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RESEARCH HIGHLIGHTS FROM NYU ABU DHABI



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NYU Abu Dhabi's research enterprise is on the vanguard of almost every field. The University's research culture promotes academic excellence and an environment where multidisciplinary knowledge is encouraged. Manara is an annual magazine created to reflect and celebrate NYU Abu Dhabi's pioneering research.

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## INTRODUCTION

As the interconnected machinations of technology, humankind, and nature grow increasingly complex, the time for interdisciplinary research has never been more imperative.

From considering shifts in migration patterns to how AI can alter experiences in the arts for those with disabilities, and how global economics impacts the food that is served on our tables, we engage in important work that will reveal previously undiscovered aspects of the human experience. By innovating medicine-delivery mechanisms, reconsidering the materials we use to build our landmarks and infrastructure, and empowering change through virtual reality, we can create a more livable future.

As ever, the work presented in this edition of Manara represents steps toward positive, global change. Change that will inform our awareness of the world around and within us, and lead to discoveries that will impact generations to come.

As a university in and of Abu Dhabi, the commitment to our future is a guiding force in our mission to be a hub of development, innovation, and engagement. the region, and the world. We are proud to have made a mark through our impactful research – propelled by the curiosity, dedication, and boundless creativity of our students, faculty, and academic partners around the globe – and are committed to continuing to do so.

The research you will read about in this edition of Manara is a beacon that signals to the world our community's collective pursuit and commitment to make our future equitable, innovative, and prosperous.



**Arlie Petters**

Provost, NYU Abu Dhabi



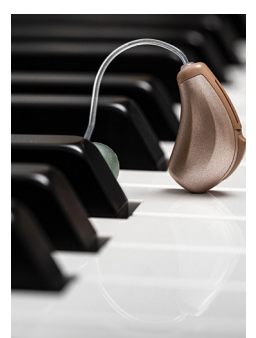


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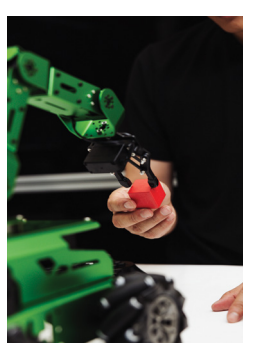
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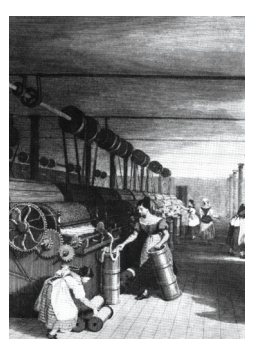
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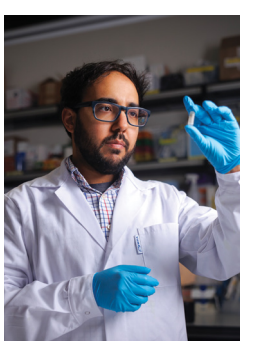
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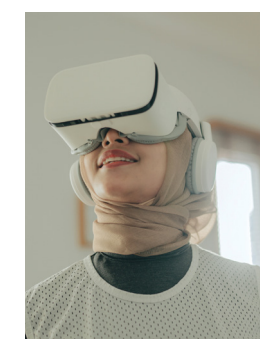
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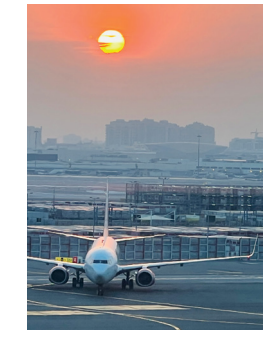
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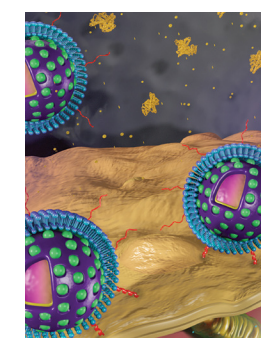
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**Art, Activism,  
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**Chinasa Ezugha's** journey from Nigerian masquerade to the global stage embodies resilience, cultural richness, and a relentless pursuit of justice.

