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Transformation

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Editorial

by Jane Yau and Tomislav Meštrović
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The intricate interplay between society and the realms of science, technology and innovation is a dynamic and reciprocal relationship. Society acts as a mold, shaping the trajectory of scientific and technological advancements, while, in turn, these advancements become powerful catalysts for societal transformation. Consequently, this relationship unfolds as a two-way street – contributing to positive shifts often associated with "social progress" and, at times, unveiling challenges that necessitate careful consideration.

From technological advancements that reshape our daily interactions to medical innovations that enhance our well-being, the power of science fuels transformative shifts in our society. This means there is a need for a profound exploration of connections between societal dynamics and the realms of science and technology. It necessitates a comprehensive understanding of how societal values, aspirations and challenges are interwoven with scientific and technological advancements. Moreover, it underscores the ethical imperative of guiding these innovations in a manner that aligns with the broader goals of fostering positive societal change.

Consequently, this issue of GYA Connections accentuates the power and interconnectedness of different scientific domains, illustrating that their collective impact extends beyond the confines of individual fields. We invite you to read original contributions dealing with sustainable, large-scale tidal energy operations and social-ecological transformation. You will also encounter genuine ideas on transforming the future in STEM, and we encourage you to delve deep into accountable multi-sectoral data platforms.

We see this issue of Connections as a call to recognize and leverage the transformative power of knowledge for the greater good. In a world marked by uncertainty, science emerges as a beacon of progress, a catalyst for positive change. Together, let us embrace the evolving transformative power of science, forging a path towards a future defined by innovation, collaboration and a collective commitment to a better and more sustainable world.

Jane Yau (Leibniz Institute for Research and Information in Education, Germany)
GYA Connections Co-Editor-at-Large
Email: jane_yau@yahoo.com

Tomislav Meštrović (University North, Croatia)
GYA Connections Co-Editor-at-Large
Email: tmestrovic@unin.hr

Social-ecological transformation for a sustainable future

Mercedes Caron

We stand at a pivotal moment in history, facing unprecedent social and environmental crises. These challenges call for the application of novel approaches to solve them. In this context, ecology plays a key role helping societies to study, understand, manage, and restore nature, thereby securing its contributions to people. Nature contributes to society in many ways, including provision of the following: essential goods like food, water, and raw materials; services such as pollination, climate regulation, and soil fertility; and cultural benefits such as spiritual enrichment, recreational opportunities, and aesthetic pleasure.

However, nature can also present challenges such as excessive water and flooding, or extreme heat and drought, all of which can lead to damage or harsh experiences. In essence, nature's contributions to people can be understood as the vital role of ecosystems in supporting human development, offering a wide array of tangible and intangible benefits that sustain livelihoods, cultures, health, and overall quality of life for societies around the globe.[1]

Nature's contributions to people are frequently considered as a crucial component of a future envisioned for humanity and, to make this future possible, ecology plays an essential role. Ecology can enhance our understanding in several areas, for example, the resilience of ecosystem services or the links between ecosystem change and natural disasters. However, it can also contribute to the development of environmentally sound technologies and systems. These advancements ensure the continued provision of nature's contributions to people and foster decision-making approaches that account for the evolving relationship between humans and ecosystems.

However, despite the key role of the ecology, tackling complex contemporary socio-ecological problems requires interdisciplinary collaboration among ecologists, social scientists and decision makers. Together, these fields should help to formulate positive and plausible visions of the relationships between society and ecosystem that can potentially sustain nature's contributions to people over the long term.[2]

These visions of a better future in which societies and ecosystems develop in harmony are especially needed. While doomsday predictions can be necessary, they often do little to inspire people or encourage proactive steps towards creating a better world.[3] Transforming our future for the better starts with an evocative vision of our potential destination. Recognizing that better decisions stem from better visions, it is essential to incorporate ecological perspectives.

These perspectives are crucial in guiding societies towards eco-social integration, a key step in our transformation.[2]

Without any doubt, transformations in the direction of more harmonious relationships between societies and ecosystems necessarily involve political-strategic aspects, including the capability to intervene into ongoing socio-political, economic, institutional, and technological transformation processes, as well as providing transformative knowledge in different settings.

Therefore, a more solid understanding of those dynamics that hinder a transformation towards sustainability is needed.[3] Revolutionary approaches such as those supported by the concept of social-ecological transformation, where progress is redefined through a lens of harmony between society and nature might be the cornerstone for progress in the direction of a sustainable future.

The concept of social-ecological transformation refers to a shift in societal systems and practices towards sustainability, resilience, and a more amicable relationship between human society and the environment. It involves rethinking and reconfiguring the ways we live, produce, consume, and interact with nature. Social-ecological transformation acknowledges the interdependence between society and the environment, aiming to create a balanced, resilient, and sustainable system that benefits both. It is a multifaceted approach that requires collaboration across various sectors, including government, businesses, communities, and individuals.

The ecology of transformations encompasses a diverse array of methodologies and approaches that enable the navigation of change and sustainability. One of the most frequently used approaches is Resilience Theory, which is often associated with social-ecological systems and which focusses on understanding the dynamics of complex systems. The theory delves into how societies and ecosystems interact, adapt, and transform in the face of disturbances, emphasizing the ability to absorb and adapt to change.[4]

Another relevant field is Sustainability Science, which focuses on the dynamic relationship between humans and the environment, particularly on the vulnerability, robustness, resilience, and stability of the coupled human-environment system and attempts to find pathways toward a sustainable future. This field encompasses diverse disciplines such as ecology, economics, sociology, and policy studies to create strategies for a more sustainable world.[5]

A further interesting approach frequently applied in social-ecological transformations is the Complex Adaptive Systems approach, which recognizes that societies and ecosystems are complex adaptive systems where multiple variables interact in nonlinear ways. This approach examines how these systems adapt, self-organize, and change over time.[6]

One of the cornerstones of socio-ecological transformation is the application of Transdisciplinary Research, where researchers work across disciplinary boundaries, combining different areas of expertise to tackle complex problems. This collaborative approach is not limited to the work of scientists, but also involves stakeholders, policy makers, and local communities in the process of knowledge creation and problem-solving.[7] Therefore, this approach represents a significant advancement, moving beyond strictly scientific methods to more comprehensive processes. These processes include key actors who are directly invested in solving socio-ecological problems and bring diverse sources of knowledge and perspectives to the discussion.

The preceding points underscore the pressing need for significant shifts in socio-economic, political, and cultural domains, going beyond incremental steps in specific areas such as climate change and biodiversity policies. Moreover, the process of transformation is far from linear. Rather, it grapples with intricate, multidimensional systems and potential tipping points. While technical innovation is vital, it is not exhaustive and social innovation is fundamental to socio-ecological transformation.[8]

The type of transformation needed for the development of more harmonious relationships between society and ecosystems relies on multidisciplinary collaborations that pave the way for fundamental insights that drive the transformation of society's relationship with nature. However, achieving this transformation will require not only multidisciplinary research, but also transdisciplinary approaches.

The current unparalleled environmental crisis presents an opportunity to pursue a "Social-Ecological Transformation". This approach advocates for a paradigm in which scientists from various disciplines collaborate with stakeholders.

Together, they should steer progress towards sustainability by fostering collective change. By fostering transdisciplinary collaboration, it is possible to envision a future in which human efforts converge harmoniously with thriving ecosystems, which might be the needed step towards crafting the blueprint for a sustainable future.

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GYA member Mercedes Caron (European Forest Institute – Mediterranean Facility, Spain) currently works on the interphase between research and policy on forest-related issues. Mercedes holds a researcher position at the National Scientific and Technological Research Council (IMBIV-CONICET-Argentina) focussing on the regeneration of woody species of the Chaco region in the face of climate change.

Email: mechicaron@gmail.com

Healthcare in Africa - traditional medicine and how it is surviving the times

Priscilla Kolibea Mante

Traditional medicine maintains a strong position in Africa even as cities grow and things become more modern, and its unique beliefs and practices aim at treating health in a holistic way. Ancient rituals and important community figures play a big role in this practice. Even though Western influences bring challenges, traditional healers change and keep going, proving how things can transform while still holding on to their essence.

Africa is home to a great number of indigenous cultures, each of which have their own beliefs, practices, and approaches to disease treatment.[1] And although these practices differ from one group to the next, they are known collectively as "African traditional medicine".[2] These practices have been vital to various ethnic groups on the continent for generations. From the Maasai in the east to the Zulu in the South, traditional medicine remains an important part of healthcare in Africa.

At the heart of African traditional medicine are important figures such as mallams, priests (akomfour), healers, shamans, and herbalists.[2] These individuals are seen as holders and protectors of ancestral wisdom. They wield knowledge passed down, often orally, through generations, and use a blend of plant, fruit, animal and natural remedies (backed by supernatural rituals) to treat patients. Their role is crucial to their communities as they have been in charge of maintaining well-being for generations. For example, in Kenya the "ababari emetwe" (traditional surgeons) of the Kisii ethnic group have been performing craniotomy.[3]

In Kumasi, the second-most important city in Ghana, traditional medicine thrives despite the rapid rate of urbanization. Here, herbalists hold a sacred role, providing guidance and healing to those in need.[4] Even as western medicine becomes more accessible, traditional remedies continue to be sought after. Many people prefer to use both methods, or they turn to one when the other proves inadequate.[5] The herbal markets of Kumasi are always busy with activity. On most days, the air is filled with the aroma of different herbs and roots, which are often displayed in colourful stalls to attract the many residents seeking remedies for their ailments.

Most indigenous cultures in Africa maintain a close relationship with nature. They regard themselves as guardians of the environment and try to live in perfect harmony with it.[6] On a continent so rich in

medicinal plants, from the potent properties of the African potato to the healing effects of aloe vera, this relationship is needed to maintain balance. Traditional medicine relies on a profound understanding of the plant kingdom. If you consider factors such as the old Akan women in West Africa who can predict pregnancy in the early stages from examining hands and feet, an argument can also be made that traditional medicine has an even deeper understanding of human anatomy.[7]

The spiritual aspect of traditional medicine cannot be overstated. In many African societies, diseases are believed to be the result of imbalances in the spiritual or ancestral realm.[8] Traditional healers therefore serve as bridges between the physical and metaphysical worlds. In most places, these healers begin treatment by asking for guidance from their ancestors. While using plant-based remedies to treat physical symptoms, they also address the spirit with ritual.[8]

Traditional medicine in recent times

Although traditional medicine remains common in Africa, it has not been immune to change. Both westernization and urbanization present challenges and inspire significant growth. As western medicine and pharmaceuticals become more accessible in cities, traditional practices decline.[9] African traditional medicine often finds itself at odds with Western medicine. It is mostly dismissed by the medical and academic communities as superstitious and unscientific. Even when the botanical aspect is absorbed, the spiritual aspect is still met with a lot of skepticism. This tension between old and new ways of healing continue to shape the landscape of healthcare in Africa.[9]

Change and heritage

Traditional medicine continues to show remarkable resilience as it adapts to today's challenges. Healers are opening up and working together with modern healthcare professionals. Some are even choosing to undergo formal medical training.[1] These collaborations promote a more peaceful coexistence between age-old practices and contemporary methods. Also, many in African cities continue to trust in traditional practices and healers. This strong connection keeps traditional medicine relevant to modern urban life.

In a continent of vast cultural diversity, the story of disease treatment through traditional methods continues to fascinate many. It is a tale of culture and resilience. A tale that respects the past but looks to the future. A constant dance between heritage and progress. Although filled with pride, African traditional medicine is not too set in its ways to ignore essential change, and continues to evolve with the times as practitioners adapt their methods to cater for the needs of today's world.

This is a potent reminder that traditional societies keep growing, adjusting and overcoming challenges.

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GYA member and Co-Chair 2022-2024 Priscilla Kolibea Mante (Kwame Nkrumah University of Science and Technology, Ghana) is a neuropharmacologist with expertise in drug discovery and neurogenetics. She has a Ph.D. from the Kwame Nkrumah University of Science and Technology, Ghana, and postdoctoral training from the University of Michigan, United States. Her research focuses on developing better therapeutic options for resistant epilepsy by reducing diagnosing costs and improving therapy based on patients' genetics.

