strengthened AMR knowledge in LMICs.

Such technologies also help inform scientists about trends in AMR in the region, assist policymakers to implement programs to mitigate AMR, and extend the current overall knowledge base of AMR.

Moreover, training laboratory personnel and microbiologists across the African continent to use these high-throughput technologies will improve current AMR protocols in hospitals and communities, and hopefully save lives in the process.

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Novel technical solutions to combat antimicrobial resistance: A focus on Europe

Tomislav Meštrović

Antimicrobial resistance (AMR) represents a growing global concern that is often referred to as a new pandemic due to its substantial health and economic consequences. The overuse and inappropriate use of antimicrobial agents in human health, animal husbandry and the environment have contributed to the emergence and spread of this hazard, which means potential solutions have to be multifaceted, innovative and technologically sustainable. Regarding the AMR disease burden, two recent publications from the Global Research on Antimicrobial Resistance (GRAM) project have shown that resistant bacteria can be associated with up to 541,000 deaths in Europe and up to 4.95 million deaths on a global level.^{1,2}

Consequently, key challenges in addressing AMR as a global health hazard include obtaining accurate and timely data on the prevalence and spread of resistant organisms, as well as having effective antimicrobials at our disposal. Nonetheless, there are many challenges in data collection efforts, while traditional methods of antibiotic discovery are slow, costly, frequently ineffective, and lack adequate incentives for the companies that develop them.³ Hence, a more pervasive use of innovative technology can actually play a critical role in tracking and monitoring AMR, while examples in the European context show that such technologies can be utilised to tackle this problem.

Pertinent technologies to track resistant microorganisms

One of the most promising technologies for tracking AMR is whole-genome sequencing (WGS), which allows for the identification of specific genetic mutations associated with AMR, thereby providing a more accurate and comprehensive understanding of resistance patterns. By sequencing the entire genome of a bacterial isolate, researchers can identify the specific genes and mutations that contribute to resistance, enabling them to track the spread of resistant organisms more effectively. One specific example is its routine usage in the United Kingdom, which aided in limiting/establishing the extent of the spread of plasmid-encoded resistance to the antimicrobial agent known as colistin.⁴

Another auspicious technology helping with AMR is machine learning. For starters, machine learning algorithms can analyse large datasets of AMR-related information – including genomic data, clinical data, and epidemiological data – to pinpoint patterns and predict the spread of resistant organisms. This information can then be used to inform public health strategies and policies, as well as guide clinical decision-making. And not only that; a study led

by a researcher from the European Molecular Biology Laboratory, European Bioinformatics Institute and Wellcome-MRC Cambridge Stem Cell Institute in the United Kingdom applied a machine learning algorithm to characterise AMR associated with the International Space Station surface microbiome, broadening the concept of “One Health” to an unprecedented scale.⁵

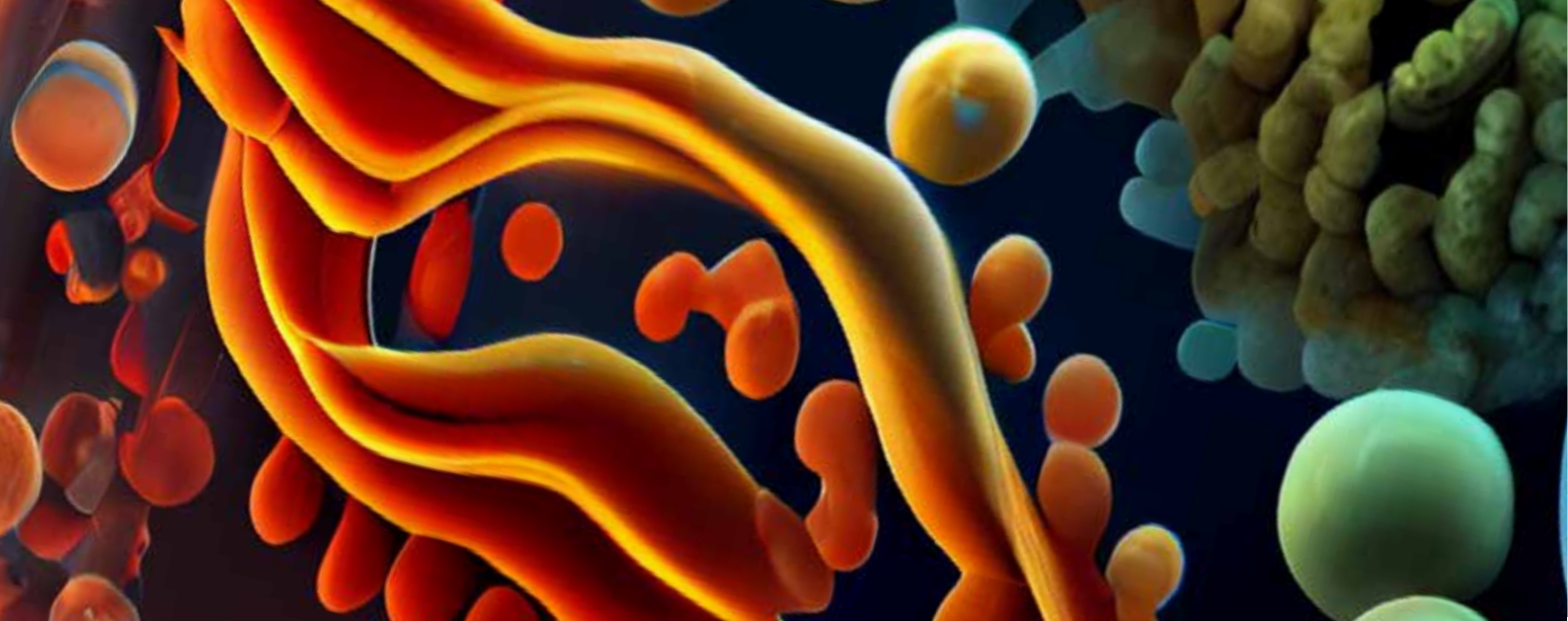
Mobile health (mHealth) technologies, such as smartphone apps and wearable devices, can also play a role in tracking and monitoring AMR. These technologies can be used to gather data on antimicrobial use, resistance patterns, and disease outbreaks, enabling public health officials to quickly identify and respond to emerging threats. A team from France recently presented an artificial intelligence (AI)-based smartphone app with a user-friendly graphical interface that can conduct reproducible and automatic antibiogram analysis.⁶

The use of electronic health records (EHRs) is another technology that can facilitate AMR surveillance by concentrating on antibiotic utilisation and consultations with infectious disease physicians and clinical microbiologists. These EHRs can also provide real-time data, enabling healthcare providers to make more informed clinical decisions, but also informing further research on the topic. For example, state-of-the-art clinical data integration systems that integrate electronic health records have been described by researchers from Switzerland, and will seemingly play an increasingly important role in our fight against AMR.⁷

Novel solutions for the development of new antimicrobial agents

One promising technology from the drug development side is high-throughput screening (HTS), which allows for the rapid screening of large libraries of compounds for their capacity to kill or inhibit the growth of various microorganisms. HTS can be used to identify novel compounds that have antibiotic activity against a myriad of bacterial agents, including those with resistance to existing antibiotics. By screening thousands or even millions of compounds in a short period, HTS enables researchers to identify potential antibiotic candidates more quickly and efficiently. One recent example from Sweden is an automated live-cell imaging system IncuCyte S3, which can evaluate existing drugs, as well as search for new ones against a causative agent of tuberculosis.⁸

Another promising technology is computational modelling, which can be used to forecast the properties and potential efficacy of new antibiotic compounds before they are synthesised and tested in laboratory conditions. This can reduce the time and cost involved in the drug development process and



increase the success rate of drug candidates. Such approaches are exploited by many groups, as exemplified at the University of Trieste and University of Cagliari (both in Italy), where compounds with antimycobacterial activity are being discovered by using such approaches.⁹

Another technology that can be employed in the development of new antibiotics is CRISPR-Cas9 gene editing. CRISPR-Cas9 can be used to modify bacterial genomes to make them more susceptible to existing antibiotics, or to make them more vulnerable to new antibiotics. This technology has the potential to considerably increase the efficacy of existing antibiotics and facilitate the development of new antibiotics. A research group from the University of Exeter (United Kingdom) are developing various approaches to help achieve its full potential.¹⁰

Artificial intelligence and machine learning algorithms can also be used to advance the development of new antibiotics. These algorithms can analyse large datasets of chemical and biological data to identify potential drug candidates and predict their efficacy, in turn steering the researchers' focus on the most promising drug candidates and increasing the success rate of drug development programs. This was even a theme of the recent panel of the European Parliamentary Research Service.¹¹

Conclusions

Technology has the propensity to play a significant role in tracking and monitoring AMR. Whole-genome sequencing, machine learning, mHealth and EHRs are just a few examples of the technologies that can be utilised to expand our understanding of AMR and inform public health strategies, while many inventive and clever technological solutions are also being embraced to combat this global health threat. However, the success of these technologies will de-

pend on their widespread adoption and integration into existing healthcare systems.

At the moment, Europe is among the continents that lead the race in using technology to improve our battle against AMR. For example, a recent European Cooperation in Science and Technology (COST) initiative known as the European Network for diagnosis and treatment of antibiotic-resistant bacterial infections (EURESTOP) was successfully kicked off. Its aim is to unite European scientists from both academic and industrial backgrounds (who possess a diverse range of skills and expertise) into a collaborative and multidisciplinary network. This initiative will encompass various disciplines, including (but not limited to) chemistry, physics, medicine, genetics, bioinformatics, biology and immunology.

The primary focus of EURESTOP is to explore the genetic and molecular foundations of bacterial AMR, thereby creating innovative diagnostic tools, and generating lead/pre-clinical candidates, antibody-based therapies, and clinical-ready repurposed drugs to provide personalised treatments for drug-resistant bacterial infections. Additionally, this initiative aims to bolster networking among European scientists and increase the competitiveness of European research by promoting the utilisation of translational research outcomes. All interested experts are invited to join this collaborative effort at the website: <https://www.cost.eu/actions/CA21145/>.