Amid the rhythmic beats of drums and the mesmerizing swirl of colorful masks, four-year-old Chinasa Ezugha gazes in awe, clutching her mother's skirt. Each vibrant costume at the Nigerian masquerade weaves tales of tradition and heritage, captivating all who witness them and leaving an indelible mark on a young Ezugha.

Today, the assistant professor of live art weaves her history into a form that transcends entertainment, delving deep into the human experience. Her live art challenges perceptions,

“ Mainstream education was not easy for me, and that experience instilled a need for justice. ”

fights injustice, and shares a powerful message of unity and resilience, each haunting melody serving as a reminder of her childhood in Nigeria and the difficult years that followed.

Known for her 2017 Biafra, *British Politics*, *Ibo Brexit* show, Ezugha – previously co-director at the Live Art Development Agency in London and founder of Live Art in Norfolk, UK – is celebrated internationally for her craft. But life has not always been so dazzling for the British Nigerian artist. Born in 1991, Ezugha's family

moved to Birmingham, UK, when she was just nine years old, unwittingly introducing her to a world of bullying and discrimination.

“I struggled with the move and was expelled from school when I was 12 years old,” she says. “Mainstream education was not easy for me, and that experience instilled a need for justice. In my future roles, I sought to use art and performance to open up spaces for people who might be recovering from abuse, living in care, or unhappy in school.”







After leaving school, Ezugha attended a community education center for children who had left mainstream schools. There she became increasingly immersed in art, achieving stellar GCSE results and eventually admitted to the Fine Art program at Aberystwyth University in Wales, followed by an MA in Performance Making at Goldsmiths University of London.

"I was always interested in drawing and painting but I came to live art in the second year of my undergraduate degree, almost by accident," she says. "Growing up in Nigeria, my grandparents would tell us stories, and sometimes those stories would include music and dance. It was a form of entertainment, but it was also a way of passing down knowledge."

"I didn't understand the impact of these experiences until I started looking at performance art. Being in the UK gave me the language that I needed to articulate life in Nigeria and see the value and uniqueness of coming from a different culture. I learned to understand how my childhood experience could be framed within that formative discourse."

After graduating, Ezugha used art as a method to engage underprivileged communities, working with government bodies and arts organizations while practicing independently as an artist. In 2022, she relocated to the UAE to take up a teaching post at NYUAD, where she has continued her research on the use of food as a weapon.

"Historically, food has been used as a very weapon to either destroy the opposition or to create a generation of malnourished individuals," she says.

In 2023, Ezugha was offered the opportunity to lead a full production called *Art, Activism and Food*; performance practice and food politics, on which she worked with students to stage a six-hour performance.

"The project came from both a political and a personal need to speak out about the injustice that has occurred regarding food."

Today, Ezugha is working on a project connecting academics, artists, and business entrepreneurs in investigating food sustainability in the UAE.

"The research is ongoing, but we're hoping to expand into a social enterprise working with locals here and forming international collaborations," she says. "If we face the topics that make us uncomfortable and use performance as a space to cultivate more voices, hopefully we can make a change." ■