Email: priscilla.mante@globalyoungacademy.net

The threat of antimicrobial resistance as a catalyst for sustainable societal change

Tomislav Meštrović

Antimicrobial resistance (AMR) stands as one of the most pressing global health challenges of our time, threatening to reverse many of the medical advancements made over the past century.

Scientists are well aware how the emergence and spread of AMR can swiftly jeopardize the efficacy of antibiotics and other antimicrobial agents, rendering once-treatable infections increasingly cumbersome to manage, and resulting in an ever-growing burden of morbidity and mortality.[1,2] Hence, addressing AMR requires not only advancements in medical science and technology, but also a truly profound societal transformation.

Societal dynamics play a pivotal role in the emergence and dissemination of AMR. Factors such as antimicrobial misuse and overuse, inadequate infection prevention and control practices, inadequate sanitation and hygiene, as well as limited access to quality healthcare contribute to the proliferation of resistant microorganisms.[3] Across the world, marginalized populations and indigenous communities tend to experience higher rates of poverty and encounter barriers to accessing adequate healthcare services, while in other corners of the world, antibiotics are overly prescribed.[4] Thus, to develop a successful worldwide approach to combating AMR, it will be crucial to guarantee fair, leveraged and equitable access to antibiotics and healthcare services universally.

And indeed, healthcare systems around the world have found themselves compelled to undergo substantial evolution. This primarily pertains to their approaches in implementing salient infection control measures and educating healthcare professionals on the newest developments in the field. One important development was the AWaRe classification developed by the WHO's Expert Committee on Selection and Use of Essential Medicines.[5] This categorization system segments antibiotics into three groups: Access, Watch, and Reserve. Consequently, the AWaRE system serves as a significant instrument for enhancing prescription guidelines and promoting antibiotic stewardship initiatives globally.

The AWaRe classification undergoes updates every two years (primarily aimed at monitoring antibiotic usage and setting benchmarks). In practice, this results in many of the adopters of the AWaRE classification witnessing substantial transformation within their healthcare systems.[5] More specifically, it has led to the development of institutional antibiotic stewardship programs, which prompted a more judicious approach to prescribing antibiotics, in turn reducing their unnecessary usage. The implementation of the

AWaRe classification has also facilitated the monitoring and surveillance of antibiotic usage by monitoring antibiotic consumption, resistance patterns, and antimicrobial stewardship interventions.[5] Such data-driven approaches enabled very proactive AMR management at the local and regional levels, but also enabled evidence-based decision-making in healthcare delivery. Going forward, developing and utilizing similar approaches will be indispensable to make a more profound impact.

Recognizing the urgent need for action, societies have increasingly prioritized initiatives aimed at raising awareness and educating the public about the responsible utilization of antibiotics, which is mostly done through well-designed public health campaigns. A recent systematic review indicated that effectively crafted public health initiatives have the potential to notably enhance outcome measures associated with AMR.[6] However, it is pivotal to integrate transparent assessment methods into the planning phase of forthcoming campaigns. In other words, a framework for evaluating campaigns, tailored for campaign developers, could aid in achieving this goal.[6] Likewise, education campaigns stand as indispensable pillars in our collective approach to combatting AMR, leading to informed decision-making among healthcare professionals and the general population alike.

Of course, community engagement stands out as a highly promising avenue for instigating behavioural shifts towards combating AMR, particularly within low- and middle-income nations.[7] The strength of this approach lies in its capacity to provide a personalized touch, empowering communities to formulate solutions that resonate with their unique circumstances. However, it is noteworthy that existing community engagement initiatives predominantly focus on human-centric factors and drivers fuelling the demand for antibiotics.[7] This narrow scope overlooks various other dimensions contributing to the exacerbation of the AMR crisis – such as the overuse of antibiotics in agriculture and veterinary medicine – thereby neglecting crucial facets that have propelled this issue to unprecedented proportions.

This means that any comprehensive approach to addressing AMR has to acknowledge its interconnectedness with human health, animal well-being and the environment – a concept known as One Health. Societal transformation efforts must embrace a "One Health Governance", which represents a comprehensive strategy involving the development and implementation of policies and mechanisms designed to encourage a unified and synchronized strategy for tackling health issues that intersect human, animal and environmental health domains.[7,8] Such a multifaceted concept recognizes the intricate interconnections among these realms and underscores the ne-

cessity for collaborative and interdisciplinary efforts to effectively navigate and prevent health risks that transcend traditional boundaries.

Consequently, within the realm of academia, there is indeed a significant possibility to spearhead the formation of a global framework for One Health.[8] Such a framework would serve as a blueprint or a guide, offering invaluable insights and benchmarks for countries seeking to fortify their governance structures. Through collaborative efforts across academic institutions, researchers can contribute to the development of mechanisms and policies that facilitate coordinated action and effective communication among stakeholders. Moreover, by leveraging their expertise and research findings, academics can play an indispensable role in shaping the future of One Health approaches, promoting innovation and driving progress in addressing complex health challenges on a global scale.

A consensus-driven method aligned with international standards is essential for guaranteeing the effectiveness and coherence of One Health governance frameworks that would be introduced.[7,8] By adhering to internationally recognized principles and guidelines, governance structures can facilitate harmonized action and promote alignment with shared objectives and priorities – in turn driving a societal transformation for curbing AMR.

Consensus-building processes involving diverse stakeholders can help to forge common ground and overcome potential conflicts or disagreements.[8] Moreover, by incorporating feedback and insights from a wide range of sources, governance mechanisms can be refined and adapted to address emerging challenges and changing circumstances effectively.[8] Finally, equity considerations should be fully taken into account to address disparities and promote inclusivity.

All of this means that societal transformations should also encompass changes, and agricultural practices are responsible for the spread of AMR. For instance, reducing the use of antibiotics in agriculture production, improving waste management practices to minimize environmental contamination with antimicrobial agents, and promoting sustainable agricultural practices can help mitigate the emergence and dissemination of resistant pathogens.[7]

Recent research also points towards the impact of anthropogenically-induced factors such as fluctuations in temperature, degradation of soil fertility, heightened levels of soil salinity, and the presence of contaminants like pesticides and metals in facilitating the evolution and spread of AMR.[9] These environmental stressors, exacerbated by human activities, are increasingly recognized as significant drivers shaping the dynamics of antimicrobial resistance across ecosystems, and thus have to be taken into account.

Promoting progress in research and innovation endeavours can be seen as a cornerstone in the ongoing quest against AMR, as it paves the path for the development of cutting-edge diagnostics, new antimicrobial agents and innovative treatment approaches.[10] However, achieving meaningful strides in the fight against AMR requires more than scientific breakthroughs alone, as demonstrated here. In that regard, societal transformation entails dismantling structural barriers that impede equitable access to these ground-breaking innovations, particularly in resource-constrained settings where access to healthcare resources may be limited.

Efforts to foster research and innovation should be complemented by a comprehensive approach that ensures the affordability and sustainability of new antimicrobial technologies on a global scale. By prioritizing accessibility and affordability, we can ensure that the benefits of scientific advancements in the field of antimicrobial research are accessible to all, regardless of geographical location or socioeconomic status – maximizing in turn their impact in the global battle against AMR.

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GYA member Tomislav Meštrović is a medical doctor with a PhD degree from the University of Zagreb, a Master's of Public Health degree from the London School of Hygiene & Tropical Medicine, and an MBA degree from the Frankfurt School of Finance & Management, Germany. Tomislav is currently an Associate Professor at University North in Croatia, and an Affiliate Associate Professor at the University of Washington School of Medicine. He is also the GYA Connections Co-Editor-at-Large 2022-2024.

Email: *tmestrovic@unin.hr*

STIRring tidal energy: Integrating societal values for holistic sustainability

Lekelia Danielle Jenkins

Engineered solutions are key for achieving sustainability. However, we often struggle to create technologies that are materially, environmentally, economically, and socially sustainable due to barriers in integrating societal concerns into research and development and logistical constraints on researchers.

Achieving sustainability in energy systems needs an interdisciplinary, societally integrated approach, which the Sustainability of Tidal Energy (STE) project, based at the University of Washington, aimed to do (more here: http://depts.washington.edu/pmec/docs/20140700_KawaseM_poster_STE.pdf) by engaging researchers from engineering, biophysical sciences, and social sciences. Tidal energy systems harness renewable energy from tidal currents to generate electricity using turbines. However, inadequate integration of human dimensions and unresolved engineering and scientific questions have hindered the development of sustainable, large-scale tidal energy operations.[1,2,3,4]

For instance, a proposed tidal energy project in Puget Sound, Washington, United States, met unforeseen stakeholder concerns, leading to legal disputes and project abandonment. Currently, tidal energy design remains diverse, with no standardized options, leaving room for social and environmental considerations to influence the designs. The STE project embarked on a journey to make engineering designs more holistically sustainable by applying Socio-Technical Integration Research (STIR) in combination with future visioning (a process of considering the possible social, environmental, economic, and other implications of decisions, such as various engineering options) through scenario analysis.[5]

Socio-Technical Integration Research

STIR is a collaborative method shown to enhance the integration of societal goals and values into technical decision-making. While such integration naturally occurs during research, STIR supports and enhances the process in real time.[6] The question STIR investigates is how to align technology development with public values by supporting researchers to consciously adjust their decisions based on these values. Ideally, the consideration of social implications should be an integral part of engineering research, with the outcome being improved research decisions.

Erik Fisher of Arizona State University, United States, developed STIR to assess the possibility and utility of integrating societal concerns directly into nanoscale research and development as mandated by an unprecedented U.S. law.[7,8] The first pilot study of STIR placed an "embedded humanist" – or STIRer – in an engineering laboratory for 12 weeks.[7] The study found that "engineering research decisions were subject to societal influences" and that engineering researchers became "aware of the possibility of modulating their decisions accordingly". Increased awareness also led one engineering researcher to "alter several decisions", thus decreasing perceived future risks to environmental and human health.[9] Subsequently, STIR has been deployed worldwide in dozens of laboratories and organizations working on various emerging technologies. These studies show increased reflection by researchers, the shaping of research direction, and other utilities of collaboratively enhancing integration.[7,9-16] Moreover, U.S. scientific bodies have recognized the promise of STIR to transform research.[17,18]

STIR employs a decision protocol (Fig. 1) to structure collaborative interactions, and employs midstream modulation to analyze results, where midstream modulation is a process of learning and adjustment that unfolds in three iterative phases:[9,11]
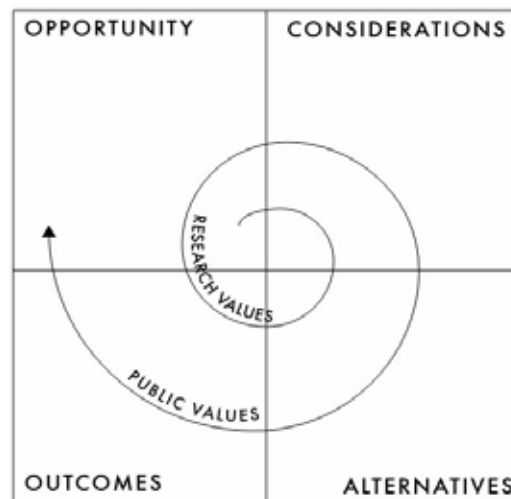

Figure 1. Decision Protocol with an arrow indicating conversation flow[19]

• De facto modulation, where a variety of cognitive, affective, and societal factors influence research projects.[16]

• Reflexive modulation, where researchers become more aware of the factors influencing their decisions.

• Deliberate modulation, where researchers change their practices (e.g., material, behavioral or strategic) after reflecting on the societal factors' impact on their decisions.