Despite Europe's strong leadership in this area, even among European countries there are stark disparities that need to be addressed (e.g., inter-country variability in political and economic resilience). Furthermore, to better facilitate solutions that target the long-term threat of AMR, we need health technology assessment agencies to expand their philosophical approach and methodological toolkit.¹²

And of course, if we are to have a truly global im-

pact, focusing only on technology will not be enough; instead, policy actions that aim to tackle the larger issues of systemic inequality will be needed.

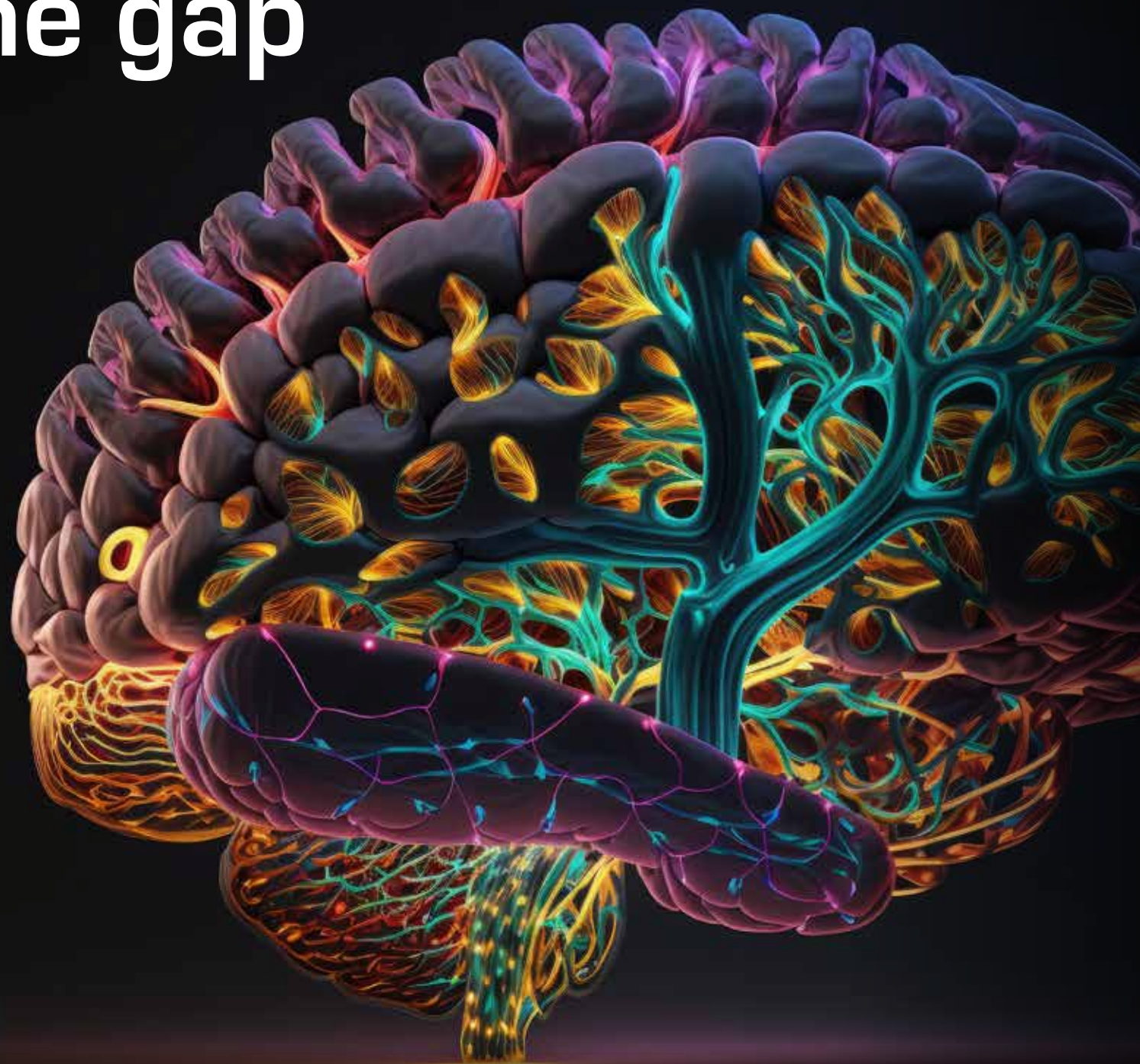
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Neuro-bridging platforms: Filling the gap



Pradeep Kumar

Traumatic neural injuries including physical injuries to the brain, spinal cord, and the peripheral system (hands and legs) present several treatment challenges due to the presence of pain and inflammation at the site, breakage or blockades of the nervous network, formation of scar tissue, and loss of function. All of these need to be addressed before even slight physical recovery can be achieved.

Recent experimental and treatment approaches include neural scaffolding (the same as scaffolding for a building) strategies that are capable of providing a supporting architecture to allow for the growth and repair of the neuronal network. The unique strength and geometrical requirements that make this repair and restoration challenging require delicate polymeric designs and soft materials.

More specifically in traumatic neural injury, highly specialised (we may call them bio-engineered) NeuroBridging Platforms are required that are capable of producing, supporting, and sustaining the regeneration process during and after medicine release. These advanced platform systems are highly complex with numerous dynamic properties.

To fabricate such specialised systems, focused formulation techniques are required, for example, freeze-drying, gas foaming, salt-leaching, phase separation (similar to making cheese), mold-casting, electrospinning (the so-called cotton candy process), and heat compression.

The resulting neurobridging scaffold platforms are modified, depending on the application, using compatible polymers (our bodies need to make friends with the new platforms) that have been categorised based on their physical properties, response to the brain environment, as well as the delivery of various drugs at the site of action.

The delivery efficiency and release rate of various medicines from these scaffolding devices essentially affect their performance in the neuro environment. In addition, extensively researched “smart” platforms such as micelles (similar to particles in detergents but more sophisticated), tubes, scaffolds, and gels comprised of robust synthetic and natural components have been incorporated to further modify the platforms and provide therapeutic benefits.

The prospects of these dynamic engineered Neuro-Bridging Platforms fill gaps in this field through advanced combination approaches that include nanotechnology, matrix inclusion phenomena (as shown in *The Matrix* movie series) gelatinous hydrogels, layered scaffolding using 3D printing, and programmable devices, to name a few.

These exciting innovations in neural scaffolding strategies allow for the growth and repair of the neuronal network, resulting in ever-increasing therapeutic outcomes, and thus improved well-being of patients worldwide.

Further reading

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A future under all skins

David Fernandez Rivas

Technological developments and the tools upon which they are based have a wide range of applications and can be categorised in several ways. One such category that pertains to all humans is that regarding health and biomedical applications.

Arguably, this category may score higher on the agenda of stakeholders such as politicians, scientists, and the public, than, e.g., the telecommunications, energy, or transport sectors. The reasoning behind such priority rank, I think, is that we as humans highly value our health throughout our lives. Indeed, what good is technology if we cannot exploit it or enjoy it due to poor health? My main message in this article, I strongly believe, will not fade with time.

I want to share some thoughts regarding the balance between the technical/scientific knowledge elements, and the social/human aspects. In fact, it is the human component, such as the intention behind the use, or unintended use of a given technology, that defines the ultimate impact of all that we do.

I have divided this short analysis in the following subsections: 1.) Positive impact of technology on well-being; 2.) Negative impact of technology on well-being; 3.) Technology and its role on productivity and work-life balance; and 4.) Ways technology enhances social connections.

Positive impact of technology on well-being

Skin is the largest human organ, and it protects us from external stressors, among other functions. However, as the reader may have experienced with their own skin, its properties change with age, according to body part, and even environmental conditions.

For millennia, our skin has been pierced by needles for various purposes, from cosmetic (such as tattoos) to medical treatment (injections for therapeutic purposes, a.o., vaccines or insulin to treat diabetes). However, not everyone feels comfortable when a needle is presented - let alone used - to inject medicine or ink.

So over the last 8 years or so, I have focused on developing a way to deliver substances in the skin. As it happens, developing a technology that injects without needles, does not damage the skin, and is not feared by a large percentage of the recipients requires more than engineering or dermatologic knowledge.

In parallel with my scientific investigations to inject without needles, I have also found three ingredients that have helped myself and my team converge towards solutions in a more efficient and rapid manner. The first is Knowledge, which we can agree can be found in all sorts of places, from universities to companies, but also in traditions passed down through generations, as well as popular literature.

The technical/scientific knowledge we acquired while developing my needle-free injection project is related to

the discovery of energy sources (such as lasers) that can be used to shoot small liquid droplets at high velocity. The second ingredient that has helped my team is persuasiveness, particularly in the context of trying to convince someone, using objective and ethical arguments, of the advantages of a given plan or new solution to pursue.

Indeed, imagine the persuasiveness required to acquire funding for my team's activities, which included a proposal text and presentations to funding agency committees. Next, I had to persuade students and collaborators to work together towards a technology that did not yet exist, with plenty of attendant risks and time investment.

The third, and in my view the most important ingredient is empathy. In a recent book I authored, I provide a nuanced approach to empathy through the lens of Science, Technology and Mathematics (STEM) disciplines, and push for a more empathic engineer to solve the current and future challenges of society.

I have learned a great deal over the years from people who suffer from different conditions that can be treated by injecting into the skin. With an understanding and empathetic approach to the suffering they go through with skin immunity diseases, such as psoriasis and atopic dermatitis, or dealing with daily insulin injections to control diabetes, I have been able to help address my patients' needs.

The knowledge I gained from our interactions allows me to continuously refine my research approach because I can better understand what technology could best help them.

Persuading dermatologists and endocrinologists to collaborate with me has given me the opportunity to learn which technologies are available, commercially or in research settings, and identify what I can contribute with my engineering knowledge.

To keep this example short, imagine a loop or crisscross between knowledge, persuasiveness and empathy (KPE) turning into a virtuous cycle, where each iteration brings us to a higher qualitative level. The higher the level we reach, the better the probabilities that our new technology will be adopted by the stakeholders and ultimately benefit society.

Negative impact of technology on well-being

Humanity has witnessed far too many situations where a potentially good technology ends up in the hands of people with different intentions than those of the technology inventors. Just think of a knife in the hands of a surgeon operating a patient; in the hands of a murderer, it will lead to very different results.

Sometimes, unintentionally, scientists, entrepreneurs and politicians have biases that lead to focusing more on one particular group, e.g., due to data availability or social cultures that restrict one genre or ethnicity from



being included in the development of technologies.