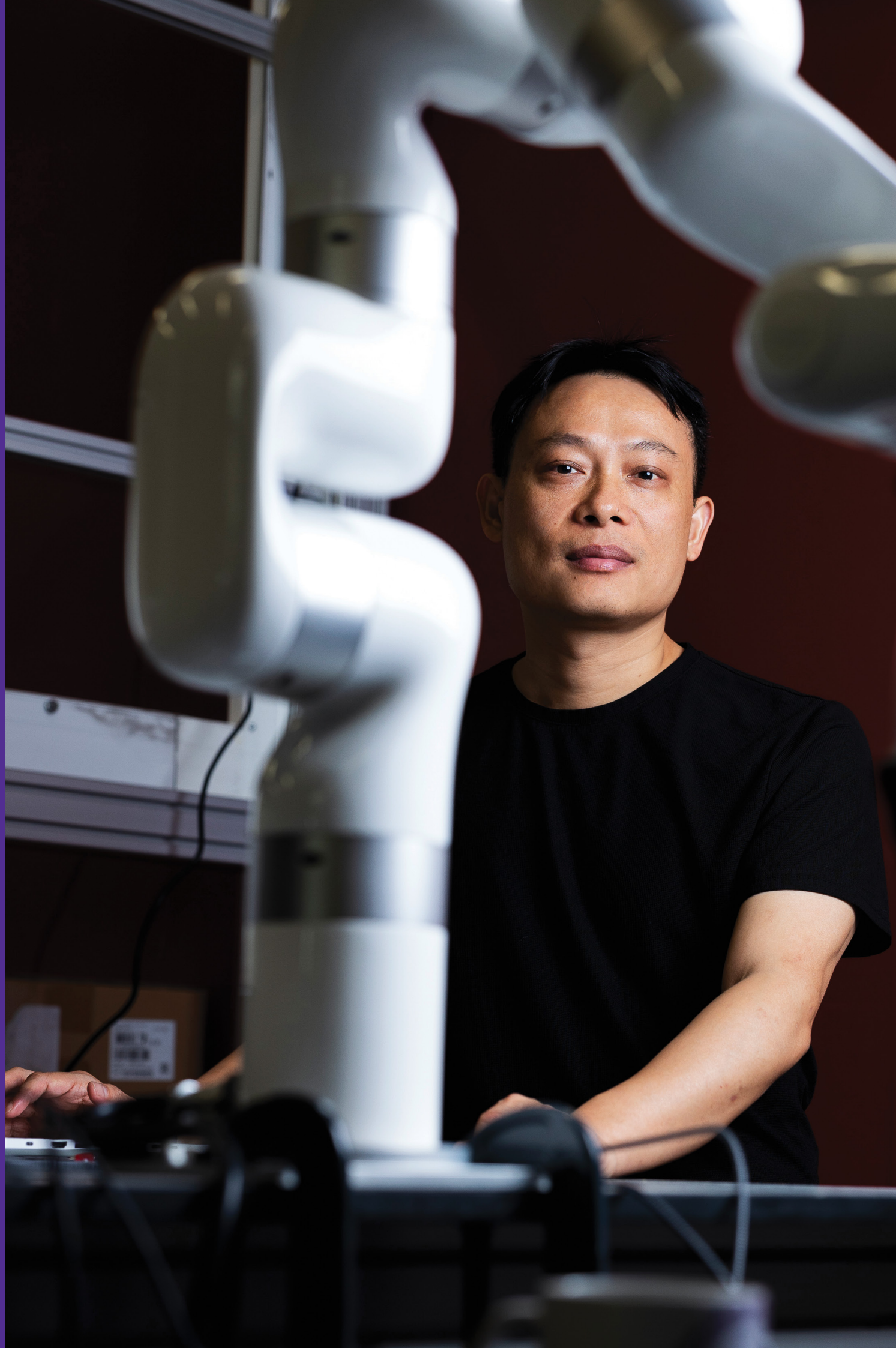
## Harnessing AI to Enhance Perception and Interaction with the World

How the pioneering work of **Yi Fang** could see AI technology helping a wide range of people, including the visually impaired.

The emergence of artificial intelligence has been heralded as the next technological quantum leap. There are many who stand to benefit from the nascent technology, perhaps none more than the visually impaired, who could discover new opportunities for independence and engagement with the world around them.

Yi Fang, an associate professor of electrical and computer engineering at NYU Abu Dhabi, is at the forefront of this revolution, leveraging advanced machine learning and computer vision to enrich this understanding of the environment.

Fang's pioneering research primarily focuses on AI, developing sophisticated algorithms that empower machines and robotics to better perceive, understand, and interact with their surroundings. With his



expertise spanning several diverse fields, including 3D computer vision, multimedia processing, and deep learning, Fang brings a wealth of knowledge to his roles as an educator and researcher.

"I teach machine learning, which is a senior-level course, along with computer vision and pattern recognition," he explains of his position at NYU Abu Dhabi. "These subjects span a significant breadth of knowledge, which is vital for the research I lead."

Through state-of-the-art techniques in big data and deep learning, Fang, a Purdue graduate who worked for Siemens, can create advanced systems capable of far greater capabilities than simply recognizing objects - instead, they can contextualize and understand complex environments.