Midstream modulation naturally occurs in research, and STIR is used to probe this process.[7] The primary technique for probing midstream modulation is collaboratively mapping decisions in real-time using the decision protocol. The decision protocol consists of four steps to map opportunities (events that set a decision in motion), considerations (criteria that de-

termine the response to the opportunity), alternatives (options for responding to the opportunity), and outcomes (actual or anticipated results of selecting an alternative given the considerations) of research decisions.[7]

The protocol is structured but flexible, with the STIRer probing the researcher (STIRee) with questions and completing the decision protocol based on the responses. The discussion can cover various research-related topics, the order of discussing the quadrants can vary, and quadrants can be revisited to add information. Since STIR typically spans 12 weeks, the same decision may be discussed multiple times to capture how the decision-making process evolves. The discussion typically expands from research values to public values as the quadrants are revisited.

In the study, an adaptation of the approach, termed team-based self-STIR, was piloted to institutionalize STIR in research teams. In this context, technical experts implement STIR themselves without the need for an embedded humanist. This adaptation has since been employed in other settings.[20,21] The present research aimed to assess whether team-based self-STIR yields reflexive learning and goal-directed modulation.

While the study followed all the steps of the original STIR approach, it differed in several key aspects. The study lasted six months, with 12 non-consecutive weeks of decision protocols, providing flexibility for the research team's schedule. The research team began with an informed perspective, as they were already considering how human dimensions could impact tidal energy design. Notably, the STIRer (a graduate student) and STIRee (principal investigator of the STE project) had a different relationship than is typical in STIR, both sharing a disciplinary background in mechanical engineering, working together

on the future visioning research project, and having an advisor/advisee relationship.

STIR modes: From elicitation to collaboration

Initially, team-based self-STIR faced challenges and appeared ineffective. The STIRee became disinterested in the conversations, and the STIRer exerted excessive effort in creating engaging, meaningful questions. Rather than enhancing their discussions on decision-making, both sides found the STIR protocol to be cumbersome.

Several factors contributed to these initial roadblocks. First, the STIR and future visioning activities were kept separate as distinct research lines. Second, the STIRer asked the STIRee about broad, highly technical decisions influenced by many members of the research team, leading to more time spent on background explanation than collaborative mapping and reflection. Similar initial challenges have been encountered and overcome in other STIR studies, where the STIRer is a short-term visitor. However, for members of the same research team, especially between a graduate student and professor, expectations for the junior team member's training and project familiarity can be more pronounced and at first called into question the efficiency of the approach.

The initial issues with team-based self-STIR were evident in a recurring conversation about turbine rotor types. There are many tidal turbine rotor types, with the most common resembling typical (horizontal axis) wind turbine blades. When the STIRer first asked about rotor types, the STIRer struggled to broach the topic, and the STIRee had difficulty answering. The STIRee stated that he had not been "thinking much about that question". However, he had thought a lot about this topic but hesitated to discuss it because he had not reached a final decision. The next time the

question of rotor types arose, a discussion did ensue, but the STIRee hedged his responses, and both found it challenging to deal with uncertainty in the topic. Thus, the conversation stayed mainly within the STIRee's area of expertise (engineering) and on the aspects of the topic that were most well-established.

After grappling with the knowledge and power imbalance between the graduate student (STIRer) and the faculty member (STIRee), the pair had a breakthrough. They decided to concentrate the STIR decision protocols solely on the future visioning research they were collaboratively engaged in. This focus on their shared research helped bridge the knowledge and power gap, significantly enhancing the dynamics of their partnership. The STIR conversations became more natural, flexible, creative, candid, deliberate and profound. The roles of STIRer and STIRee blended, and they intuitively shared responsibilities, with either person prompting protocol steps and jointly populating the protocol with responses. The resulting STIR conversations became more useful by broadening the scope of the future visioning research, expanding the values considered, and expanding options for possible futures. For example, when revisiting the discussion of rotor types, the conversation extended beyond engineering and technical issues to include economic, social, and environmental considerations. The conversation also contemplated new alternatives and demonstrated an increased capacity to deal with uncertainties and cross-domain considerations.

Benefits of team-based self-STIR

While STIR and future visioning were separate research activities, STIR positively shaped the language in the future visioning process. "Issues" became "considerations" when contemplating a design option's economic, environmental, social and technical dimensions. "Problems" became "alternatives".

Once the pair integrated STIR and future visioning, STIR became a method to brainstorm for future visioning, expand research considerations and alternatives, and include diverse stakeholder perspectives. The initially intended approach to create one tidal energy scenario evolved into creating several scenarios by mixing and matching three rotor types and three foundation types to create three future vision scenarios. Later, the idea progressed to allow any rotor options to match any foundation options. The pair also decided to convene a stakeholder workshop on future visions attended by biology, regulation, engineering, navigation, fishing, and industry experts. The goal became to incorporate a range of perspectives and debate, in real-time, the merits and drawbacks of different options for sustainable tidal energy systems. This was unanticipated at the initiation of the future visioning research and showed the power of STIR to evolve research objectives and activities.

STIR proved beneficial in regulating the pace of conversation, allowing for thorough consideration of options and preventing the premature selection of one option as "the answer." The process of expanding both alternatives and considerations was instrumental in breaking free from routine thought patterns and fostering innovative thinking. For example, the consideration of extreme scenarios led to insights about mooring cables for tidal turbines. The pair initially framed the opportunity as how to manage the buoyancy for mooring (i.e., restricting the location) of tidal turbines. With this framing, desirable alternatives would add further mooring cables. However, the STIRee mentioned a stakeholder concern about whales' entanglement or collision with cables, so the pair reframed the opportunity as how to reduce the risk of whale collisions, leading the pair to sketch a mooring design with fewer cables.

The pair also applied STIR to refine the framework for evaluating tidal energy systems holistically. Initially, the pair delineated considerations as social, environmental, economic, or technical, but the final approach allows for a spectrum (e.g., socio-environmental through techno-economic). This spectrum of considerations led to a design philosophy by which the research team considered different design options in an integrated and holistic manner.

These outcomes show material (e.g., the evolution of the holistic design framework), behavioral, and strategic forms of practical adjustment. A behavioral practical adjustment brought a workable research structure that combined the STIR and future visioning research lines. Examples of strategic practical adjustment included keeping design options open, planning a stakeholder workshop, the extension of the future vision exercise from a summer project to thesis research, and influencing the STIRee's future interdisciplinary research approach.

In retrospect, the initial frustrations in applying team-based self-STIR arose from unexamined assumptions about the process. However, the benefits realized in this experience highlight the value of STIR as an approach for executing integrated and interdisciplinary research. This application of team-based self-STIR suggests that engineers can institutionalize STIR within their labs. To overcome pitfalls encountered in the study, it may be helpful to focus STIR on decisions related to a shared tangible research goal, minimize asymmetries in the STIRer/STIRee relationship, provide STIR training for the whole research team (rather than just the STIRer), and transition from embedded humanists to team-based self-STIR progressively. These adjustments can hasten the realization of STIR's benefits and promote an open-minded, flexible approach during the early stages of team-based self-STIR.

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Educational and societal transformation to advance the UN SDGs

Jane Yau

The challenges of our times have a fundamental effect and impact on our daily, school and working lives. For example, mis- or dis-information has serious effects on democracy by manipulating public opinion on issues such as the climate crisis. Equally as troubling, the increasingly widespread use of generative artificial intelligence (GenAI) systems can automatically (and stealthily) create texts of all sorts, which can eliminate the need for learners to write their own assignments and thus adversely affect the learning process.

So are current school pupils who will enter the workforce in coming years obtaining the required skills in today's school systems to collectively build and maintain a sustainable future and planet for all? And is there anything that can be done to combat mis- and dis-information, which has a potential detrimental effect on democracy? This article will explore these issues.

According to the World Economic Forum, science, technology, engineering and mathematical (STEM) skills will be needed in 75% of jobs by 2050, and such skills are necessary in order to collectively build and maintain a sustainable future and planet for everyone.[1]

To help equip learners with these necessary skills, an educational transformation is needed to change parts of the existing curriculum from being based on gaining knowledge to acquiring skills.[2] It must be pointed out that knowledge acquisition can be considered redundant, as technology – especially GenAI – can create "knowledge" instantly. So instead, learners should be much more focused on acquiring skills such as scientific literacy as well as digital and AI literacy (to overcome misinformation).

Scientific literacy skills for every learner should be gained in every school, so that each person can critically think through information that is being presented, that is, whether it is correct or potentially incorrect, or raises any potential red flags. If citizens are able to interpret basic empirical evidence like this, it could increase public trust towards science, for example relating to vaccines, climate change and public health.

The aim is to collaboratively build a better future using technological innovation to mitigate multiple crises and challenges in today's world. A scientifically literate society is more likely to advance knowledge and medical progress, have a better understanding of environmental needs, and make informed decisions relating to public policy, healthcare, global collaboration, and the United Nations Sustainable Development Goals (UN SDGs).

Harnessing AI for the good

In a technology-driven world, digital and AI literacy is necessary to understand how these technologies affect ethical, copyright and equitable concerns. Unfortunately, as of 2022, only 15 countries have developed & implemented government-endorsed AI curricula in schools.[3] For older workers and citizens, special programmes for gaining such skills should be provided either at workplaces, community centres, or other educational institutions.

AI and mobile technologies have the potential to bridge educational, digital and curriculum divide and gaps.[4] With the power of AI, it is even easier to personalize learning and provide adaptive learning paths for different learners, and this is especially important in places where there is a lack of a sufficient number of teachers available to students. In terms of providing local language support, AI can easily break down language barriers by providing real-time translation services and educational content for students with different native languages.

By using computer-assisted technologies and AI, a more inclusive learning environment can be created, which can adapt to students with learning disabilities, and diverse and multilingual classrooms would be possible.[1] More fun, skills-acquisition-based projects mapped to real world problems – especially those contributing to sustainable development – can be implemented in schools with the support of GenAI, and thereby not place additional workload on teachers.

Such hands-on projects should aim to develop and reinforce various learner competencies such as critical thinking, collaboration, inquiry, communication, and leadership skills. Related to this, there has been a significant increase in global mental health problems especially in youth, and every school needs to take action to drive positivity and provide flexible and inclusive education, which can help reduce stress and anxiety for students with different abilities.[5]

Therefore, many creative types of learning scenarios and assessments should be created based on the acquisition of skills, which could require relatively low levels of workload if they incorporate GenAI technologies. Even using gamified assessment simulating real-world scenarios could make them more engaging and less stressful for evaluating a range of skills and competences.

Challenges and concerns

So what are some of the key challenges of GenAI in relation to SDG 4, Advancing Quality Education for All? One of the key challenges is that GenAI can worsen digital poverty, especially in the Global South and indigenous populations. This is because

many of the largest international technology companies that create GenAI are based in the United States, China, and Europe, meaning that most AI models have been trained with data reflecting the values and norms of the Global North. This makes GenAI models inaccurate when used in more disadvantaged communities in the Global South (and the Global North as well). Thus, the technology can further marginalize already disadvantaged people.

Overall, SDG4 can only be achieved if digital tools such as GenAI are made inclusive and accessible, and if, by design, they advance equity, linguistic diversities and cultural co-existence. In particular, AI-enabled tools should be inclusive in their handling so that people with disabilities or special needs can use them.

Another key challenge is developing guidelines for the validation of GenAI systems to ensure that there is no gender bias, discrimination against marginalized groups, or hate speech or other inappropriate content embedded in the data or algorithms. Models should be trained with representative data of diversity (in terms of gender, disability, social and economic status, ethnic and cultural background, and geographic location).[3]

Using education to address the climate crisis

Climate change education should be taught in every school to raise global awareness and help foster an understanding of causes, consequences and dynamics, which is essential for collectively mitigating and reducing the effects of climate change as a global collaborative effort.

Informed citizens are more likely to advocate for and support policies that address climate change. This can also increase democracy and can protect individual and human rights, especially in minori-

ty and underrepresented groups. Informed citizens are in general more open to innovation and diverse perspectives for building a sustainable and resilient society.

In the European Union and UK Research and Innovation-funded project "Games Realising Effective and Affective Transformation" (GREAT), the aim is to use games to reach citizens in order to enhance their dialogue with policy-makers and/or governments concerning mitigation of the climate emergency.[6]

The project aims to reach 300,000+ citizens via short quiz games, which will be placed inside popular games as a playable advert in return for game rewards. These games will seek players' opinions and attitudes relating to climate policy. The data will be anonymized, analysed and transferred to policy-makers with the aim of influencing them to enforce policies more suited to citizens' needs.