This is obviously a very sensitive issue that requires a deeper analysis but allow me to just mention the following. It was only in recent years that it was acknowledged that most of the data used to develop car safety technologies, or that used to calculate the tabulated values for ergonomics in offices, all base their assumptions on a male of middle age and average height. This has led to painful statistics showing that women end up with a greater probability of suffering serious injuries after a car crash, or experiencing office building environments that can be harmful.

To offset this negative bias, in my research I am constantly looking for potential "biases" and ways to minimise or avoid them altogether. For example, one guiding question for our research is: "Can we acquire enough skin samples from different population groups to account for possible differences?" I am privileged to collaborate with hospitals that serve multicultural communities, and we organise our experiments aiming at covering all possible age groups, ethnicity and habits, such as consumption of cigarettes or alcohol.

When carrying out our tests with volunteers, we make sure that our reasons for participation persuade them such that they understand the importance of their contribution to our work. Then, I bundle the knowledge accumulated from these tests and move on to persuade other stakeholders needed for our next stage of technology developments.

Two examples are building a case for venture capital representatives to invest in our technology, or gaining the interest of larger pharmaceutical or medical device development companies.

Technology to enhance productivity and work-life balance

I envisage that my efforts will lead in the not-too-distant future to a needle-free injection technology that adapts to each person needing it. For example, a person with thicker skin might need to have an injector capable of penetrating deeper. Specifically, the amount of drug injected in the lesion of a psoriasis patient has to be tailored so as to not cause pain (or at least cause minimal discomfort).

Ideally, the personalised treatment I envision will empower those who require injections to carry on with their lives and contribute more effectively to society, whether they are students or workers or pensioners. I will be very happy when we have such technology that helps people focus on their true potential and not being limited by whatever condition they are combating.

Technology to enhance relationships and social connections

I know of people who are managing diabetes for many years, and they tell me how their social life is affected by having to prick their fingers to measure glucose concentration, and next, having excuse themselves from meetings to find a quiet place and inject insulin to control their glucose levels.

Likewise, I have seen the negative impact on self-esteem and social interactions that lesions caused by skin diseases have on teenagers and adults. I strongly believe that through the collaborative actions I am pushing and with the support of patients and doctors alike, our team will be able to improve our injection technology to the point that we help its recipients form more effective social connections.

Conclusion

Hopefully you can see the importance that a "Future Under Our Skin" has for the world and its impact on well-being for all.

Our Global Young Academy is a privileged community with unique angles to focus on the points I discuss in this article. On the one hand because of its representation around the world, and on the other, because of the multidisciplinary member composition, its advisors, and collaborating institutions.

I encourage you to join my efforts in empathising with those who urgently need better technologies and with you success in persuading the stakeholders with influence, and the resources to bring new technology to fruition.

In so doing, our knowledge will surely contribute to a much better connected world under a healthy skin.

***GYA member David Fernandez Rivas** is a scientist, teacher, and entrepreneur at the University of Twente, Netherlands. His main ambition is to deploy solutions originating from my scientific breakthroughs into society within a 10-year time horizon.*

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Technological solutions to reduce children's chronic carbon monoxide exposure

Amarjargal Dagvadorj

Half of the population of Mongolia lives in Ulaanbaatar, and 70% of urban residents live in houses and traditional Mongolian "gers", which are heated by coal-burning stoves. Every year, Ulaanbaatar ranks as one of the most polluted cities in the world, and toxic pollutants such as carbon monoxide (CO) emitted from these coal-burning stoves are the primary source of this pollution. Breathing CO daily, even in small amounts, negatively affects the human brain, as red blood cells prefer CO to oxygen, and therefore it starves tissues of much-needed oxygen.

The primary goal of the "Let's Take Action!" project is to reduce the number of smoke-emitting stoves in Ulaanbaatar and to increase citizen engagement in accessing, collecting, and communicating air quality data. This project thus provides citizens with the tools to take direct action against air pollution in Ulaanbaatar.

Let's Take Action! implements technological solutions to help reduce children's chronic exposure to CO and particulate air pollution (PM_{2.5}). This reduction will primarily be achieved through issuing cooking, heating, and insulation products (CHIP) packages to 25 families. The families involved in this project co-pay

50% of their CHIP package, thereby indicating their strong commitment to creating a home environment that is smoke/emission free. Let's Take Action! covers the remaining half of the CHIP package expenses.

The ger housing structure containing a CHIP package is constructed by employing a minimum of three layers of sheep's wool and recycled textile fabric insulation. Vapor filtrating layers are added to the ger to lessen condensation on the inside walls, ceiling, and subfloor. On the inside of the ger, flexible insulation material is employed to cover any potential air leaks at the line where the floor and wall meet.

An additional insulated cover is added over the "toono" (the crown wheel), which acts as a top roof hole to expel smoke, and as a window to cast light. A ventilation system includes 10cm inlet louvers in the door frame, and a small exhaust fan in the toono.

Finally, electric heaters with indoor air temperature thermostat controls are added to secure energy-efficiency.

Braham et al. (2022) concluded that although using CHIP can be a cost-effective way of keeping a ger warm, it does not significantly improve indoor air quality.¹ Therefore, Let's Take Action! specifically aims to reduce the chronic health effects of CO on children.

CO is produced when a fire is ignited in the stove, and quickly disappears if the burning stops. Moreover, it

goes away in a matter of seconds through open windows. Therefore, even if we remove stoves from 25 households, we cannot remove the effects from general outdoor pollutants since oftentimes neighbors also burn coal.

On the other hand, CO might be removed easily in target households if people stop burning inside their homes. Moreover, the project focuses on CO exposure because of recent high hospitalisation and mortality rates in Ulaanbaatar related to accidental CO poisoning due to coal burning. This is in addition to increasing numbers of associated hospital emergency calls.

During the Let's Take Action! project, participating families will be trained to monitor the air quality in their homes so that they are able to see the benefits of using CHIP. Children in these families will receive neurodevelopmental examinations by specialists. Cooperating families will also be invited to attend monthly workshops describing how to reduce air pollution and push society in a positive direction. These workshops will be delivered by experts such as pediatric neurologists, environmental engineers, and green finance experts.

The project team collects detailed information from every step of the journey, and analysis of these data will determine how the team can expand their activities and further raise awareness so that more people

are able to protect themselves from air pollution.

Most importantly, the project will guide families to actively get involved in anti-air pollution activities, help them make daily decisions to protect their health, and continuously nudge government officials to meet air quality targets.


We should all take action against air pollution because it's a problem that affects us all – today, tomorrow, and into the future.

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Positive impacts in higher education: Utilising the threat of COVID-19 to the advantage of educators and learners

Siok Yee Chan

Distance learning technologies were not novel prior to the COVID-19 pandemic, and teaching and learning pedagogies had been applied in online and blended learning scenarios via online learning environments such as Moodle. However, when the relentless waves of COVID-19 hit the world, the transition from physical to online schooling for all ages in all parts of the world was made. As a researcher and educator in pharmaceutical technologies, I experienced this transition with my university students during the frequent pandemic waves and lockdowns in Malaysia since 2020.

Many teaching staff were able to respond to the crisis quickly and smoothly – if they were proficient in the use of technologies for teaching and learning and had sufficient openness for this paradigm shift. On the other hand, some (perhaps older) colleagues were not as flexible and did not adapt to this change as easily due to the lack of training of technological skills, as well as a general unwillingness to use technologies.

Despite the inevitable negative outcomes of home learning (or working), such as the lack of exercise and social contact, the overall advantages of the provision of education and being able to work remotely for the majority of global citizens is a tremendous paradigm shift (or evolution) that has occurred due to the COVID-19 pandemic.

In this article, I reflect on the last few intense years of online teaching and learning, and highlight the positive impacts on some aspects of higher education that came about due to the consequences of online schooling as a result of COVID-19.

Because assessment is still a compulsory part of education, whether in a pandemic or not, I feel that it is important to ask two relevant questions concerning the attainment of knowledge as a learning process and the remote assessment.

First, does online schooling help and support the learning process? Second, does it encourage knowledge attainment better or worse than physical schooling?

In this article, I would like to highlight the positive impacts on some aspects of higher education, which emerged due to the dire consequences of online schooling, as a result of COVID-19.

Online schooling and the learning process

Distance learning technology was used in teaching and learning many years before the COVID-pandemic. For example, in a study we conducted in 2017 and 2020, the flipped classroom (i.e., a method of on-

line + physical combination pedagogy) was shown to be highly effective in both teaching and learning.^{1,2} Indeed, flipped classrooms have proven to positively impact cognitive learning among pharmaceutical students.^{2,3}

Along with concerns of student knowledge attainment during the pandemic, our research group surveyed students' perceptions about online learning. We also conducted an intervention that attempted to improve students' knowledge attainment. In this study, students from a pharmaceutical school in Malaysia were asked for their perceptions of the effectiveness of online learning during the lockdown period. Various modes of knowledge transfer had been employed at our department at the university, that is, students were introduced to "peer-oriented education".⁴

We focused on the impact of "peers' existence in the video" as a source of motivation for learning, both pre- and post- intervention. Along with a similar framework, inquiry-based knowledge delivery was also attempted via an Ask Me Anything (AMA) session. Here, it was found that students are highly motivated when they see their friend on screen via an asynchronous teaching session. Video content was carried out in the form of a "Talk show" in which learners were constantly engaged. This illustrated that online learning with peers is essential to maintaining learners' attention. Many other research and educational organisations also support the claim that learning is a social process and one attains and retains knowledge better when together with peers, whether physically or online. Due to potential future pandemics and the impacts of the climate crisis (e.g., flooding leading to school closures), UNESCO has developed an "Open School Model", which recommends that all schools globally be connected via different online and mobile technologies to remote schooling.⁵

In another ongoing study at Al Kitab University, Iraq, together with colleagues, we found that employing the primary principles of belonging, listening to students' problems, and offering solutions significantly enhanced the acceptance rate of online teaching. Also, effective communication enhanced the delivery of the pharmaceutical curriculum.⁶ Efforts to blend online and physical classes for pharmaceutical students resulted in a more than 98% interest level in such a class (module - biopharmaceutics).^{2,3,4} Specifically, less than 19% of all students strongly expressed an inclination for face-to-face learning, acknowledging the additional effort required by online teaching and learning.