“ This embodiment of AI signifies a major stride towards creating personalized and empathetic technological solutions. ”

Fang's technological advancements can be embedded in intelligent agents, such as smart glasses, that can become interactive companions providing real-time assistance to the visually impaired.

For example, social cues and nuanced interactions can be interpreted and navigated with the system responding intelligently to statements like "I'm thirsty" by guiding the user to a coffee shop or assessing crowd density and advising caution.

This work exemplifies the concept of embodied AI, where the technology not only processes information but also understands and responds to the social dynamics of the environment.

"We leverage language models and visual reasoning to grasp the context thoroughly, ensuring that our descriptions, summarizations, and interactions are coherent and meaningful," Fang continues. "This embodiment of AI signifies a major stride towards creating personalized and empathetic technological solutions."

Beyond his research, Fang's commitment to merging academic and industry insights is evident in his teaching philosophy. As an educator, he inspires students to explore diverse AI applications.

Many have made significant contributions in fields such as autonomous driving and automated services, reflecting the practical relevance and impact of his mentorship.

Additionally, in 2012, Fang co-founded the NYU Multimedia and Visual Computing Lab, a visionary project that predates mainstream AI applications like ChatGPT.

This interdisciplinary lab offers a collaborative platform for students and researchers from NYU's New York and Abu Dhabi campuses to tackle challenges in multimedia and visual data processing.

"Our goal is to develop master tools for processing modern multimedia data," Fang says.

Through his groundbreaking research and commitment to education, Fang is redefining the potential of AI, broadening its applications to enhance how both humans and machines perceive and interact with the world. As we move towards a future powered by intelligent agents, the vision of a more perceptively interconnected world is increasingly within our reach. ■





## Agents of Reform

From 19th Century factories to modern-day sweatshops, sociologist **Elisabeth Anderson's** research examines how policy can address injustice in the workplace.

In the dimly lit factories of the late 19th century, small children toil ceaselessly, their small frames bent under the weight of heavy labor.

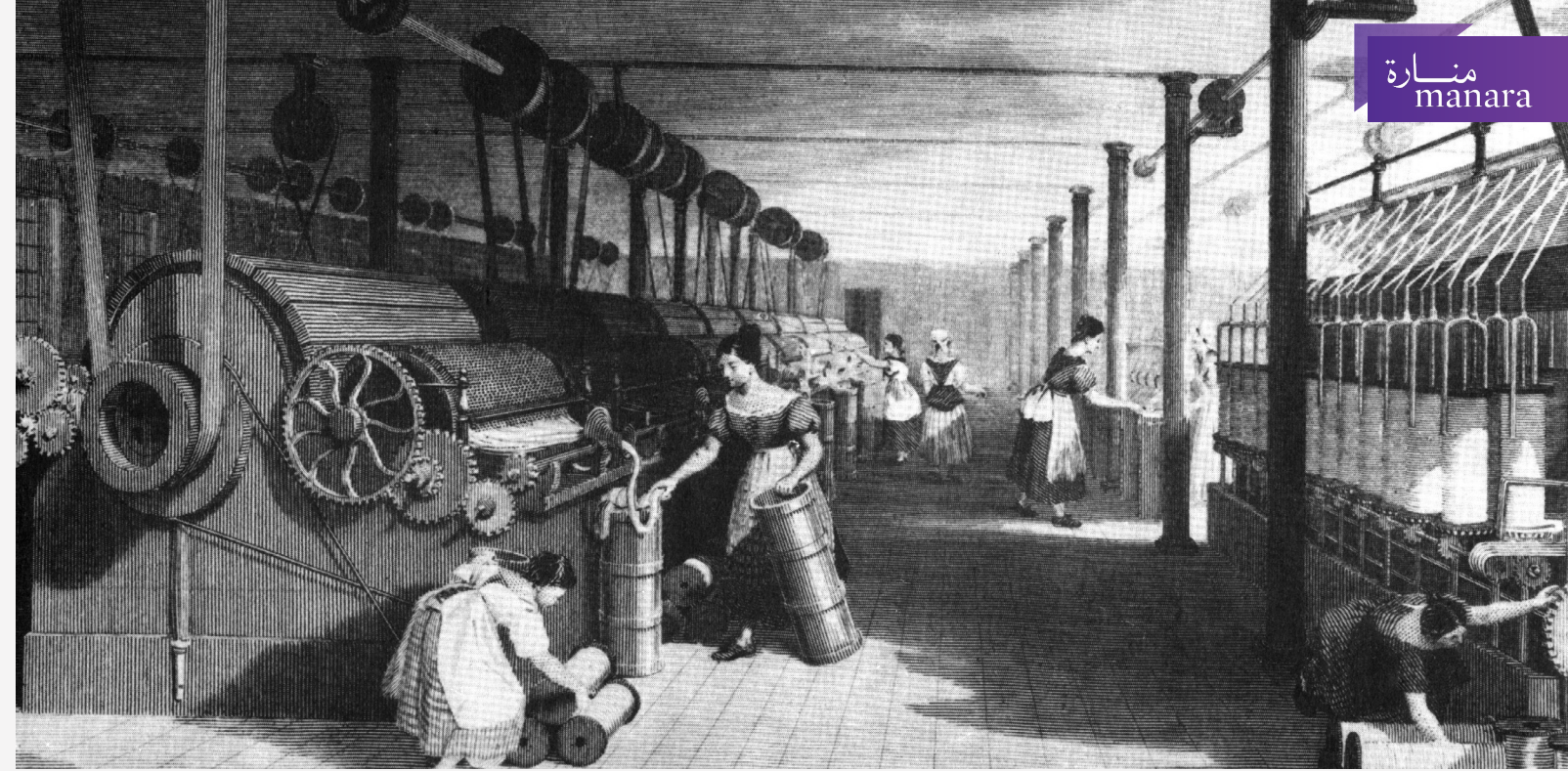
Today, conditions have greatly improved, yet echoes of the past still reverberate, with modern-day sweatshops making headlines around the world. It is at this crossroad of history and progress that sociologist Elisabeth Anderson shines a guiding light.