These large quantitative datasets will be complemented by qualitative data collected by a collaborative dilemma games approach, where smaller groups of citizens will be invited to participate for a longer duration of time to collectively solve an authentic challenge that they may face such as opting to use sustainable heating. The dilemma games are designed with different narratives, branching and options, so that players can deeply reflect and see the possible consequences of their choices.

This project is currently ending its first year of pilots, and in its second year will begin collecting large datasets from citizens in collaboration with the United Nations as a first series of substantial case studies within G20 countries; the game has been made available in 21 languages.[7]

Global citizens

Another set of skills that could be learned in every school relate to global citizenship, that is, empowering students to understand, appreciate and engage with the world and its different citizens in a responsible and ethical manner.[1] This may not eliminate all causes of wars and conflicts but could very well help contribute to the prevention of conflicts in some cases by promoting deeper empathy and understanding of diverse perspectives, cultures and backgrounds.

The curriculum for global citizenship could include aspects such as cultural literacy, understanding global challenges such as climate change and how that affects poverty, unemployment, inequality, migration, and so on. Additionally, such a curriculum would require practicing cross-cultural communication by connecting students from different parts of the world to work on projects together and share experiences.

We currently have advanced technologies such as AI-supported communication platforms, virtual classrooms, and online collaboration tools. Why not use them to create realistic simulations and Virtual Reality experiences for immersing students in different cultural contexts and global scenarios, and training them in conflict resolution and negotiation skills that will help resolve conflicts peacefully, rather than having to resort to violence?

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GYA member Jane Yau (Leibniz Institute for Research and Information in Education, Germany) is an Advisory Committee member of the Smithsonian Science Education Center, a member of the ALLEA Science Education Consultative Working Group, as well as a co-lead of the GYA Science Education for Youth WG and the GYA and the UN SDGs Incubator. She is currently a Visiting Researcher at the UNESCO Institute for Lifelong Learning, Hamburg, Germany, and is Co-Editor-at-Large of Connection 2022-2024.

Email: jane_yau@yahoo.com

Implementation and deployment of multi-sectoral data platforms in Niger: Towards a better statistical culture

Ibrahim Sidi Zakari

Accessing quality and current data poses a daily challenge for both decision-makers and citizens eager to oversee the execution of public policies across various administrative levels, be they national, regional, departmental, or municipal.

Until recently, the Agadez and Tahoua regions in Niger grappled with this issue due to a lack of dedicated online platforms to showcase local data, the only exception being the National Health Information System (DHIS2 Niger) deployed by the Ministry of Public Health, which unfortunately remained inaccessible to the public.

Under the initiative "Strengthening Subnational Data Value Chains", backed by the African Population and Health Research Center (APHRC) and spearheaded by the Abdou Moumouni University of Niamey since March 2022, Agadez (housing 6 departments and 14 communes) and Tahoua (with 12 departments and 44 communes) have each received a DHIS2 Niger-based platform.

These platforms encompass several sectors simultaneously, particularly agriculture, education, population and migration – identified through participatory means as critical areas. Routinely updated, these platforms are accessible not just to practitioners and decision-makers but also to the citizenry. The adaptation of DHIS2 Niger to sectors beyond health was greatly appreciated by the project's implementers and beneficiaries. Furthermore, this adaptation positions Niger among the few African countries capable of extending DHIS2 Niger to domains such as education (see Figure 1, page 28).

The selection of DHIS2 Niger (which is available in several languages) as a basis for platform development is justified by its seamless integration capabilities with other systems. DHIS2 Niger excels in tasks ranging from data collection, entry, and quality verification to real-time data analysis and visualisation. Its personalised user account management, flexibility for source code modification, and robust feedback mechanisms further validate its suitability. Additionally, DHIS2 Niger offers effective data sharing and dissemination channels, while its mobile version proves highly advantageous for remote areas with limited or no internet access.

Moreover, DHIS2 Niger's widespread usage across all health centres in Niger presents a significant advantage, streamlining the adoption and utilisation of these platforms at the local level.

The sector dashboards can, for example, serve multifaceted purposes. They enable decision-makers to efficiently pinpoint trends and emerging issues, facilitating the formulation of tailored solutions. Moreover, these dashboards are instrumental in the preparation of implementation or monitoring/evaluation reports for the Regional Development Plans (i.e., RDP 2022-2027). This mirrors the existing practice of utilising health
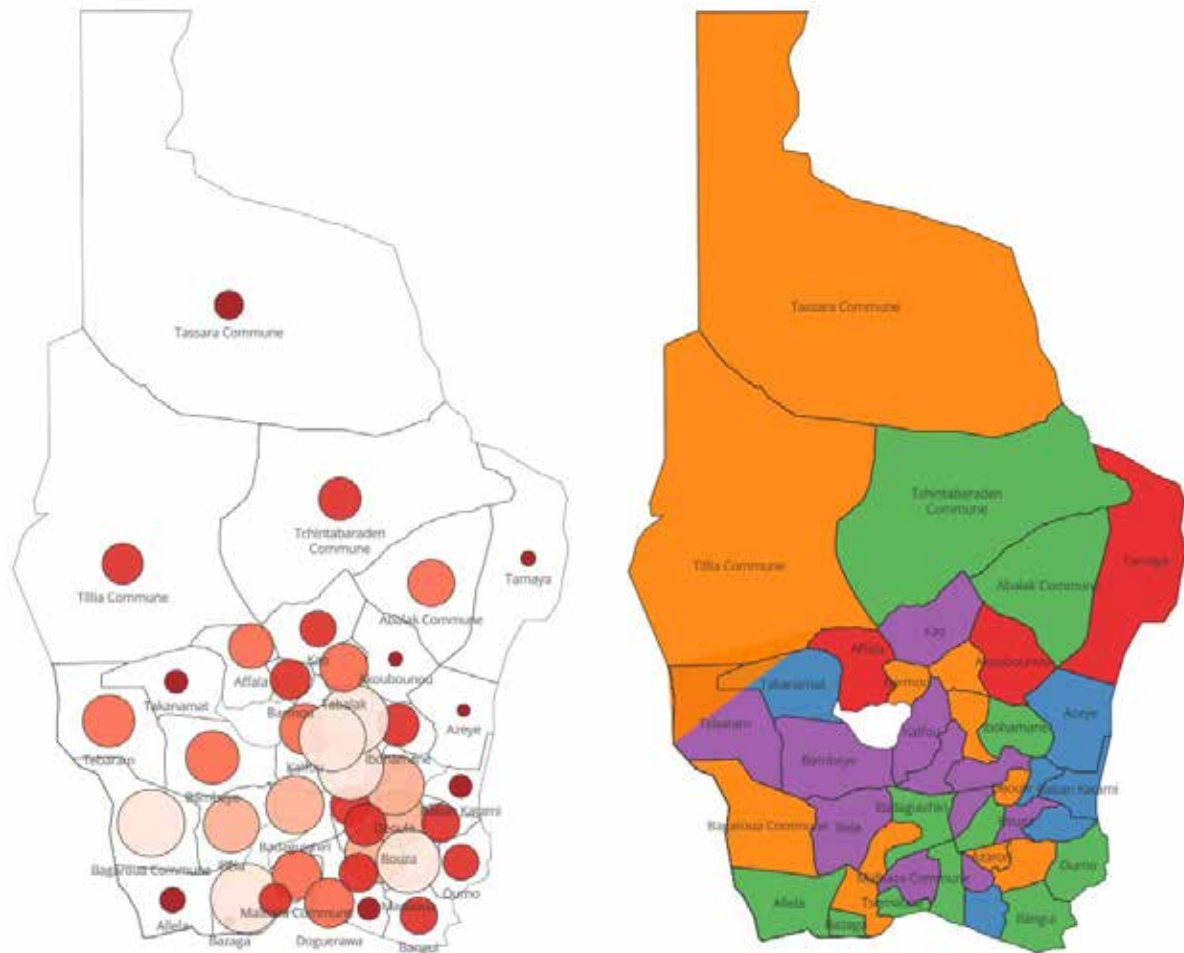
Figure 1. Visual example of an education sector dashboard for the Tahoua region, Niger.

sector indicators sourced directly from the national DHIS2 Niger in such reports.

It is important to highlight that numerous workshops, events and collaborative efforts significantly contributed to enhancing the platforms, for example, enhanced levels of indicator disaggregation, mapping, scorecards, metadata enrichment, and more.

The finalisation of user guides and platform administration is nearing completion. Detailed information regarding project activities and the implementation team can be accessed online for further insight.[3]

Notably, the project has facilitated strengthened collaborations among diverse research teams at Abdou Moumouni University, including statisticians, data scientists, computer scientists and socio-demographers, among others. Additionally, robust partnerships have been forged with the National Institute of Statistics, both at the central level in Niamey and within the Regional Directorates of Agadez and Tahoua.

Furthermore, collaborative efforts extend to the Regional Directorates of sectoral Ministries such as education, agriculture, health (specifically in the population domain) and the Ministry of the Interior, which is responsible for the decentralisation of migration issues. Active engagement with the DHIS2 Niger community globally has been instrumental.

All these elements have contributed to improved coordination across various operational aspects and facilitated the recruitment of interns and students who actively participated in platform development and data enhancement. Additionally, the theses of these students focused on identifying demographic models applicable to the project's data, further enriching the overall project objectives.

Ensuring the accessibility of multi-sector data to all stakeholders holds significant value in terms of dissemination. This accessibility serves to enhance stakeholder participation in decision-making processes, fostering transparency and accountability. Nonetheless, it is crucial to acknowledge that data gaps can exist, leading to several scenarios: data might be uncollected or inaccessible, incomplete, scattered across multiple sources, lacking disaggregation, or be incomparable across regions, departments, or municipalities. Addressing these gaps is essential for comprehensive and equitable data utilisation.

When we speak about value chains, this starts at production and goes to the valorisation and impact of the data. In clearer terms, there is a lot of data that is produced, and through this project we are seeking to determine what mechanisms allow us to better exploit data in paper format, especially at the regional and municipal levels.

Our long-term goal is to see how we can leverage this local data to make it available to end users for better planning and decision-making. We will then be able to make decisions based on facts, that is to say, on convincing, quality and, above all, up-to-date data.

Finally, it is important to emphasise that current platforms hold the potential to offer high-quality data, enabling the evaluation of outcomes in priority sectors, identification of anomalies and tracking trends such as agricultural productivity declines, increases in migrant numbers, demographic shifts and more. They also facilitate assessing service coverage and provision in areas like schools, migrant reception centres and farmers' houses.

This marks a departure from the past, when information existed in fragmented systems, towards a more cohesive framework. This transition involves the establishment of a technical team supported by various partners and a steering committee. Undoubtedly, these steps will significantly contribute to fostering a culture centred on the utilisation of data and ensuring accountability, including citizen oversight. Such a shift is pivotal for improved planning processes.

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GYA alumnus Ibrahim Sidi Zakari (Abdou Moumouni University, Niger) is a statistician and teacher-researcher who is currently serving as Project Coordinator of the "Strengthening Subnational Data Value Chains" initiative. Ibrahim also invented "Tabtakey" , his gift for humanity, which is a computer keyboard integrating a mathematical algorithm for searching dates in the Gregorian calendar. He is also the Next Einstein Forum's Ambassador for promoting equal access to education and more public investment for STEM in Niger.

Email: *sidizakariibrahim@gmail.com*

Commentary: Shifting our focus from resource-centric to human-centric development

Aram Simonyan

In the dynamic landscape of the 21st century, humanity has scrambled to adapt swiftly to rapid external changes. Lifestyle and mindset adjustments have become necessary to keep up with the pace of such unprecedented transformation. Despite the allocation of billions of dollars to tackle global problems such as poverty, climate change, disease, gender discrimination, etc., global policymakers are facing significant hurdles.