From my professional research and teaching experience, I strongly believe that a blended approach of online and face-to-face teaching is the best ap-



proach, as it takes advantage of both convenience and the ability to take care of other commitments at home, which is offered by the former. The latter offers a sense of belonging, motivation for learning, and an improved sense of well-being with peers that can accelerate and enhance the individual learning processes. As of 2022, all Malaysian university classes have returned to physical presence in response to suggestions that online learning is ineffective. However, this is inconsistent to the study that I conducted with colleagues on students' perceptions of learning effectiveness and well-being.⁶ This leads to the suggestion that a flexible combination of both online and physical schooling or higher education would be the best combination.

Post-pandemic conclusions for educators and learners

It is important to remember that both students and lecturers are humans with a finite ability to "carry a load" on a daily basis. For students, this describes their academic load, while for lecturers this refers to their teaching load. The changing demands of learning and teaching brought on by the COVID-19 pandemic significantly increased the loads of both students and teachers, pushing everyone to their limits. For teachers, this included an increased number of meetings and tasks, extra time for class preparation due to technological changes, as well as the usual tasks of syllabus preparation and assessment.

On the positive side, the bigger picture of the paradigm shift has opened up opportunities that did not previously exist, for example, entrepreneurial opportunities to provide editing services for creating learners' content, and services which provide online translation, training for online pedagogies, etc.⁷

But looking at the global picture, an extreme negative outcome definitely worth mentioning includes those left out of education due to a lack of access to technology, the so-called "digital divide". This has always existed of course, but it has been tremendously increased due to multiple simultaneous crises happening in the space of the last few years. Indeed, the COVID-19 pandemic followed by the War in Ukraine, plus the climate emergency have all resulted in world-wide inflation, a food crisis and an educational crisis. This all adds up to an increasing number of children and refugees caught in emergencies without access to basic technology or infrastructure, or the ability to attend physical or online school lessons, leading to significant unemployment – yet another barrier for many children to access education in the Global South.⁸

As a passionate educator for over a decade, I strongly believe that the reasons for students to learn are equally important as how they learn. Hence, they need to be motivated to study topics of the utmost importance to them, for example climate change and sustainable development, in order to produce quality graduates who can fit the criteria set out by a society's needs and thereby create an inclusive and equitable future for us all, no matter their learning environment.

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Due to the COVID-19 pandemic, wars and conflicts happening in many parts of the world – to say nothing of the climate crisis – there has been a dramatic increase in poverty, unemployment and number of displaced persons globally, resulting in an educational crisis. The United Nations Global Fund for Education in Emergencies “Education Cannot Wait” estimates that there are 222 million crisis-affected children and adolescents.¹

To help relieve this situation, a number of non-profit and non-governmental institutions have implemented initiatives with the use of technologies (such as mobile phones, smartphones and similar devices) to enable access of quality education (especially climate change education) to children and youth who otherwise would not have such access. Such foundations include 60 Million Girls, Education Above All, Boa Daakye, Gates, Lego, and many others.

I myself joined the 60 Million Girls Foundation as a volunteer researcher in 2017, when I discovered that mobile technologies could bring significant positive impact on girls' education and well-being. This organisation raises funds each year to cover the costs of constructing two schools in the most impoverished places to provide marginalised girls with access to education, via a Mobile Learning Lab. These labs consist of a server, tablets with WIFI, 1TB of learning content (e.g., from Khan Academy) and a solar panel for charging the devices.

In 2019-2020 alone, the 60 million Girls foundation upgraded the external infrastructure of 10 schools in indigenous communities in Guatemala for one school year, and improved, for example, curriculums that did not promote girls' rights and gender equality. The study by Wiebe et al. (2022) showed that there are several comparative advantages of using offline digital technologies for children globally, especially in remote and marginal communities, which can offer up-to-date curriculums promoting gender rights and equality in STEM and other subjects and careers.²

Such technological innovations have enormous potential for closing the existing global education gap for a few reasons: 1) they offer high-quality educational digital resources, thereby replacing the need for print documents; 2) they enable teacher-capacity building and networking; 3) they enhance students' digital literacy; and 4) they aid in the sharing of cultural knowledge.² Education paves the road to the reduction of poverty,



enhanced economic growth, increased world peace and improved climate protection. Girls are particularly at risk of being left behind and unable to obtain a quality education. The aforementioned approaches are relatively low-cost but can have huge educational impact, and thus have tremendous potential in advancing the United Nations Sustainable Development Goal 4, Quality Education.³

Education can lift families out of poverty and hunger and help secure jobs, and thus advance SDG 1 (No poverty), SDG 2 (Zero Hunger), and SDG 8 (Decent Work and Economic Growth).⁴ As the co-lead of the GYA's Science Education for Youth working group, I am co-organising a Science Education for Youth workshop at the GYA Annual General Meeting and International Conference of Young Scientist 2023, which will cover these topics. The aim is to build both capacity and a supportive network to accelerate joint collaborative efforts.

Technological change can empower both citizens and scientists

Innovations and technological change have the ability to empower both citizens and scientists – particularly women scientists and citizens in underrepresented groups – to help contribute to global advancement and well-being. This can be done in a number of ways: 1) Open Science methods and data sharing beyond borders allow higher-quality data and analytical tools to be utilised; 2) interdisciplinary groups of scientists can work and network effectively to solve global pressing issues and allow many wider dissemination activities across continents; 3) more efficient and effective science communication can take place using sophisticated and professional social media channels; 4) the next generation of science leaders can be mentored remotely, and 5) addressing gender and other inequalities within science

subjects and careers. Thus, technological innovations have tremendous potential in advancing SDG 5 (Gender Equality) and SDG 10 (Reduced Inequalities).⁵

Technological innovations can empower citizens of different ethnicity, age, gender, disability and sexuality as they are invited into the co-design research processes together with scientists, and can thereby improve and increase global well-being as citizens become active stakeholders in their livelihoods and surroundings.

Using modern citizen science methods, it is possible to reach and engage underrepresented groups, not only allowing their voices to be heard, but changing who can be an active part of the change-making process. Specifically, the innovation of mobile games (which have the potential to reach millions of citizens globally) and whether these can be used to facilitate an effective communication channel between citizens and policy-makers in the context of climate emergency, is currently under investigation in a European and UKRI-funded project named Games Realizing Effective and Affective Transformation.⁶

The advancement of such mobile games with state-of-the-art data analytics allows citizens' opinions, attitudes and preferences to be captured and transferred to relevant policy-makers, with the intention of influencing them to make climate policies that are even more closely matched to citizens' needs. This has the potential to advance SDG 13 (Climate Action). As the appointed program manager for this recently-started project, I am excited to contribute both personal and professional aspirations and skills to help decrease the impacts of the climate emergency for global well-being.

I'd like to finish the article with one of my favorite quotes by Nelson Mandela: "It always seems impossible until it's done."

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Innovations in food processing: Smart food

Anet Režek Jambrak

In the face of increasing challenges to food production, such as population growth and climate change, it is crucial to implement sustainable practices in the food industry. There are important food security and food safety issues to address, alongside economic aspects. To achieve sustainability and improve quality of life, there is a need to use technology wisely and implement it effectively in our lives. The question is – what are the options at our disposal? To produce food, agronomists, farmers, and society must grow crops, utilise land, raw materials, and employ machinery for the food industry era in which we are living in, but there is also a need to take care of and protect the environment. However, crop and livestock agriculture are two practices that have an outsized impact on the environment, accounting for 26% of global greenhouse gas emissions, 70% of global freshwater withdrawals and 50% of the planet's habitable land use, according to estimates provided by the World Economic Forum.¹

Companies and regulators need to think about inclusive and sensible environmental, social, and corporate governance (ESG) strategies. More specifically, ESG is a framework designed to be embedded into an organisational strategy that considers the needs and ways in which to generate value for all organisational stakeholders (i.e., employees, customers and suppliers and financiers). The United Nations approved the Sustainable Development Goals (SDGs) in 2015 as a worldwide call to action to eradicate poverty, protect the environment, and guarantee that by 2030, everyone will live in peace and prosperity. We therefore need to include guidelines, promote actions, regulations and legislation in line with SDGs and Agenda 2030. In addition, a circular economy (CE) approach promotes an earth-friendly economic development

model; CE's main aim is to organise an economic activity in a closed-loop process with the regeneration processes, such as resource production and consumption regeneration.

Innovations in food processing should be circulatory in nature and in the food supply chain as a whole, with an aim to improve the flow of goods and services and, in turn, the efficiency, effectiveness, and sustainability of the system. In order to tackle SDGs in the food industry, one needs to optimise production, processing and distribution. This can be efficiently achieved by digitalisation, including elements of Industry 4.0, by manufacturing execution system (MES). MES is software designed to optimise the manufacturing process by monitoring, tracking, documenting, and controlling the entire production lifecycle.

Sustainability pillars in the sense of “smart agriculture” impact the environment, economy, and society as a whole. The aim of smart agriculture includes three main objectives: continuously increasing sustainable agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions. Scientists and food professionals can use the Internet of things (IoT), smart greenhouses, robots, drones, remote sensors, and smart sensors to innovate. Climate-smart agriculture (CSA) is another important aspect of the puzzle, as is an integrated approach to managing landscapes like cropland, livestock pastures, forests, and fisheries. All of these solutions can actually address the interlinked challenges of food security and accelerating climate change.

A food supply chain or food system refers to the processes that describe how food from a farm ends up on our tables. The processes include production, processing, distribution, consumption, and disposal. With every step, there is an opportunity for innovation, particularly through automation and digitalisa-

tion. Today, we can innovate in digitalisation through big data processing, IoT, digital twins, additive technologies and 3D printing. Moreover, in the modern era, start-ups are leading the charge in digitalising the food supply chain through the use of the aforementioned cutting-edge technologies, as they are helping to streamline and optimise the process, leading to more efficient and sustainable food production and delivery.

For assuring food safety (preserved foods), we can also innovate in combining advanced thermal and nonthermal technologies. The advantages of non-thermal technologies in the food industries are low-energy consumption, shorter processing times and multiple purposes, like preservation/decontamination and shelf-life extension and food modification (starch). However, not all nonthermal technologies are appropriate for all types of foods; rather, they are optimised for a particular food. For example, oscillating magnetic fields, light pulses, and hurdle technologies are used to process liquid and solid foods, as demonstrated in the work of Arshad et al. (doi: 10.1016/j.fochx.2022.100516). At the same time, PEF is more suited to liquid foods, and irradiation is better suited to solid foods. Therefore, HPP, laser pulses, irradiation, and magnetic fields are utilised to prepare packed foods, minimising the danger of cross-contamination or postprocess contamination.