Through her meticulous study of the past, she unveils how US states first addressed the realities faced by vulnerable workers and illuminates a path towards a more just future for generations to come.

"I definitely do think that there are lessons to be learned from the past, especially given the level of political polarization in the US and a lot of other countries," says the associate professor of sociology. "Nineteenth-century child labor reformers were often very skilled at building alliances with people who thought differently from them.

She says making progress is difficult, but it's possible when pursuing realistic goals. The key, according to Anderson, is to convince powerful people that policies to protect the poor can benefit them too.

Anderson's work as a comparative-historical and political sociologist of the welfare state and social policy is renowned. Her 2021 book, *Agents of Reform: Child Labor and the Origins of the Welfare State* scooped several international awards, most recently the 2023 Stein Rokkan Prize.



“ I love the detective work that historical research requires. You're given little scraps of evidence and you have to dig through them and piece them together to build a convincing narrative. ”

The beginnings of the modern welfare state are often traced to the late 19th century labor movement and to policymakers' efforts to appeal to working-class voters.

In *Agents of Reform*, however, Anderson shows that the regulatory welfare state began a half-century earlier, in the 1830s, when middle-class reformers advocated for the first child labor laws.

"I love the detective work that historical research requires," says Anderson. "You're given little scraps of evidence and you have to dig through them and piece them together to build a convincing narrative."

Anderson's sleuthing career ignited during her teenage years in Richmond, Virginia, where social injustice was part of everyday life.

"I grew up during the war on drugs when a lot of the middle class fled to the suburbs, leaving the city in a state of economic decay," she says.

"I went to Richmond public schools and many of my classmates were from less privileged backgrounds."

During that time, she saw a lot of inequality and disadvantage and, though she was relatively protected as a middle-class white student, that experience weighed heavily on her mind and became the impetus for her to major in sociology.

After graduating from the University of Chicago, Anderson took a federal government role, researching the implementation of social policy programs in the US. In 2013, she earned a PhD in Sociology at Northwestern University, having specialized in the politics of the welfare state.