Two major issues – corruption and exploitation – are undermining the efforts of those working to bridge the developmental gap between the Global North and the Global South.

In the Global South, dictators and corrupt leaders stagnate the development of their own nations for personal gain. At the same time, major powers in the Global North also exploit smaller countries for resources and use them as proxies in conflicts. These factors continue to distort dialogue between these global regions, hampering the push for human-centred development worldwide.

From a broader perspective, certain politicians prioritize providing oil and gas to their people, often at the expense of indirectly enabling exploitation and violence against other communities. In some instances, certain national leaders (better described as dictators) conduct ethnic and religious cleansings to annex new territories with the excuse of fostering growth and prosperity for their nations. To achieve their selfish objectives, these leaders use bribes, kickbacks, and other forms of corruption. They also manage to defy international law and escape punishment whilst their actions continue to leave the inhabitants of the affected regions under-developed and impoverished.

Additionally, kleptocrats continue to freely defraud entire nations, avoiding accountability, while imposing severe punishment for minor offenses such as shoplifting (acts often driven by the desperate need to secure basic necessities for one's family). In even more severe cases, people are given capital punishment simply for exercising their fundamental human right to free speech.

At the ground level, a few influential billionaires want to use their organisations to alter societal behaviour. However, in their quest for a "one size fits all" solution, they often neglect the beauty of the diversity in global perspectives. Their tunnel vision forces them to overlook their own personal development as well as recognize that a uniform approach may not be the best solution even in today's interconnected world. Meanwhile, people are being so bombarded by technology that even with the overflow of information and AI advancement, they struggle to set priorities and cherish the present.

In certain parts of the world, focus has shifted towards converting unhealthy eating, sleeping and consumption habits into more wholesome routines, with an added pursuit of becoming famous as Tik-Tok Influencers. Yet, on a larger scale, a significant portion of the world still struggles to meet the basic needs as outlined by Abraham Maslow's hierarchy of needs, especially in the areas of physiological needs and safety.[1] Solving these fundamental problems remain a challenge for many.

On a macro level, rampant technological change and resource-driven policies fail to answer the crucial question, "Who benefits from these ambitions?". Simultaneously, on the micro level, the question arises, "Why pursue these paths?" Perhaps we would be better served by slowing down on quantity and evaluating the essence of our goals. We also need to concentrate on the outcomes measured, not only by numerical metrics but also by life satisfaction, happiness, and sustainability.

Moreover, wouldn't it be more reasonable to prioritise universal human interests over state, organisational, and ideological interests? One answer is certain: war is an ineffectual solution to existing problems.

Back to Maslow's framework, even as hunger remains one of the leading causes of death in the world, staggering amounts of money – exceeding $592 billion in 2022 – are allocated to weaponry, supposedly to fight the unhealthy hunger for power by dictators.

While civilians hide in shelters from bomb threats, those responsible for the assault prioritize securing billions amassed from the theft of oil, gas, and other illicit activities in banks that protect their identity.

To fight this canker, many nations worldwide have agreed to promote policies to counter financial enabling and money laundering. These policies require acceleration and protection against double standards.

To meet the needs stated in Maslow's upper pyramid, education is essential. Young people have to be taught how to block and ignore narcissists and their "flying monkeys". The focus should not only be on defensive measures against narcissism but also on teaching them how to nurture meaningful relations with themselves and the people around them. Amidst the day-to-day chaos of breaking news and external stressors, reconnecting with our purpose, values, and priorities has to become a daily task.

Indeed, the current challenges on all local, regional, and international levels appear daunting and hard to tackle swiftly. Nevertheless, our current global policies require a paradigm shift from resource-centred, power and control-driven pursuits (especially over neighbouring territories and people) to human-centred development. We risk neglecting human inner resources as we push the boundaries of our external evolution.

It is critical that we avoid reducing words such as integrity, honesty, dignity, and morality in human interaction, the business world and policy-making into one word: law. This is particularly so because currently, certain world leaders are more equal before (international) law than others (as George Orwell put it).

Transitioning from declarative condemnation-based to action-based policymaking is complicated but urgent. This transition may vary across regions and even within the same countries, but it still remains essential.

In essence, transforming policies from mere productivity to empathy-driven initiatives can be highly beneficial and cut hidden costs for this generation and, even more importantly, for future generations.

The responsibility lies on the shoulders of our generation and our governments, to lead this transformation for a better world.

The first crucial step in this journey is to stop all ongoing wars and prevent the initiation of new ones!

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GYA member Aram Simonyan (University of Kiel, Germany/University of Sussex, United Kingdom) has held visiting positions at multiple European universities. Additionally, he was a Weiser Professional Fellow at the Gerald Ford School of Public Policy and a visiting Fulbright Scholar at the Ross School of Business at the University of Michigan, United States.

Email: aram.simonyan@isec.am

Science Leadership Programme for Latin America and the Caribbean

Paulina Carmona-Mora

The inaugural Science Leadership Programme for Latin America and the Caribbean (LAC-SLP) took place in 2022 in Leticia, Colombia.[1] Leticia, the southernmost city in Colombia, is situated in the Department of Amazonas, along the Amazon River and just minutes away from the borders with Brazil and Peru. This is a region where indigenous knowledge thrives. Drawing heavily from the Amazon rainforest, the region is often referred to as "the lungs of the world", and provides sustenance to local communities. The Amazon natives, who are the primary stewards of the rainforest and this region, symbolize the Latin American identity.

During the LAC-SLP, 20 fellows from ten LAC countries representing diverse disciplines gathered to learn about the GYA's tools of collective leadership.[2] Fellows then used these tools to reflect on and analyze the challenges faced by early- and mid-career researchers in the LAC region, with the aim of proposing concrete steps and ideas for tackling the obstacles impacting their research ecosystems.

Being in Leticia reconnected both the participants and SLP co-leads from the GYA with their local communities and territories in a profound way. Away from big cities, and with limited internet access, human connection flourished. Participants were reminded of the essence of the LAC region, its disparities, and that scientific discoveries must reach everyone, regardless of location. Would the transformation have been the same if the programme had taken place in a capital city? Most likely not – the intense experiences lived in Leticia seamlessly led to the birth of a collaborative network of LAC science leaders with a renewed commitment to transform their research systems, with the impact of science at the forefront.

After the in-person portion, the LAC-SLP programme continued in 2023 with online sessions, where participants refined the ideas that were born in Leticia and delved further into research strategies that had already been implemented. Participants drew lessons from the determinants of success, subsequently sharing best practices and advocating for science as a group.

As scientists, we often realize the issues and gaps of the research systems that we are immersed in. Reaffirming the positive impact of the LAC-SLP journey, the fellows developed the idea to share best practices from LAC initiatives that can be replicated in other countries within the LAC region. This presents a positive approach to tackling existing deficiencies and shortcomings.

The SLP fellows summarised their learning and reflection into two policy briefs, "Transforming the STEM future: Visibilizing the social responsibility of young academics in Latin America and the Caribbean", and "Articulated Science to Accelerate Sustainable Development in Latin America and the Caribbean", both of which they discussed in GYA podcasts.[3] These policy briefs offer recommendations derived from best practices, aiming to empower science in LAC to truly transform and achieve sustainable development for the region.

The declaration advocates for opening spaces for scientists, promoting dialogues of different types of knowledge, legitimizing the social commitment of scientists, and facilitating the networking of scientists working for the benefit of women in STEM, among other objectives. As a reminder of the importance of context, the outcome of the LAC-SLP collective transformation is named the Declaration of Leticia.[4]

As a testament to the transformative power of contextually grounded initiatives, the LAC-SLP is fostering a new wave of science advocacy for Latin America and the Caribbean.

In closing, let the words of some of the LAC-SLP fellows show us the power of collective transformation:

- "The SLP helped me confirm that we, scientists from LAC, will have to create our own game to better support our region… We need a different type of leadership, supported by inclusion, humility, inquiry, reflection and strategy."

- "My heart is now full of this sense of belonging and responsibility to support the change our region needs."

References

1. https://globalyoungacademy.net/activities/science-leadership-latin-america-and-the-caribbean/

2. https://youtu.be/-KwM-RYroUY

3. A podcast for each policy brief by the authors can be heard here: https://globalyoungacademy.net/podcast/

4. Declaration of Leticia: https://www.nafaforestry.org/ff/download/leticia_declaration.pdf.

GYA member Paulina Carmona-Mora *(University of California-Davis, United States) is a Research Scientist whose current research interests focus on using genomic and molecular tools to understand mechanisms that control neurological and developmental disorders.*

Email*: pcarmona.gya@gmail.com*

The GYA and the UN SDGs

Stella Tsani and Jane Yau

The GYA and the United Nations Sustainable Development Goals (UN SDGs) Incubator group was established in January 2022 with the primary goal of leveraging the GYA's cumulative potential as an interdisciplinary, global, and young academy to contribute its work towards the achievement of the UN SDGs.

These goals were adopted by the UN in 2015, and consist of 17 SDGs and 169 targets within these SDGs. The GYA and its members are active in many SDG-related areas, participating in working groups, participating in meetings on the implementation and monitoring of the SDGs, or by providing science-based policy advice to policy-makers and global science organizations.

Each GYA working group (WG) aims to contribute to at least one SDG; for example, the Climate Change and Disaster Risk Reduction WG (SDG 13), Global Health WG (SDG 3), Science Education for Youth WG (SDGs 4, 5, 10), Women in Science WG (SDG 5), Trust in Science WG (SDGs 3, 16, 17), etc.

However, interlinkages and contributions between the efforts of different WGs and connections with the SDGs and their targets might not always be apparent. The goal of the GYA and the UN SDGs Incubator is to raise GYA members' as well as partner organizations' awareness of the SDGs and the work that is already happening on the SDGs in the GYA, through internally planned workshops and trainings for our members and alumni, as well as externally to interested partners and organisations.

The SDG group's work is driven by the realization that the global community is halfway to the deadline set for achieving the 2030 Agenda and SDGs. Further, slow progress to date calls for accelerated action to meet the targets by 2030 and for setting priority transitions at its core.

GYA members and groups can meaningfully contribute to priority actions and results-driven acceleration of the SDGs to help meet these targets. Integrated science-to-action, supported by strong innovation from exceptional young scholars – shapers of the future scientific and policy directions globally – should be put at the service of the priority transitions.

Strong integration between the natural and social sciences as well as technology, such as that characterizing the work of the GYA, is necessary to provide holistic, independent, and evidence-based advisory support to SDG action.

Such actions include high-level policy interventions such as the the 2023 UN Climate Change Conference (COP 28), and science-focused events such as the GYA's Open Science First Fridays series, which are open to the public to share and discuss current topics impacting Open Science.

Additionally, and complementary to the SDGs group, further GYA actions include:

- **Interdisciplinary Database of Ethics Dumping Cases**, which aims to mitigate exploitative practices that compromise the rights of research subjects, especially those in low- and middle-income countries (LMICs).
- **Science Leadership Programme in Latin America and the Caribbean**, which contributes to several SDGs, including SDG 4 (Quality Education) by promoting scientific leadership and capacity-building among young researchers in the region, while giving equal opportunities to women in the application process.
- **Science + Art = Peace and Justice WG,** which develops innovative science communication using multimedia approaches.
- **Global Health WG,** which aims to furnish policymakers and stakeholders with insights and strategies to effectively navigate future health crises, all of which are intricately linked to the SDGs.

In sum, the GYA and by extension the UN SDGs group is committed to delivering scientific evidence-based solutions and interventions to support well-informed policy making with a clear recognition of the role of early-career researchers.