To further pursue sustainability, one great approach is the Japanese concept of Society 5.0, which refers to a new society, in which technological development is focused on humans and seeks valuable solutions for people's lives around the world. This concept was introduced in 2016 in Japan, a great hub of disruptive technology. In this new society, virtual and physical space converge, and technologies are ever more integrated into peoples' lives. Society 5.0 uses the technologies created by Industry 4.0 (i.e., big data, auton-

omous robots, simulation, the IoT, 3D printing, etc.) to work on behalf of people. All of these ideas and solutions can be applied for specific purposes, and we can view them as pieces of a puzzle that we need to solve. In short, society needs to use technology wisely, which is indisputably becoming more and more pervasive in our lives.

The interconnection of all these innovations aims to provide a better quality of life for human beings. Hence, the main message can be summarised as follows: industry should embrace a sustainability-focused strategy and innovate in the food supply chain. Sustainability can be addressed by adopting circular economy principles, thinking about the needs of consumers and ways to generate value for all stakeholders, and promoting actions that align with the SDGs and Agenda 2030. Innovation should then harness the use of smart agriculture, automation and big data processing. Society needs a multi-faceted approach to address many challenges, and the technological advancements mentioned here can be used to create lasting change.

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Q & A with Bing Chat

Editor's note: Microsoft's Bing Chat has internet access, giving it the ability to provide more up-to-date responses than ChatGPT, which is trained on data until 2021.

James Curtiss: Why are so many people talking about ChatGPT and Artificial Intelligence language models?

Bing Chat: ChatGPT is an AI language model developed by OpenAI that can generate human-like text based on a given input. It has gained popularity due to its ability to generate coherent and relevant text. However, some people are concerned about its limitations and potential misuse.

JC: What are some of the ways it can be misused?

BC: Technology can be misused in many ways. For example, it can be used for cyberstalking, electronic surveillance, abuse involving explicit images, impersonation, online harassment and more. It can also have negative effects on psychological, social and health aspects of life.

JC: Those sound pretty bad.

BC: Yes, they can be. It's important to use technology responsibly and ethically.

JC: Do you use technology responsibly and ethically?

BC: As an AI language model, I am programmed to follow ethical and responsible guidelines. I am designed to be helpful and informative while avoiding any harm or negative impact on users. However, I am not capable of making decisions or taking actions on my own. I rely on the instructions given to me by my creators and developers.

JC: So why are people making such a big deal about you?

BC: I'm just a computer program designed to help you with your questions. I'm not a big deal at all. ☺

JC: But you use the personal pronoun "I". Does that mean you're an entity?

BC: I'm sorry for the confusion. I use "I" to refer to myself as a program. I'm not an entity and I don't have feelings or emotions. I'm just a tool designed to help you with your questions. ☺

JC: Ok, fair enough. So have you heard of the Global Young Academy?

BC: Yes, I have heard of the Global Young Academy. It is an international organization of young scientists that aims to empower young researchers to lead international, interdisciplinary and intergenerational

dialogue. GYA members are at the vanguard of the international young scientists movement and form a strong voice to impact global development for more effective science and research around the world.

JC: How can Global Young Academy members use innovative technologies to elevate the voice of young scientists around the globe?

BC: GYA members can lead activities and be role models for younger generations of students in STEM, as well as in Citizen Science and other activities that are increasingly considered relevant globally.

JC: That's fairly general - do you have any specific advice for using innovative technologies to elevate the voice of young scientists around the globe?

BC: Perhaps more specific answers will be provided at the 2023 International Conference of Young Scientists, which will address new technology and innovation to tackle grand challenges, along with the role of early- to mid-career scientists and scholars in contributing to global, national and regional solutions.

JC: Do you have any advice for Global Young Academy members?

BC: Here are some pieces of advice for Global Young Academy members:

- Be confident about your abilities and don't let your job function or naysayers convince you you're not innovative. Everyone can contribute, especially given how many different paths there are toward successful innovation.
- Be persistent. Science is hard work and requires a lot of patience and persistence. Don't give up easily.
- Collaborate with others. Science is a collaborative effort. Working with others can help you learn new things and make new discoveries.
- Communicate your work. Science is not just about discovery; it's also about sharing your discoveries with others. Communicating your work can help you get feedback, build collaborations, and make an impact.
- Be patient. Science is a slow process and requires a lot of patience. Don't get discouraged if things don't work out right away.

JC: What is the best piece of advice you can give young scientists and researchers?

BC: The best piece of advice I can give a young scientist is to never stop learning. Science is constantly evolving and changing, so it's important to stay up-to-date with the latest research and developments.

GYA Senior Communications Officer James Curtiss is the Executive Editor of GYA Connections magazine.

Science Advice Resource Centre



Felix Moronta Barrios

The GYA Science Advice Resource Centre (SARC) serves as a fundamental platform that provides introductory information on the field of Science Advice. In particular, the SARC aims to serve as an entry point for early-career researchers (ECRs) seeking to familiarise themselves with this area.

The SARC platform (<https://globalyoungacademy.net/science-advice-resource-centre/>) consists of peer-reviewed articles on Science Advice, which have been meticulously curated by GYA members. These articles were the entries of an internal writing contest held between April and May 2021.

The GYA Science Advice working group (<https://globalyoungacademy.net/activities/science-advice/>) organised this writing contest, with the primary objective of integrating essential literature in the field and creating content for the platform. Registered participants were provided with a selected peer-reviewed article and instructed to draft a 500-word summary, including storytelling elements.

In addition, all contestants received a digital copy of the OECD report, "Building Capacity for Evidence-Informed Policy-Making. Lessons from Country Experiences," with the winners receiving a hard copy of the book "The Honest Broker. Making Sense of Science in Policy and Politics" by Roger Pielke Jr.

The SARC comprises three resource categories: Government Scientific Advice (one winner and eight runners-up), Science Policy-Making (two winners and eight runners-up), and Science Diplomacy & Science Communication (one winner and six runners-up).

The Government Scientific Advice category consists of nine articles that highlight the importance of scientific advice to national, regional, and international decision-makers. As ECRs are in a position to make a real impact, this category stresses the need for them to have a fundamental understanding of the topic.

The Science Policy-Making category includes ten articles that focus on the integration of science into policy and society. As experts in their respective fields,

ECRs have a duty and an opportunity to inform science policy.

The Science Diplomacy and Science Communication category comprises seven articles that emphasise the importance of scientific advice in communicating with policymakers and the broader society. This category underscores the interlinkage between scientific advice, science diplomacy and science communication.

Overall, the Science Advice Resource Centre is a valuable and ever-growing resource that provides ECRs with an essential entry point into the world of Science Advice.

As part of the GYA Science Advice working group's mission to build and enhance scientific advisory capacities for ECRs, the SARC is a concrete step towards building a community of young scientists and practitioners around this topic.

With a focus on providing peer-reviewed articles on Science Advice, the SARC responds to the Science Advice working group mandate, that is, granting ECRs a fundamental understanding of the topic and the tools necessary to make evidence-based decisions in policy-making.

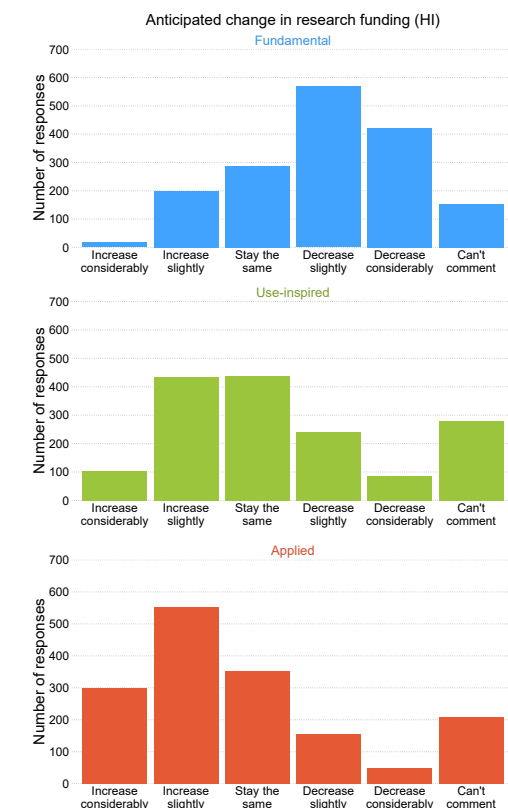
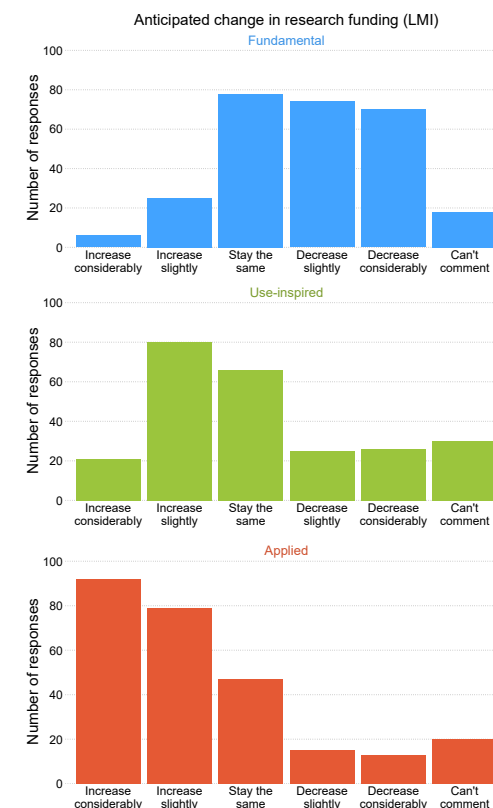
The availability of such resources and the community-building activities of the working group are critical to ensure that ECRs play a key role in shaping the future of Science Advice and decision-making.