Today, Anderson is a leading authority on child labor and has continued her research at NYU Abu Dhabi since joining the Social Research and Public Policy program in the Division of Social Sciences in 2015. Currently, she is working on a series of papers with fellow NYUAD sociologist, Sabino Kornrich, examining worker protection in the welfare state.

"We all need to be able to consume the necessities of life, but we also need to be protected at work. I'm trying to make the case that worker protection and social provision are equally important sides of the welfare state that shape each other in interesting ways, both historically and today." ■





## Warren Churchill explores the intersection of music and Deaf culture, fostering inclusion and challenging stereotypes.

How does someone with a hearing impairment enjoy music? And how can they become leading educators and researchers in the field?

Warren Churchill, senior lecturer of music at NYU Abu Dhabi, where he also serves as the coordinator of musical performance, embodies the possibility of both, challenging conventional perceptions.

His personal journey, marked by his identification as being hearing impaired in his youth, underscores the potential for individuals within the Deaf community to engage with music on their terms.

With over three decades of teaching experience in both public and private schools, Churchill has become a leading advocate for disability studies in music education. His lessons at the University span a variety of instruments and musical disciplines, and he has also developed a core curriculum course, "dis/Abilities in Musical Context."

## Discovering the Harmony of Music and the Deaf Community

There are many modern musicians with hearing impairments such as American rapper Sean Forbes and jazz and pop singer Mandy Harvey. Classical composer Ludwig van Beethoven was also famously hearing impaired. Churchill himself once played in a Deaf rock band.

The way that music is experienced by the Deaf community is different to people with hearing," he says. "Whether a person is born with deafness, or whether it is acquired over time, assistive hearing devices are available; you can feel the vibrations of the music and the meaning of a song or a piece of music can still be enjoyed via the lyrics or at a concert with a sign language interpreter. There is a real poetry to the hands, reflecting a visual linguistic sub-track."

Churchill's research is focused on individuals affiliated with the Deaf community who use sign language and also identify as musicians or sound artists. He draws on ethnographic fieldwork methods and narrative inquiry to understand and navigate the complex discourses connected to musical ability, along with their social and political ramifications.

"For example, my recent book chapter, entitled 'Towards 'Little Victories in Music Education'', explores the problems of singing in sign language, and the difficulties regarding inclusion in music education, drawing connections between Deaf music-making and society's ideas of what it means to be disabled."

Churchill is interested in the intersection of disability and music education, utilizing Deaf studies, sociology, philosophical perspectives of music education, and narrative inquiry. "I enjoy learning sign language, but a lot of people still don't understand the cultural aspect," Churchill continues. "Traditionally, deafness has been viewed as a problem to be solved, but disability studies challenges this perspective by recognizing the Deaf community as a minority to be valued in its own right."

Churchill's influence extends to his students, with several doctoral candidates exploring disability-related topics, such as how middle school music educators facilitate inclusion.

“ There is a real poetry to the hands, reflecting a visual linguistic sub-track. ”

"One of my doctoral students has examined the skills and resources needed to teach students with various disabilities, which many educators might be unprepared for," he says. "I am also mentoring a capstone student who is investigating how early childhood music education can foster inclusion and holistic development."

Through his work, Churchill hopes to continue to challenge traditional educational paradigms and foster a more inclusive approach to teaching and learning.

"The UAE provides an ideal environment for this, as the notion of People of Determination has emerged, which reflects a shift towards inclusivity," he says. "In the future, I would like to engage more with the local community, promoting the work of musicians with disabilities, and inviting artists and educators to be part of the conversation." ■







## Getting Plastic Back in Our Good Books

How a thought-provoking course is encouraging students to reconsider the viability of a material so often labeled as an environmental pariah.

Khulood Alawadi is on a mission to re-engineer our relationship with plastic but it's no small feat. The simple thought of single-use plastics conjures images of garbage patches in the ocean half the size of the Arabian Peninsula. But her design-based approach to engineering is beginning to reframe perceptions of the material among NYUAD students and beyond.

Plastic is currently the proverbial persona nongrata in the global pollution debate, but Alawadi argues that it's our relationship with the material and our single-use mindset that is the true problem.

"It's broken," says the Emirati faculty member. "It's not the material itself, the material is absolutely amazing; we would never want to go into a hospital if they did not use plastic products."