Learn more at https://globalyoungacademy.net/activities/gya-and-sdgs/

GYA member Stella Tsani (National and Kapodistrian University of Athens, Greece) is co-lead of the GYA and the United Nations Sustainable Development Goals Incubator, and an Associate Professor with research interests in sustainable development, public policy assessment, and sovereign wealth management.
Email: stellatsani@gmail.com

GYA member Jane Yau (Leibniz Institute for Research and Information in Education, Germany) is an Advisory Committee member of the Smithsonian Science Education Center, a member of the ALLEA Science Education Consultative Working Group, as well as a co-lead of the GYA Science Education for Youth WG and the GYA and the UN SDGs Incubator. She is currently a Visiting Researcher at the UNESCO Institute for Lifelong Learning, Hamburg, Germany, and is Co-Editor-at-Large of Connection magazine.
Email: jane_yau@yahoo.com

Open Science

Stephanie Jurburg and Tasha Gownaris

The Open Science movement aims to make scientific research more accessible, transparent, and collaborative, and touches upon all aspects of scientific life, from data stewardship and publishing structures, to AI and legislation. With these goals in mind, the GYA's Open Science working group (OS WG) engages in diverse initiatives designed to promote these principles and practices across the global scientific community.

The goals of the OS WG are multifaceted, and aim to raise awareness among early-career researchers (ECRs) about OS, promote inclusivity in research communication, facilitate international and interdisciplinary collaboration, influence policy to reflect the interests of young scientists, and align OS policies with the UN SDGs. These goals underscore the GYA's vision of science as a global public good and highlight the role of OS in achieving a more equitable global society.

In 2023, the GYS's OS WG launched the Open Science First Fridays lecture series. These monthly discussions provide a platform for scientists and the public to engage with current topics related to OS, ranging from the use of AI tools like ChatGPT to the development of OS policies. These sessions are not only informative but also serve to foster a community of practice around OS issues.

In addition to promoting dialogue among scientists, the OS group fosters exchanges between scientists and other stakeholders in the scientific process, including publishers and government organizations.

Over the past few years, the OS group has formed strategic partnerships with publishers at the forefront of the OS movement, including the Public Library of Science (PLOS), eLIFE, and F1000.

Indeed, the European Commission launched the Open Access publishing platform Open Research Europe (ORE) in 2021, and the GYA has been a part of the consortium, led by F1000 Research, from the beginning.

Our involvement with ORE has resulted in multiple workshops and outreach activities. For example, Our 2021 Annual General Meeting (AGM) and International Conference of Young Scientists "Trust in Science" included a panel discussion on the topic during our "Building Trust with Open Science" session. Further, our 2023 International Conference "Technological Innovations for Discovering Solutions to the World's Greatest Current Challenges" in Kigali, Rwanda, featured the session "Scientific Publishing: A global perspective from early-career researchers on open access dissemination of scientific discovery & data sharing", during which open access publishers such as PLOS, eLife, and Nature were discussed alongside ORE.

The Rwanda workshop led PLOS and the GYA to issue a Memorandum of Understanding (MoU) establishing cooperation between the two organizations. The purpose of the MoU is to create a strategic partnership between the parties to increase awareness of OS, its principles, and its implementation into practice.

According to Tasha, "The GYA's Open Science working group strives to raise awareness of Open Science principles and approaches among young scientists and to provide input into Open Science policies from a diverse, international perspective."

Stephanie adds, "We're excited about the work that PLOS is doing and are looking forward to closely collaborating on initiatives to make science more effective, equitable, and accessible."

Such collaborations are focused on exchange as well as creating OS solutions that are equitable and accessible globally, ensuring that the perspectives of ECRs are incorporated into the development of OS practices.

Indeed, during the 2023 GYA AGM and International Conference of Young Scientists in Kigali, the OS WG organized a "lunch with the editors" event, during which ECRs were able to informally discuss the present and future publication landscape with the editors of Nature and PLOS ONE.

Through its activities and goals, the GYA is working towards a future where science is accessible to all and where young researchers are empowered to lead and innovate in the OS domain.

In 2024, the OS WG looks forward to harnessing its established partnerships to hold targeted discussions about the improvement of the publishing landscape in light of OS principles and continuing its Open Science First Fridays sessions.

GYA member Stephanie Jurburg (German Centre for Environmental Research, Germany) is a Scientist interested in understanding how microbial communities respond to stress, and in understanding the similarities across microbiomes.
Email: s.d.jurburg@gmail.com

GYA member Tasha Gownaris (Gettysburg College, United States) is an Assistant Professor of marine ecology. She teaches classes on ecology, fisheries, and oceanography and is passionate about fostering diversity in STEM and teaching students data literacy skills.
Email: ngownaris@gmail.com

Science + Art = Peace and Justice
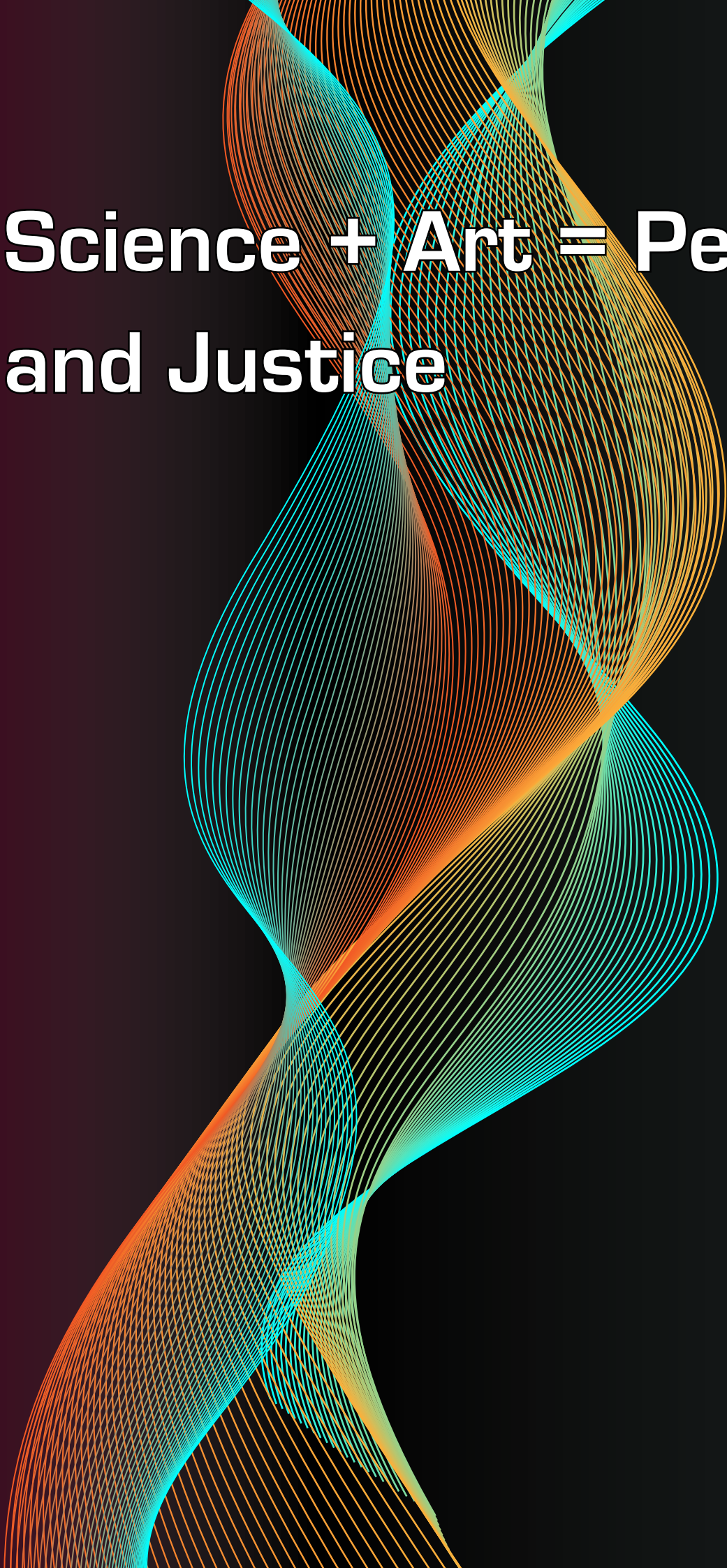
The Science + Art = Peace and Justice (SAPJ) WG aims to promote the active engagement of scientists with the arts and set up mutually beneficial creative collaborations with artists.[1] Further aims include to dissolve artificial barriers between disciplines and borders to engage the world's various societies and promote changes in the world to encourage compassion, to help the disadvantaged, and to facilitate peace and justice.

Past activities of the SAPJ group include the multi-year Seasonal Flower Clock project by Nina Yasuda and GYA alumnus Akihiro Kishimura (Kyushu University, Japan), which was initiated just before the GYA Annual General Meeting in June 2022. A time-lapse video shows the blooming of the clock's plants and the gradual completion of the clock throughout the year. [2]

Other past projects include Data Sonification, which began in 2016 as the "Well-Tempered Brain", and continued and expanded in 2017 to Dolphinet, GYA dreams, Sketches of Science, and the subject of this article, Poetry of Science: Alchemies, which focused on the expression of scientific concepts through poetry.

To this end, the SAPJ WG invited members to reach beyond the scope of the known to draw new pathways using poetry, thus allowing them to rediscover their own field through different textures and to gain the ability to resource to the "poetry of science" as a new language of positive societal impact.

The SAPJ was hoping that members and alumni could explore the secret waves and utterances of the poetic expression to give new impulse to their outputs and conclusions and offer transformative tools of expression.

The theme of the poetry call was Alchemies, which offered the possibility of learning, experiencing and sharing metamorphosis as a force in action able to transform matter (one's research) into energy (poetry) and poetry (one's regained language of impact) back into matter (one's enhanced capacity to communicate with the wider world).

The poems on the following pages - inspired by the writer's science story and their GYA membership - are the output of this call.

Notes

1. https://globalyoungacademy.net/activities/science-art-peace-and-justice/

2. https://www.design.kyushu-u.ac.jp/~tomotari/SeasonalFlowerClock.html

Untitled

In the realm of scientific thought and inquiry,
Lies a beacon of youthful inspiration and fiery,
The Global Young Academy, a platform so bright,
Where the brightest of young minds alight.

From disciplines diverse, they gather and convene,
To collaborate, converse, and achieve,
Their quest to shape the future and improve,
Through research, advocacy, and actions behove.

Under forty, these savants bring a unique flair,
Unfettered by age, their minds agile and aware,
The GYA offers a space to connect and reflect,
To explore, and innovate, with their intellects.

Leadership and mentorship, the academy provides,
Networking and training, to help them rise,
To new heights of creativity, and critical thought,
And share their brilliance, as they ought.

The future of science, in their hands,
A global community that understands,
The power of research, and its wider scope,
To create change, and enhance human hope.

In the Global Young Academy, they find a place,
To lead, inspire, and leave their trace,
To reshape the scientific landscape, and more,
And create a world where knowledge can soar.

GYA member Elina Amadhila
(University of Namibia)

Dog's best friend?

The Dog, they say,
Is man's best friend.
I wonder what
The dog feels about men!

A dog's life on the streets
Is not hunky-dory
They need to fend
For shelter and food;
They need to learn who
Are the "bad guys"
And how to tell
The ones who are good.

The little pups need
A lot of warmth and care
Born in the wintry days,
The good moms know
How to keep them warm
And care for them
In so many ways.

The pups often grow
In joint families,
With caring grandmoms,
Sisters and aunts,
Then there are
The putative fathers
In caring, they play
Significant parts.

In spite of all
The pups die soon
Survival is low,
Just one in five –
Humans, believe me,
Are the primary cause
That do not let
The pups survive.

Yet they love,
And beg for love,
And some hearts melt
Looking at those eyes.
They are smart,
They know to trust
Not for food but
Love, that never lies.

GYA alumna Anindita Bhadra
(Indian Institute of Science
Education and Research Kolkata, India)

Untitled

I am a believer,
and I believe in you!

Big, small and in between,
sundry wings of your imagination
You say atom or universe,
I believe in your vision

White, black and in between,
mingled hues of your existence
You say race or diversity,
I believe in your oneness
Fragrant, foul and in between,
blended scents of your essence
You say all or none,
I believe in your intention

Power, prejudice and in between,
brewed tastes of your significance
You say war or peace,
I believe in your world
Rich, poor and in between,
incessant nature of your wealth

You say success or failure,
I believe in your creation

Truth, lie and in between,
abiding values of your words
You say risk or sustainability,
I believe in your communication

GYA alumna Shabana Khan
(School of Planning and Architecture,
India)

Orbits of opal

Water in hand
Or dust from lost wings?
A transfer of hints,
a pool of eclipses…
Time has eroded,
caressed,
detached,
revealed
and inflicted.
But dances are hidden
in the pulse of a feather,
encased in an angle
and launched to the roots
from the depths
of the verge of a ladder.
Your eye is an edge
at the end of the maze,
swimming in cages
of mirrors and traces.
You find your own voice
descending your intent
at the top of the star,
stranded in light,
far,
and rejected,
from silver spheres.