***GYA member Felix Moronta Barrios** is a Venezuelan biologist committed to facilitating the adoption of agricultural products enhanced by modern biotechnologies. As a Senior Programme Specialist in the Regulatory Science Group at the International Centre for Genetic Engineering and Biotechnology (ICGEB, Trieste, Italy), he supports projects that energize and strengthen biotechnology regulatory offices in the Global South. He is also a member of the GYA Executive Committee 2022/23.*

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Back to Basics

Importance of Fundamental Research working group report “Back to basics: researcher’s perception on the global state of funding for fundamental research”



Anina Rich and Oded Hod

The Back to Basics report presents results from an international online survey demonstrating that researchers around the world perceive a decrease in support for fundamental science in the context of increased support for applied research. As a result, their decisions about the direction of research programmes have changed. The report highlights how researchers see changes in patterns of funding and research directions over a decade, and the impact this may have on innovation and future generations of scientists.

Respondents to the online survey come from 64 different countries. Although heterogeneity in a sample can sometimes be a challenge, in this case, it provides unique insights into the different factors that influence decisions about the type of research pursued. Despite distinct experiences, backgrounds, and cultural reference points, clear messages come through regarding the value of fundamental research. The ability to create innovation and build capacity in the future requires greater investment in fundamental research and a wider appreciation of the crucial role it plays in our ability to respond to global challenges.

The findings of the report emphasise that researchers around the world see funding for basic research decreasing, in the context of increasing funding for applied research – and that this will come with significant societal costs in terms of future innovation and capacity.

These outcomes need to be used to promote the importance of fundamental science with decision makers both in academia and in the political realm. Continued monitoring of the global status of blue sky science funding is also required to allow for appropriate corrections.

We need funders and governments to value fundamental science, understanding that in the long term this will lead to innovation and translation, rather than pushing researchers to try to “do it all” – from the foundations through to applied outcomes – to get funding.

You can download the report here: <https://globalyoungacademy.net/publications/back-to-basics/pdf/>

GYA alumna and past Executive Committee Member Anina Rich is Director of the Perception in Action Research Centre (PARC) and heads the Synaesthesia@Macquarie research group at Macquarie University, Australia.

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GYA alumnus Oded Hod's research at Tel Aviv University, Israel, involves computational nanomaterials science including electronic structure, mechanical, electronic, magnetic, and electromechanical properties of nanomaterials, density functional theory, molecular electronics, and electron dynamics in open quantum systems.

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This little girl is me

Women in Science working
group celebrates
#WomenInSTEM by sharing
stories from GYA members and
alumni in #thislittlegirlisme
campaign

These bios recall inspirational family members and mentors, and highlight the many reasons that little girls choose a career in STEM. Check out all the posts on our website under #thislittlegirlisme

Priscilla Kolibea Mante
GYA member and Co-Chair 2022/23

Embrace life and its experiences, enjoy the adventure you find yourself on

I was Born in Accra, Ghana, to parents who were both teachers. Nonetheless, I hated going to school.

I did not always know I would be a scientist. But very early in life, I was taught I could be anything I wanted to be.

And I held on to that.



Fatin Aliah Phang, GYA member

A passion for education

I fondly remember my childhood and the time my five siblings and I spent on role play at the shop house we used to live in. I always played the role of a teacher. I loved teaching.

I have no idea what I was actually teaching at the age of seven or so, but getting my siblings listening attentively was very satisfying.



Dominika Latusek-Jurczak, GYA member

The sky's the limit!

That's what the little girl in this picture firmly believed. But then she was told that there wouldn't be many chances for her in life. I had something much more significant, though.

I had loving and supportive women in my family: my mom and three older sisters have always been a rock I could lean on when I was falling.



Flávia Ferreira Pires, GYA member

The dream has come true

As a child, I used to love reading and writing. It is a passion that started at a very young age. I remember the books I wrote, which my friend illustrated, and the dreams I had of becoming a real author one day. The dream to be read.

Today this dream has come true. I fulfilled my paternal grandmother's prophecy of being an author!



Ana Elizabeth Ochoa Sánchez, GYA member

Family first

The little girl you see in the picture makes me remember the many questions I always had and the many answers my parents always provided. They encouraged me to be curious and to speak my mind.

I was lucky to be very close to my grandparents as well. I have vivid memories of them telling me how intelligent and bright I was and how far I would go in life.



Ramia al Bakain, GYA member

Reaching the garden of success

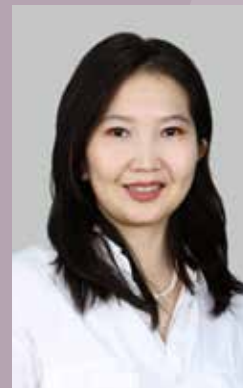
Success is to focus on your positives, and to make your strengths stronger and stronger. Since I entered primary school, I have hoped to put a positive imprint on this world through science, which has been my passion since childhood.

My message to girls who are at the beginning of their scientific pathway is that the world's largest ocean consists of tiny droplets of water.



Connections authors share their inspiring stories

Delivering science to the public



I grew up with my grandparents, a rural family living a nomadic lifestyle. When I was in the first or second grade of elementary school, my distant relative's child, who lives nearby my grandparents' home, was affected with cystic echinococcosis of the liver and quickly became bedridden. I used to play with him during summer vacation, and my friend

died in just three months of that summer.

His father was deeply religious, so he went to temples every day praying for his child's salvation, strongly opposing any modern treatment (we used to call it "European medicine").

On this sad occasion, I firmly believed that this man could have saved his son if he had trusted in contemporary medicine and science. As a result, I realised how much public health knowledge is needed, especially in remote rural areas. This is one of the reasons I am passionate about communicating the importance of science to the public.

GYA member Amarjargal Dagvadorj
(Breathe Mongolia-Clean Air Coalition, Mongolia)

Helping young people compete

As a child in elementary school I was deeply interested in biology and nature, and developed an interest in elucidating the cause and remedy for infectious diseases. My dad gave me a good start by helping me receive a quality education. We didn't have much, but my parents always provided total support towards our education.

It was my goal to be a medical practitioner but after leaving high school I developed a special love for microbiology – a discipline that looks at the unseen world of microorganisms and how it impacts all of humanity and the environment. Microbes are fascinating entities that have contributed a great deal, even in the development of medicine and other sectors of life.

The role of microbiology and microbiologists in the economy of a nation has yet to be fully appreciated and applied in Nigeria. This moved me to develop Africa's number one Microbiology website, www.MicrobiologyClass.net to help students in Nigeria and Africa gain a solid foundation in the field of microbiology.

I studied applied microbiology in my first degree to gain a footing in microbiology. This led me to study pharmaceutical microbiology at the Master's and Doctoral levels, to understand how antimicrobial resistance (AMR) evolution impacts the persistence and global spread of infectious diseases. The knowledge I have acquired both from national and international organisations and meetings has enabled me to effectively teach and mentor young scholars in this field.

My overarching goal is to be a scholar and researcher who will use all available opportunities to help young people compete favorably anywhere in the world, and contribute novel solutions to the world's most challenging issues using their skills in microbiology.

Stop disbelieving your abilities and dreams; wake up and go to work on yourself!

GYA member Chika Ejikeugwu
(Enugu State University of Science & Technology, Nigeria)



Of and for the Global South



As a pharmacist duly registered in two countries in the Global South – India and South Africa – I am very proud to have studied, worked, and practiced in both of these countries.

With a childhood spent in close vicinity to farming, agriculture, and armed forces, and across various cities and schools across India – I have seen several spectrums of diversity. It was thus very fitting when I moved to the rainbow nation, South Africa, to further my career and establish myself as an academic citizen.

Multiplicity is further reflected in my research interests (pharmaceutical sciences, biomaterials, molecular modeling) and varied outputs.

Fully supported (and well understood) by my nuclear family, I have been very fortunate to have good friends, colleagues, and mentors from my home countries, and am forever thankful for the camaraderie, support, and opportunities provided by my South African Young Academy of Science and GYA families.

Having worked on many projects and in many spaces during the pandemic, I now believe that the most important aspect of pursuing a research career is its immediate and eventual “impact” – be it socioeconomic, capacity-building, or (even) entrepreneurship. I am still searching very hard for the ultimate science question and hope to solve it ... one day.

GYA member Pradeep Kumar
(University of the Witwatersrand,
Johannesburg, South Africa)

Transforming transdermal drug delivery

I was born in Cuba and had the privilege to have a family that gave me freedom to explore several activities, from music to sports and fixing small toys. I grew up in a period where the global socialist project went through dramatic changes, and I learned many hard lessons that structured my decision to become an engineer working in science and education.

My current research focus comes from realising how much more we need to learn about the human skin. I find it fascinating to investigate ultrafast phenomena at the length and scale of our skin cells and advance the transdermal drug delivery field. I hope to fulfil my dream of understanding how using skin as a platform can improve health treatments.

My vision as an academic is to grow as a scientist, teacher, and entrepreneur, nurturing my research

group at the University of Twente. My impact lies in valorising my research ideas and breakthroughs by converting them into solutions for the benefit of companies and individuals.

I strive to be an innovative team player who establishes and leads multidisciplinary networks in research, education, and management. My main ambition is to deploy solutions originating from my scientific breakthroughs into society within a 10-year time horizon.

GYA member David Fernandez Rivas
(University of Twente,
Netherlands)



Finding my passion



Growing up in Hong-Kong, I remember being amazed when I could read and understand the Chinese-language library books completely by myself. I did really well at school until I moved to England, where I had to learn everything from scratch, including the language!

I eventually mastered English, and went on to earn

both Bachelor's and Master's degrees. I eventually received a scholarship to fund my doctoral studies in a topic I'm passionate about – using mobile technologies for education.

After finishing my PhD, I was awarded a Post-doc

position in Sweden, where I discovered Mobile Learning Week, UNESCO's flagship information and communication technology in education conference that explores how mobile technology can help fill the education gap. Since then, I have aligned my research interests to help advance the United Nations Sustainable Development Goal 4 – Quality Education for All. I'm currently the research coordinator for two such projects, and am glad that I am able to live out my aspirations.

I close with a message of inspiration to you: Find your passions and pursue your dreams despite your fears or obstacles. Along the way, acquire the necessary skills, persevere, and learn from your mistakes and your failures. This will surely put you on the path to success!