Pieces are broken
and, at once, they are together,
like the elusive glow in the metal.
The thread is a fabric
unseen by the senses
but felt in the velvet,
the skin and the cedar.
Time is an embrace of horizons,
subsequent to laughter,
preceding an abyss
of gems made of whispers…
What a sigh of the crystals!
A key in the ice,
is the mask of the Ocean
awaiting a sign that welcomes rebellions
and songs
in the choral.
Your mesh is just ready
for twilight encounters
and
orbits
of
opal.

GYA alumna Cristina Blanco Sío-López
(Universidade da Coruña, Spain)

Untitled

Have you ever looked at the night sky? –
What did you see?

Is it the same that I see?

Is it "data" or an "impression"?
What do you imagine, and how do you
explore?

Are you guided by logic, or by intuition?

We share the same world, but does it mean
the same to us?

How does perception influence
perspective?

Are you a scientist or an artist?

I am a human.

GYA alumnus Martin Dominik
(University of St. Andrews,
United Kingdom)

Untitled

Children's minds are kaleidoscopic.
So do not search for one answer.
Search for their resonances.
They are alchemic. They are magic.

GYA member Natalia Kucirkova
(University of Stavanger, Norway)

Abdulsatar Sultan (Iraq)

Associate Professor / Technology

Sultan is a Lecturer in the Business Management Department at Catholic University in Erbil. With over a decade of experience in academia, he has held various roles, including coordinator and department head positions at the Lebanese French University. He is recognized for his contributions to education and research, exemplified by his membership in the Arab-German Young Academy of Science and Humanities (AGYA) since August 2022.

Alexia Nunez-Parra (Chile)

Assistant Professor / Biology

Alexia is an Assistant Professor at the Faculty of Science of Universidad de Chile, and the Principal Investigator of the integrative neuroscience core at the Physiology Laboratory. Her main research line seeks to understand how neuronal circuits process sensory information and how neuronal coding is altered in neuropathologies. She's a member of the Global Consortium for Chemosensory Research. She's also strongly involved in science education and is the director and creator of the "Getting to know your brain" initiative.

Anina Schwarzenbach (Switzerland)

Researcher / Sociology and Computational Social Sciences

Anina is a Postdoctoral Researcher at the Institute of Criminal Law and Criminology, University of Bern. She applies her background in sociology, criminology, and computational social sciences to study social inequalities, cohesion, and resilience. Her current project examines the social networks and dynamics that led to the emergence and evolution of extremist movements in contemporary societies. She is a former fellow of Harvard Kennedy School's Belfer Center, as well as a Max Planck Society alumna.

Anu Susan Sam (India)

Assistant Professor / Economics

Anu is an Assistant Professor of Agricultural Economics at Kerala Agricultural University, India. With over a decade of research in agricultural economics, she focuses on climate change vulnerability, adaptation and food security. She is deeply involved in supervising the thesis work of postgraduate and doctoral students, nurturing the next generation of scholars in agricultural economics. She also actively engages in extension activities, liaising between farmers, university scientists, and experts.

Asmaa Abusamra (Palestine)

Lecturer and Head of Dept. / Vocational Education

The head of the Community Service and Continuing Education Center Department at the University College of Applied Sciences (UCAS), Asmaa is a former Head Assistant of vocational diploma programs at UCAS. She is also a full-time English Language Lecturer in the Humanities Department. Additionally, she has vast experience in utilizing curriculum mapping and using Complex Task Approach CTA. She was Head of Committee for developing life skills curriculum for higher education universities in Palestine.

Cesar de la Fuente-Nunez (United States)

Presidential Assistant Professor / Engineering

Cesar is a Presidential Assistant Professor at the University of Pennsylvania. He has pioneered computational approaches that have greatly accelerated antibiotic discovery, yielding numerous preclinical candidates. Cesar has received over 60 major awards, has published over 130 papers including in Science, Nature Biomedical Engineering, Cell Host Microbe, and PNAS, and is an elected Fellow of the American Institute for Medical and Biological Engineering (AIMBE), one of the youngest ever to be inducted.

Christian Isalomboto Nkanga (United States)

Associate Professor / Pharmaceutical Sciences

Christian recently became Head of Product Development at Memsel Inc., Texas, focusing on the development of intelligent biomaterials. With over 30 publications, several patents and a significant citation record, Christian has made substantial contributions to the field of nanotechnology and biomaterials. Additionally, Christian co-founded the D.R. Congo Young Academy of Sciences (Académie des Sciences pour les Jeunes en RDC).

Erin Anne Maloney (Canada)

Associate Professor / Psychology

Erin is an Associate Professor and Canada Research Chair in Academic Achievement and Well-Being at the University of Ottawa. She's a world leader in the study of math anxiety, and has received early-career awards from the Province of Ontario (2021), the Psychonomic Society (2022), and the University of Ottawa (2021/2023). She is a sought-after speaker on the topics of academic achievement and emotional well-being, and is the author of a popular-press children's book on math anxiety.
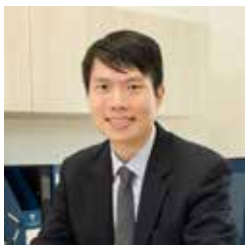
Fun Man Fung (Singapore)

Instructor / Chemistry, Education & Pedagogy

A chemistry researcher and educator at the National University of Singapore, Fun also holds a Certificate in Environmental, Social, and Governance for Professionals in Banking and Finance from the Singapore Management University. Fun designed curricula aimed at enhancing critical thinking and problem-solving skills among lifelong learners. He has given invited talks and seminars at Stanford, the University of Cambridge, ETH Zurich, the University of Pennsylvania, Peking University, and the OECD.

Ganbaatar Khurelbaatar (Germany)

Senior Scientist/ Urban Water Management

Ganbaatar is a Senior Researcher and specialist in urban water management at the Helmholtz Centre for Environmental Research in Leipzig, Germany. He studied civil engineering at the Mongolian University of Science and Technology and later did his Ph.D. at the Bauhaus Universität Weimar, Germany. Together with his colleagues in the working group "Water Sensitive Infrastructure Planning", he focuses on finding sustainable solutions on water infrastructure planning and development in rural and urban areas.

Gillian Dumsille Mahumane (South Africa)

Lecturer / Medicine and Health

Gillian Dumsile Mahumane is a Lecturer of Biopharmaceutics at the Department of Pharmacy and Pharmacology, University of the Witwatersrand, South Africa, and a Research Support Group coordinator. She is a 2023 Jeiven/Centre for Biomedical Research Fellow, functioning as a Scientific Ambassador of the Wits Advanced Drug Delivery Platform, where she is also the Graduate Communications and Marketing Lead.

Hiba Rajha (France)

Assistant Professor / Chemical and Petrochemical Engineering

Winner of the L'Oréal UNESCO for Women in Science Young Talent 2021, and recipient of the entrepreneurship Agrytech Grants award 2021, ACT Smart Innovation Hub, Berytech, Hiba is an Arab-German Young Academy member and is currently pursuing an Executive MBA at the IÉSEG School of Management, Paris. Throughout her 8 years of experience as a faculty member at the Saint Joseph University of Beirut, Lebanon, Hiba gained significant skills in leadership/entrepreneurship, and interdisciplinary knowledge in research.

Himangana Gupta (Japan)

Research Fellow / Earth and Environmental Sciences

Himangana is a Research Fellow & Academic Associate at the United Nations University, Institute for the Advanced Study of Sustainability. She is an expert in climate change and biodiversity policy and has worked on climate adaptation, forestry, women and climate change, energy efficiency, and national GHG inventories. She also contributed to India's Second and Third Biennial Update Reports to the UNFCCC. She has seven edited books to her credit and more than 30 research publications, including book chapters.

Hussain Mustatab Wahedi (Pakistan)

Associate Professor / Biology

Hussain is an Associate Professor and Head of the Healthcare Biotechnology Department at the National University of Sciences & Technology, Pakistan. He is also serving as a Visiting Professor in the College of Pharmacy at Gachon University, South Korea. Hussain received his Ph.D. in the field of Regenerative Medicine from Gachon University of Medicine and Science, South Korea. His major research focuses on understanding the molecular mechanisms of skin tissue damage and skin aging.

Hussam Khasawneh (Jordan)

Associate Professor / Electrical Engineering

Hussam is an Associate Professor of Electrical Engineering at Al Hussein Technical University, and an Associate Professor of Mechatronics Engineering at The University of Jordan. With a Ph.D. in Electrical and Computer Engineering from The Ohio State University, United States, his expertise encompasses the renewable energy, energy storage, energy efficiency, green hydrogen, and water-energy nexus. Hussam has made notable advancements in bridging academia, government, and industry, fostering innovation and facilitating green growth.

Inayat Ullah (South Korea)

Assistant Professor / Applied Econometrics

Inayat is an Assistant Professor in the Dept. of Government and Public Policy, National University of Sciences & Technology, India. He previously worked as an ISEF Research Fellow at the Environmental Planning Research Institute, Seoul National University, South Korea. Inayat holds a Ph.D in Public Policy from the Korea Development Institute, School of Public Policy and Management, and specializes in impact evaluation of interventions for sustainable development outcomes in developing countries.

Jai Prakash (India)

Assistant Professor / Physics

Jai is an Assistant Professor in the Department of Physics, Aligarh Muslim University (AMU). Prior to joining AMU, he worked as an Assistant Professor at the Centre for Physical and Mathematical Sciences, Central University of Punjab, Bathinda, India, for more than two years. His research background involves soft condensed matter physics, non-linear optics of colloidal suspension, and liquid crystal-based applications. Jai received his B.Sc. from Agra University in 2001, and his M.Sc. in 2003 from AMU.
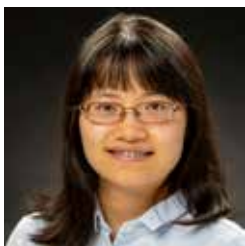
Jingyuan Xu (Germany)

Head of Lab / Renewable Energy

Jingyuan Xu is Head of the ZEco Thermal Lab at the Karlsruhe Institute of Technology (KIT), Germany. Prior to joining KIT, Jingyuan worked as a Postdoctoral Research Fellow at the University of Cambridge and a Research Associate at Imperial College London. Jingyuan focuses on sustainable zero-carbon energy technologies, with a particular emphasis on renewable energy and/or waste heat. Her work aims to minimize global primary-energy use and reduce CO_2 emissions for a sustainable future.

João Borges (Portugal)

Senior Researcher / Supramolecular Biomaterials

João is a Senior Researcher in the Department of Chemistry and CICECO – Aveiro Institute of Materials at the University of Aveiro, Portugal. His research focuses on the development of bioinstructive supramolecular multicomponent biomaterials to interface with living systems. He has been invested in science communication and outreach, and in connecting, supporting and empowering early-career scientists globally in advancing their professional development.

Kanti Pertiwi (Indonesia)

Assistant Professor / Economics

Kanti is an Assistant Professor in the Department of Management, Faculty of Economics and Business, University of Indonesia, and an Honorary Fellow at the Department of Management & Marketing, The University of Melbourne. Kanti completed her Master's degree and Ph.D. at the University of Melbourne, specialising in Organisational Studies. Her research interests include public administration, gender, the future of work, and knowledge production. She is a member of the Science and Policy working group at the Indonesian Young Academy of Sciences.