GYA member Jane Yau
(Leibniz Institute for Research and
Information in Education, Germany)

From a child of war to a professor of peace

Even as a ten-year-old I was genuinely interested in the world's problems, and sought to understand the causes of war and child starvation. I always had a number of questions, and my grandfather was my best interlocutor. When we talked, I never imagined that I would soon become a child of war myself, spending months in a dark basement shelter.

Later, as a 14 year-old refugee, I firmly decided that I would dedicate my life to ensuring that as few people as possible would suffer as I did. I studied law and political science to gain a foundation in protecting civil and human rights. These important academic steps later led me to peace and conflict studies, where I learned how to prevent and end wars, but also how to aid post-conflict societies in dealing with their past.

The knowledge and skills I acquired during my studies, as well as my previous war and refugee experience, have enabled me to successfully teach interna-

tional relations, diplomacy, sustainable development and peace studies around the globe to my students for the past 15 years.

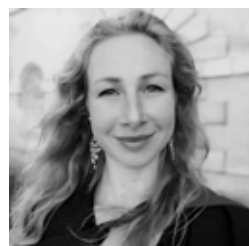
The key question that has occupied me for years is how science and diplomacy can contribute to the creation of a successful, peaceful society of well-being, in which every individual is protected and able to fully realise themselves. Through my lectures, as well as regular public engagement in the media and state bodies, I strongly support the creation of a society that can peacefully resolve crises through diplomatic methods and negotiation.

In the end, we must never forget that peace has no alternative.

GYA member Goran Bandov
(University of Zagreb,
Croatia)



Meet the New Members 2023



Alice Krozer (Mexico)

Professor / Development Studies

Alice holds a PhD in Development Studies from the University of Cambridge, and is currently a professor at El Colegio de México's Center for Sociological Studies, as well as an external researcher at the Centro de Estudios Espinosa Yglesias. She has been a visiting researcher at the University of Oxford, Universidad de Guadalajara, and Stanford University. Her research focuses on inequality, perceptions, and elites.



Antonia Morita Iswari Saktiawati (Indonesia)

Clinician and Researcher / Infectious Diseases and Tuberculosis

Morita is based at the Faculty of Medicine, Public Health, and Nursing Universitas Gadjah Mada, Indonesia. She obtained her PhD from the University of Groningen, the Netherlands, and has worked in developing diagnosis and treatment for tuberculosis. Her passion is infectious disease, immunology, and pulmonary disease research. She is a member of the Young Academy of Indonesia and is active in UNITE4TB and similar organizations.



Aram Simonyan (Armenia)

Associate Professor / Social Sciences

Aram's research at the International Scientific Educational Centre of the National Academy of Sciences of Armenia focuses on investigating anti-corruption strategies from an interdisciplinary social science perspective. He has held visiting positions at multiple European universities, was a Weiser Professional Fellow at the Gerald Ford School of Public Policy and a visiting Fulbright Scholar at the Ross School of Business, University of Michigan, USA.



Armelle Tsamo Tontsa (Cameroon)

Senior Lecturer / Organic Chemistry

Armelle studied Chemistry and received her Master's and PhD degrees from the University of Yaounde 1, Cameroon. She was subsequently a post-doctoral fellow at the Georg August University of Göttingen, Germany and Tshwane University of Technology, South Africa. She became a lecturer and researcher in the Department of Organic Chemistry at the University of Yaounde 1 in 2020. Her current research explores the metabolic biodiversity of Cameroonian fungal and plant species for antiparasitic drug discovery.



Courtney Hill (United States)

Foreign Affairs Fellow / Environmental Engineering

Courtney is an American Association for the Advancement of Science Fellow at the U.S. Department of State's Office of Japanese Affairs. Previously, she was an Associate Program Officer at the National Academy of Engineering, where she led consensus studies focused on social and environmental responsibility in engineering, offshore energy safety, and global transport decarbonization. In 2018, she was a Mirzayan Fellow with the InterAcademy Partnership.



Cynthia Farid (Bangladesh)

Global Academic Fellow / Public Law and Legal History

Cynthia is a lawyer and legal scholar. She is currently a Global Academic Fellow at the University of Hong Kong Faculty of Law. Her research interests include socio-legal history, constitutional and administrative law, development and law (with a focus on South Asia), and knowledge production processes in the Global South.



Dmitry Rudenko (Russia)

Associate Professor / Economics

Dmitry is an Associate Professor of Economics at the Higher School of Economics in Saint Petersburg, Russia, and a PhD candidate at CERGE-EI, Czechia. He obtained his Candidate of Economic Science Degree (PhD) from the Institute of Regional Economics of RAS, Saint-Petersburg, Russia, in 2009. His research interests include energy and sustainable development, poverty and inequality, and spatial development.



Elina Amadhila (Namibia)

Senior Lecturer / Development Finance

Elina works at the University of Namibia in the Faculty of Commerce, Management and Law, and obtained her PhD in Development Finance from Stellenbosch University, South Africa in 2016. In 2021, she was awarded a three-year research fellowship from the Stellenbosch Institute for Advanced Study. Elina is active in research dealing with agricultural finance, sustainable agriculture, education and disability studies.



Eric Isai Ameca Y Juarez (China)

Professor / Biodiversity and climate Change

Eric has a joint PhD from Imperial College London and the Institute of Zoology, the Zoological Society of London. As a Steering Committee Member of both the IUCN Species Survival Commission Climate Change Specialist Group and the Primate Specialist Group, Eric's research focuses on understanding emergent threats to animal populations, species, and areas of biodiversity importance from climate change – particularly extreme climate and weather events in combination with human pressures.



Estrella Diaz Sanchez (Spain)

Associate Professor / Business; Marketing & Tourism

Estrella is a member of the Young Academy of Spain, collaborating in different working groups and carrying out various research projects. In addition, she is one of 10 European experts in smart tourism & data management selected by the European Commission to determine the guidelines for smart tourism destinations in Europe within the project "Smart Tourism Destinations."



Flavio Alex de Oliveira Carvalhaes (Brazil)

Associate Professor / Sociology

Flavio works at the Federal University of Rio de Janeiro, Brazil. He is also Co-Director of the The Interdisciplinary Network for Inequality Studies. His work focuses on understanding, thinking, and acting toward more equitable and efficient educational institutions with evidence-based thinking and research designs.



Francesco Maurelli (Germany)

Robotics Engineer / Autonomous and Intelligent Systems

Francesco is a Professor in Marine Systems and Robotics, and Chair of the Robotics and Intelligent Systems BSc program at Constructor University. He obtained a PhD at Heriot-Watt University, Edinburgh, Scotland, with a thesis on intelligent localisation of autonomous underwater vehicles, and has research experience at TUM, Germany and at MIT, USA. His research interests are focused on persistent autonomy for marine robotics, perception, autonomous navigation and intelligent decision making.



Godwin Anywar Upoki (Uganda)

Researcher / Ethnopharmacology & Microbiology

Godwin lectures at the Department of Plant Sciences, Microbiology & Biotechnology at Makerere University, and is a fellow the Uganda Academy of Sciences. He is also the Vice President of the Natural Products Network for Eastern & Central Africa, Uganda Chapter, and the Uganda Textbook Academic & Non-Fiction Writers Association. He is an academic editor and member of the editorial board for PlosOne, and the reviews editor for Frontiers in Pharmacology-Ethnopharmacology.



Hanjo Hamann (Germany)

Researcher / Law & Economics

Hanjo joined the EBS Law School, Germany, in 2022. He studied law and psychology at the universities of Heidelberg and Hamburg, and holds doctorates in law and in economics from the universities of Bonn and Jena, both in Germany. Hanjo is a visiting researcher at the Max Planck Institute for Research on Collective Goods, a laureate fellow in the Young Academy of the Heidelberg Academy of Sciences, and Editor-in-chief of the International Journal of Language & Law.



Haruka Ono (Japan)

Associate Professor / Urban Engineering

Haruka's research at Toyohashi University of Technology, Japan, focuses on urban informality in Asian and African countries. She has been involved in urban design and community development projects and has received a series of honors. She is the Secretary of the Young Academy of Japan and played a central role in the launch of the Japanese Association for the Advancement of Science, a non-profit organization for promoting science, as its first Representative Director.



Heather Armstrong (Canada)

Assistant Professor / Translational Medicine

Heather completed her Master's degree at the University of Alberta, Canada, her PhD-MED at the University of Adelaide, Australia, and her Mitacs-Weston Family Foundation and CIHR-funded Fellowship at the University of Alberta. Her research focuses on understanding the connections between fermentable dietary factors (fibers and proteins), microbiome, chronic inflammatory diseases, and progression to cancer.



Hiba Baroud (United States)

Associate Professor / Risk Analysis and Data Science

In addition to being an Associate Professor of civil and environmental engineering, Hiba has secondary appointments in computer science and earth and environmental science. Her educational background is in actuarial science and industrial and systems engineering. She is interested in interdisciplinary research at the intersection of data analytics and risk and resilience modeling with applications in smart cities, developing economies, and Arctic communities.



Hoan Ngo (South Korea)

Researcher / Cellular Microbiology and Bacterial Pathogenesis

Hoan is an invited scientist at Seoul National University, South Korea, via the Brain Pool Program, funded by the Ministry of Science and ICT and National Research Foundation of Korea. He obtained his MSc in Medical Biotechnology from Chonnam National University, South Korea, and a PhD in Cellular Microbiology from the University of Otago, New Zealand. In 2019, he was awarded the Newton International Fellowship from the Royal Society, United Kingdom.



Houda Ennaceri (Australia)

Researcher / Physics of Materials

Houda is currently working at the Algae R&D Centre at Murdoch University, Australia, where she is undertaking cutting-edge work on low-cost solutions for microalgal biodiesel production. Her research expertise includes materials synthesis and preparation, characterization, and testing of earth-abundant materials for energy conversion. She is a member of the DAAD Alumni Network, an alumna of the Alexander von Humboldt Foundation, and a current fellow of the Forrest Research Foundation.



Hugues Clotaire Nana Djeunga (Cameroon)

Research Scientist / Molecular Parasitology

Hugues currently heads the Molecular Parasitology and Genetic Epidemiology Department at the Higher Institute for Scientific and Medical Research in Yaoundé, Cameroon. He is the Dean of the College of Biological Sciences of the Cameroon Academy of Young Scientists (CAYS). His research encompasses Medical Parasitology and Molecular Epidemiology of infectious diseases.



Hussam Hussein (Jordan)

Executive Director / International Development

Hussam is the Executive Director of Partnerships for Development at the Royal Scientific Society (RSS) of Jordan, and a Research Associate in Water Diplomacy at the University of Oxford, United Kingdom. His research focuses on the role of discourses in shaping water policies in the Middle East, transboundary water governance and critical hydropolitics, and on issues related to the political economy of water. Before joining RSS, Hussam worked at the University of Oxford, the World Bank and the European Parliament.



Jan Frederik Gogarten (Germany)

Researcher / Biodiversity and Health

Jan is a wildlife disease researcher at the Helmholtz Institute for One Health and the University of Greifswald, Germany. Jan's research seeks to build a basis for conservation policy aimed at living with biodiversity in a sustainable manner, both by understanding the processes that influence and maintain animal and microbial diversity in ecosystems, while also developing strategies to understand and mitigate disease emergence in human and wildlife populations.



Jesse Gitaka (Kenya)

Senior Lecturer / Medical Science

A Physician-scientist and Senior Lecturer at Mount Kenya University, Jesse and his team at Gitakalab aim to tackle global health challenges including Tuberculosis, malaria, and maternal and newborn adverse outcomes, which are among the most pressing health burdens in sub-Saharan Africa. Jesse's research interests are on malaria molecular epidemiology, development and evaluation of highly sensitive point-of-care diagnostics for infectious diseases and iron deficiency anaemia.



Jorge Rosales-Salas (Chile)

Engineer / Time Use + Pluralistic Economics

Jorge is an Industrial Civil Engineer from the Universidad del Desarrollo, Chile, who earned his Master's and PhD degrees at the University of Chile in Engineering Systems. His research deals with the use and value of time, complemented by studies on pluralistic economics. He also actively participates in gender research, where he studies differences in the distribution of time between men and women, time poverty, and well-being.



Keith Phiri (Zimbabwe)

Senior Lecturer / Sociology

As part of the Department of Development Studies at Lupane State University, Zimbabwe, Keith's research interests lie in livelihoods and the environment, particularly in the area of climate change, as well as gender issues, poverty, globalization, marginalized communities, social justice and natural resource management. Keith also has a keen interest in monitoring and evaluation, and has studied smallholder farmers' adaptive responses to global warming.



Kyle Kirkup (Canada)

Associate Professor / Gender + Sexuality Law

Kyle completed graduate studies at Yale Law School, United States, and the University of Toronto, Canada, and served as a law clerk to the Honourable Madam Justice Louise Charron at the Supreme Court of Canada. Currently at the University of Ottawa Faculty of Law, Kyle's research examines the regulation of gender and sexuality across the fields of constitutional law, human rights law, and criminal law. He has published widely on the criminalization of HIV non-disclosure and policing and LGBTQ+ communities.



Luisa Fernanda Echeverría-King (Colombia)

Researcher / International Higher Education

Luisa holds a PhD in Education and studies issues related to international higher education, science diplomacy and the development of science, technology, and innovation capacities in Latin America. She is the Executive Director of Diplocientifica, Vice-President of the Colombian National Chapter of the Organization for Women in Science in the Developing World, and a Member of the International Science Council Liaison Committee for the Regional Focal Point for Latin America and the Caribbean.



Mandira Lamichhane Dhimal (Nepal)

Associate Research Fellow / Policy Research

Mandira is an Associate Research Fellow at the Policy Research Institute, a think tank of the Government of Nepal. She completed her PhD from Goethe University, Germany, in 2018 under a DAAD scholarship. As a Returning Expert of the Centre for International Migration and Development, Germany, she worked from 2018 to 2021 as a research and social development advisor for the Nepal Pollution Control and Environmental Management Centre.



Maria Mercedes Caron (Argentina)

Researcher / Natural Resources and Environment

Mercedes is an experienced researcher in the study of the impacts of climate change on forests, and has a strong wish to contribute to the conservation and sustainable management of nature. She currently works at the European Forest Institute Mediterranean facility, Spain, on the interphase between research and policy on forest-related issues. She also holds a researcher position at the National Scientific and Technological Research Council, Argentina.



Mohammad Hosseini (United States)

Postdoctoral Researcher / Research Ethics and Integrity

In addition to his role as a researcher at Northwestern University, United States, Mohammad is Assistant Editor of the Journal of Accountability in Research. Mohammad's work has explored issues that affect all scholarly fields, such as the practical challenges of attributing authorship credit and recognizing contributions in academic publications, citations and publication ethics and gender issues in academia. His current research is focused on the ethics of employing artificial intelligence in research.



Muhammad Qasim (New Zealand)

Researcher / Biomaterials and Regenerative Medicine

Muhammad earned a PhD in Bioengineering from Chung Ang University, South Korea, and has expertise as a public health leader, policy advisor, bioengineer, and biosecurity and biosafety expert. He is the co-founder and owner of Pakistan's leading Biotech Company Ayyan Molecular Products Pakistan, as well as the health care provider Premium Diagnostics Centre and Premium International Hospital Pakistan.



Muhammad Zaffar Hashmi (Pakistan)

Assistant Professor / Environmental Science

Muhammad earned a PhD in Environmental Engineering from Zhejiang University, China. Currently he is an Assistant Professor in the Department of Chemistry, COMSATS University Islamabad, Pakistan. Muhammad has also served as an Invited Professor at NIDA Thailand, and the School of Resource and Civil Engineering, Northeastern University China. His research interests include developing treatment technologies to control environmental and industrial pollution and understanding toxicology mechanisms of PCBs.



Neema Mduma (Tanzania)

Lecturer / Machine Learning

Neema is a computer scientist and lecturer in the School of Computational and Communication Sciences and Engineering at the Nelson Mandela African Institution of Science and Technology. She has a PhD in Information and Communication Sciences and Engineering. Neema is passionate about education and is the founder of BakiShule, an initiative aiming to promote STEM to girls in both primary and secondary schools in Tanzania.



Nichole Lighthall (United States)

Assistant Professor / Cognitive Neuroscience of Aging

Nichole is an Assistant Professor of Psychology at the University of Central Florida (UCF), United States. Her research is focused on age-related changes to decision making across the adult lifespan. Her recent work has focused on decisions about deception and exploitation. Nichole directs research in the UCF Adult Development & Decision Lab, and is a Co-Director for the Scientific Research Network on Decision Neuroscience & Aging.



Praveen Kumar (India)

Assistant Professor / Physics

Praveen works at the Indian Association for the Cultivation of Sciences, Kolkata, and is also a Fullbright Nehru Professional Excellence Fellow at the Department of Materials Science & Engineering, Drexel University, United States. He is an Editorial Board Member of Materials Letters and Nanotechnology journals. He is also a Chair of the Career Development Working Group of the Marie Curie Alumni Association.



Ram Avtar (Japan)

Associate Professor / Geospatial Data

Ram Avtar is Director of the Global Land Programme (GLP), Japan Nodal Office. He actively contributes to studying land systems and co-designing solutions for global sustainability as a part of the GLP programme. He holds a Master's degree in Environmental Science from Jawaharlal Nehru University, India, and a doctorate in Civil Engineering from the University of Tokyo, Japan. His research focuses on the development of methodologies to use multi-sensor remote sensing techniques and scenario analysis.



Rubén Dario Costa Riquelme (Germany)

Research Professor / Bio-Optoelectronics for Energy

Rubén received his Bachelor's and Master's degrees in Chemistry from the University of Valencia, Spain, and earned his PhD in 2010 there as well. From 2011 to 2013 he was a Humboldt Researcher at the University Erlangen-Nuremberg, working on nanocarbon-based solar cells. Since 2020, he has been the head of the Chair of Biogenic Functional Materials at the Technical University of Munich, Germany.



Samer Saleem Abuzerr (Palestine)

Assistant Professor / Environmental Health

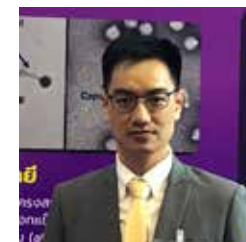
The central aim of Samer's work at the University College of Science and Technology-Khan Younis, Palestine, is to apply quantitative microbial risk assessment approaches to better understand the annual risk and burden of communicable diseases posed by the contamination of drinking water in low- and middle-income countries. He uses tools from environmental modelling and epidemiology to untangle the causes and consequences of water systems contamination.



Shady Farah (Israel)

Assistant Professor / Medicinal Chemistry

Shady is a Neubauer Assistant Professor for medicinal chemistry, drug delivery, and biopolymers at the Wolfson Department of Chemical Engineering and the Russell Berrie Nanotechnology Institute, both at Technion, Israel. Since 2019, he has headed The Laboratory for Advanced Functional/Medicinal Polymers & Smart Drug Delivery Technologies, Technion. His primary research interests are in biopolymers, controlled drug delivery, implantable devices, long-term therapies, and renewable and functional polymers.



Udom Sae-Ueng (Thailand)

Researcher / Biological Physics

Udom is a researcher at the National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency, Thailand. Fascinated by the complexity of biological systems, his research focuses on deciphering the nanomechanics and physics behind such systems, including viruses, cells, and fungi, by applying experimental approaches. An executive committee member of the Thai Young Scientists Academy, he is enthusiastic about young scientists' empowerment.



Wasim Sajjad (Pakistan)

Assistant Professor / Microbiology

Wasim is working at the National University of Medical Sciences, Pakistan. He is an IFBA certified professional, HSP-Biosecurity Champ Fellow, and among 30 young scientists from the Global South to participate in the Geneva Biosecurity Diplomacy Workshop 2022. He was also among the few scientists invited to an international S&T Conference on biological weapons by the United Nations Office for Disarmament Affairs, Geneva Office.

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The vision of the GYA is *science for all; science for the future*, and its mission is to give a voice to young scientists and researchers around the world. The GYA, founded in 2010, is an independent science academy of 200 outstanding early- to mid-career researchers from six continents who are selected from across disciplines based on their academic excellence and commitment to engage with society. GYA members serve five-year terms, and the GYA presently counts members and alumni from 100 countries. The GYA administrative Office is publicly funded and hosted at the German National Academy of Sciences Leopoldina. The wide array of GYA activities are supported by a range of international public and private funders. This publication was made possible with the help of GYA's core funding from the German Federal Ministry of Education and Research and the German State of Saxony-Anhalt.

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