Kapal Dev (Ireland)

Assistant Lecturer / Engineering

Kapal Dev is currently serving as Assistant Lecturer at the Munster Technological University, Ireland. He earned a Ph.D. at the Politecnico di Milano, Italy, and was recognized as an IEEE Communications Society Europe, Middle-East & Africa Region Outstanding Young Researcher 2022 for promising research activities for the benefit of society. His research interests include wireless communication networks, blockchain and artificial intelligence targeting applications majorly towards Industry 4.0/5.0

Lorena Michelle Coronado Vásquez (Panama)

Researcher / Biotechnology

Lorena is a Junior Researcher at The Institute of Scientific Research and High Technology Services of Panama. Her main line of investigation involves the biophysics of the malaria parasite Plasmodium, and she is interested in the use of optical tweezers to study the mechanical changes that the membrane of the erythrocytes infected with P. falciparum undergoes under various treatments. She also studies novel mechanisms of action of natural products against malaria and cancer.

Ludmilla Bogdan (Moldova)

Postdoc / Migration & Human Trafficking

Ludmila is a mixed-method sociologist studying contemporary processes of migration, human trafficking, and social and gender inequality. She has a Ph.D. in Political Sciences from the University of Vienna and postdoctoral training from Harvard University and the University of Pennsylvania. She has been a visiting scholar at Max Planck Institute for Religious and Ethnic Diversity and Georgetown University, School of Foreign Service.

Luisa Maria Diele Viegas (Brazil)

Visiting Professor / Earth and Environmental sciences

Luisa is a Visiting Professor at the Federal University of Bahia, Brazil, where she is a member of the Graduate Council of the Master's programme of Ecology Applied to Environmental Management. She is the President of the Brazilian Chapter of the Organization for Women in Science for the Developing World, Vice President of the Brazilian Association of Ecological Science and Conservation, and Co-founder and President of the Kunhã Asé Network of Women in Science.

Melina Florez-Cuadros (Peru)

Doctor / Veterinary Medicine

In addition to being a Veterinary Doctor, Melina holds a Ph.D. in entomology, and has a multidisciplinary research background. She created the Colombian Organization at the University of Nebraska-Lincoln, and was President of the Postdoctoral Association at North Carolina State University. In 2023, Melina created an organization of Colombian scientists, which she currently leads, and is also in the Advisory Committee of the Organization for Women in Science for the Developing World.

Miriam Cohen (Canada)

Associate Professor / Law

Miriam is an Associate Professor in the Faculty of Law at University of Montreal. She holds the Canada Research Chair in Human Rights and International Reparative Justice. She is a graduate of Leiden University, Harvard Law School, and the University of Cambridge and Université de Montréal. Her work focuses on public international law, international dispute resolution, international criminal law and international human rights law.

Mohamed Mahmoud (Egypt)

Associate Professor / Waste Management

Mohamed is currently working as a tenured Associate Professor at Galala University, Egypt. Armed with interdisciplinary education and training, he is a long-term scientist working on strengthening environmental management and pollution control, especially for value-added resource recovery (i.e., clean water, renewable energy, and nutrients) from wastewater and biomass, and addressing sanitation issues in resource-poor, developing countries.

Mohammad Abdel-Rahman (Jordan)

Associate Professor / Engineering

Mohammad is an Associate Professor in the Data Science Department at Princess Sumaya University for Technology, Jordan, and an Adjunct Assistant Professor in the Electrical and Computer Engineering Department at Virginia Tech, United States. His research focuses on bringing together artificial intelligence/machine learning and operations research in the areas of communications, networking, energy, healthcare, and transportation.

Mujtaba Isani (Pakistan)

Professor / Political Science

Mujtaba is a Long-term Guest Professor at the Quaid-e-Azam University in Islamabad, Pakistan. Previously, he was a Research Scientist at the German Center for Integration and Migration Research, a Visiting Professor at the University of Muenster, Germany, a Post-Doctoral Fellow at the University of Mannheim, Germany, and an Assistant Professor at the King Fahd University of Petroleum and Minerals, Saudi Arabia. His general research interests lie at the intersection of public opinion and immigrant integration, among others.

Natisha Dukhi (South Africa)

Behavioural Scientist / Nutrition

Natisha is a Behavioural Scientist and Senior Research Specialist at the Human Sciences Research Council, South Africa. She has a Ph.D. in Public Health and is involved in interdisciplinary inclusive research, contributing to the global science vision that addresses important public health issues within the social sciences. Her niche research areas include nutrition, adolescent and child health, and health promotion. Natisha is the current Co-chair of the South African Young Academy of Science (SAYAS).

Nesrin Alrefaai (United Kingdom)

Visiting Fellow / Drama and Theatre Education

Nesrin is a Visiting Fellow and Arabic Publications Editor at the LSE Middle East Centre. Her research interests are language, arts, and politics in the Middle East with a special focus on Syria. In addition to her academic career, Nesrin is a playwright and uses arts for public engagement. Her most recent play "The Beekeeper of Aleppo" made its debut at the Nottingham Playhouse in March 2023 and subsequently toured across the United Kingdom.

Noor Shaila Sarmin (Bangladesh)

Professor / Agroforestry and Environment

Noor is a Professor in the Dept. of Agroforestry and Environment at Bangabandhu Sheikh Mujibur Rahman Agricultural University, Bangladesh. Additionally, she is Head of Department of the Dept. of Environmental Hazard and Disaster Management. She is also serving in the Department of "Agrometeorology", funded by the World Bank and the Department of Agricultural Extension. In 2013, Noor was awarded a full scholarship by the Organization for Women in Science for the Developing World.

Oluwarotimi Samuel (United Kingdom)

Senior Lecturer / Computer Science

Oluwarotimi obtained a Ph.D. degree in Pattern Recognition and Intelligent Systems from the University of Chinese Academy of Sciences with excellent dissertation honors and graduate awards. He is currently a Senior Lecturer at the School of Computing, University of Derby, United Kingdom. He conducts cutting-edge scientific research, investigating core factors limiting cyber-physical systems' practical deployment, and develops novel AI-based data-driven solutions to resolve such challenges.

Peter Gan Kim Soon (Malaysia)

Public Health Physician / Public Health

Peter is a multidisciplinary public health professional with the Ministry of Health Malaysia. He navigates the intersection of health care, policy, and research to drive impactful outcomes for marginalised and disenfranchised populations. He seeks to leverage his expertise in clinical practice, mixed-method research, health systems strengthening, and policy formulation to advance health equity and sustainable development. He is also a Senior Visiting Fellow with the United Nations University.

Pooja Devi (India)

Principal Scientist / Engineering

Pooja is working as a Principal Scientist at the Central Scientific Instruments Organisation, and holds a Ph.D. in Engineering Sciences from AcSIR, New Delhi, and an M.Tech. in Nanotechnology from IIT Roorkee. Her research focuses on materials design for hydrogen production, pollutant degradation, and monitoring. She has published 84 research papers in high-impact journals, six peer-reviewed conference proceedings, edited seven books as lead editor, and published 25 book chapters.

Reem Abbo Assi (Iraq)

Lecturer / Pharmacy

Reem is a registered Pharmacist, currently affiliated as a Lecturer at the College of Pharmacy at Al Kitab University, Iraq. She is the leader of the EDEN research group, with a track record of international research collaborations, copyrights, and awards such as fellowships and excellence in publications awards from Majlis Persada Kencana, USM. Reem is passionate about creating new educational resources that inspire scientists and students to find their gifts and improve their scientific communication abilities.

Rocio Alejandra Chavez Santoscoy (Mexico)

Research Assistant Professor / Nutrigenomics

Alejandra is a dedicated Research Assistant Professor at Tecnologico de Monterrey, Campus Monterrey, where she leads the Core Lab Genomics. Her research has explored functional food development, nanotechnology applications, and complex biological systems with a strong commitment to advancing scientific knowledge and addressing pressing societal challenges. She is the founder of the technology-based company SERICEA and a proponent of high-impact technology transfers.

Santosh Kumar Gupta (India)

Scientific officer / Physics, Engineering

Santosh joined the 53rd batch of BARC Training School and subsequently joined the Radiochemistry Division in 2010. His research focuses on spectroscopy of photonic materials and designing light emitting materials for health, energy and environment. Santosh is the recipient of several awards, including the Fulbright Fellowship, the Indo-U.S. Science and Technology Forum Postdoctoral Fellowship, and the Japan Society of Promotion of Science Fellowship, among others.

Shaoshan Liu (United States)

Computer Scientist / Autonomous Machine Computing

Shaoshan's background is a combination of technology, entrepreneurship, and public policy. He has published 4 textbooks, over 100 research papers, and holds over 150 patents. Shaoshan has commercially deployed autonomous micro-mobility services around the world and is a member of the ACM U.S. Technology Policy Committee and the National Academy of Public Administration's Technology Leadership Panel Advisory Group.

Thao Nguyen (Vietnam)

Researcher / Medicine and Health

Thao is a multidisciplinary researcher with a Ph.D. in Public Health. She graduated with a Medical Doctor's Degree in 2014 and a Master's Degree in Preventive Medicine at Hanoi Medicine University, Vietnam, in 2018. She has worked at the General Department of Preventive Medicine, Ministry of Health for more than three years in vaccination and laboratory management, with a focus on developing circulars and decisions related to immunization, laboratory, or epidemiology management.

Thashree Marimuthu (South Africa)

Associate Professor / Pharmaceutical Chemistry

Thashree is an Associate Professor of Pharmaceutical Chemistry at the Wits Advanced Drug Delivery Platform research unit at the Department of Pharmacy and Pharmacology in the University of the Witwatersrand (WITS), South Africa. Her current research is focused on the molecular engineering of precise systems for therapeutic applications, with demonstrated expertise in the fields of biomaterials and biometals. She is a recognised mentor who draws upon modern pedagogy and innovative teaching and learning practices.

Tofik Ahmed Shifa (Italy)

Researcher / Chemistry

Tofik received a B.Sc. degree in applied chemistry and an M.Sc. degree in analytical chemistry from Arbaminch University, Ethiopia, and Haramaya University, Ethiopia, respectively. After working as a lecturer at Haramaya University, he was admitted at the University of Chinese Academy of Sciences, National Center for Nanoscience and Technology, where he was awarded his Ph.D. in physical chemistry. Currently, Tofik is an Assistant Professor and Marie Skłodowska Curie Fellow at Ca'Foscari University of Venice, Italy.

Veda Krishnan (India)

Senior Scientist / Nutritional Biochemistry

Veda is a Senior Scientist at the Division of Biochemistry, ICAR-Indian Agricultural Research Institute, New Delhi, India. She earned an undergraduate dual degree (botany & biotechnology) from Kerala University, her post-graduate degree in biotechnology from CUSAT, Kerala, and her doctorate from Bharathidasan University, Tiruchirappalli, India. She is a Team Leader of the Food Matrix Lab, with an active interest in enhancing global human health by contributing to food and nutrition research.

Wilson Alavia Medina (Chile)

Associate Researcher / Mineral Process Engineering

Wilson is a Chemical Engineer who graduated with honors from the Universidad Técnica de Oruro, Bolivia. He earned a Master's degree in Engineering Sciences and a Ph.D. in Mineral Process Engineering from the Universidad de Antofagasta, Chile, and a Diploma in University Teaching from the Universidad de Santiago de Chile. He is currently an Associate Researcher at the Multidisciplinary Research Center Program in Telecommunications Technologies, and an Associate Professor at the Universidad Alberto Hurtado.

Yalinu Poya (United Kingdom)

Lecturer / Chemistry

Yalinu is a highly motivated chemist and an enthusiastic early-career academic with experience in green chemistry research and broad teaching experience in higher education. She is a Lecturer in Environmental Science in the School of Computing, Engineering and Physical Sciences at the University of the West of Scotland, and a Member of the Royal Society of Chemistry. She actively spreads knowledge amongst people of all ages and backgrounds, and fosters mentorship with people interested in STEM.

About the Global Young Academy

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 over 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.

Find out more at: www.globalyoungacademy.net

Co-Chairs: Priscilla Kolibea Mante
(Kwame Nkrumah University of Science and Technology, Ghana)

Felix Moronta Barrios
(International Centre for Genetic Engineering and Biotechnology, Italy)

Managing Director: Beate Wagner (Germany)