Her course, "Plastic Fantastic," teaches students how to practically repurpose 'found' plastic into new items that can be useful to society, even going so far as finding commercial uses once again.

"The students get real life experience with plastic," she says. "We do not treat it as this horrible material...we want a more optimistic outlook, to see how useful this material is to humanity."

As part of the Plastic Recycling Research Lab, Alawadi's research-based course challenges students to ask some fundamental questions: What would a world without plastic look like? And is this a world we even want to live in?

Alawadi describes herself as "a bit of an outcast" in her NYUAD division because she hasn't studied traditional engineering and approaches the field from the perspective of a designer and artist.

According to the lecturer of engineering design, learning design is a fundamental skill that is "so important for everyone" regardless of their program or major.

In the course, Alawadi prompts students to think about recycling and associated problems, including "the myths." She challenges students to imagine the lifecycle of a singular piece of plastic waste, and to envision the item's journey

when dropped into a garbage bin instead of a recycling bin.

"They come face to face with the reality of their trash, how difficult it is to deal with, how labor intensive it is, how complex this whole system can be," she says.

During the course, students dive deep into Alawadi's research. This includes thinking about issues related to the environmental politics of plastic debris in oceans, the proliferation of cheap plastic toys and fashion trends, and even the ethics and values of plastic surgery.

“We need an attitude change, a cultural change in order for us to tackle this issue.”





They examine the personalities of plastic and work out ways of repurposing old material with a new life. By course end, the students are tasked with developing a reproducible and functional plastic product.

"It should be something they can start a small enterprise with," says Alawadi. "This gets them to think about the entire ecosystem in which they're designing, who is involved, where materials are coming from, how it is benefiting people and society."

A group last year produced an Emirati burqa - a traditional facial accessory worn by women - out of repurposed single-use plastic.

In the process, they not only gave new life to discarded material but also discovered that the product they made could have a deeper cultural impact, and perhaps become reintegrated as a modern fashion accessory.

"They ended up making it out of found plastic, following the same principles and construction. All of a sudden, we were having a conversation about plastic and cultural preservation, not just environmental preservation."



Her research and the "Plastic Fantastic" course encourages students to think about how their work can have an impact outside the classroom.

"I get them to put their work out in the world - a real product that has an identity, a brand - and see people's reactions," says Alawadi, revealing the end-of-course showcase has visitors often hungry to buy. "We need an attitude change, a cultural change in order for us to tackle this issue and our relationship with plastic." ■







## Following Gut Instinct

Pioneering work by **Khalil Ramadi** and his research team is leading to a very clever pill and a kinder medical experience for all.

In Khalil Ramadi's lab, a pill the size of an omega-3 capsule holds the potential to replace invasive surgery or intensive medication for several ailments riddling modern society.

The assistant professor of bioengineering leads the laboratory for Neuroengineering and Translational Medicine, transforming bioengineering research into practice in dynamic fashion.

His team is developing technology to improve disease diagnosis and treatment, using the nervous system as a platform and leveraging its potential to seamlessly interact with the body.

Put simply, their research aims to use electrical impulses via an ingestible electronic pill that modulates the nervous system for therapy – dramatically changing the way some conditions are treated.

This could, in turn, lessen the need for invasive surgery or strong medication, thereby reducing related side effects.

"Our body has this beautiful system able to maintain homeostasis," he says, referring to the state of balance among all the body's systems needed for it to function correctly.

"Our premise is that perhaps we can use this system as a mechanism for actually tweaking the body, instead of thinking about a drug that you give, or surgery."

Ramadi explains that another "nice thing about the nervous system" is that it communicates electrically, as opposed to chemically, as drugs do.

Therein lies the potential of Ramadi's digital pill.

"When you have electricity, you suddenly have tighter control...I can zap someone with a 100 microsecond pulse, you won't even feel it but it'll do something - versus if you give a drug, it'll take a few hours at least to clear out of the system."

Such a capsule could prove significant for the UAE's diabetes and obesity cases, by helping to use the body's own systems to curb appetite or negate the need for injected insulin.

"We don't want to do something radical to the body. All we need to do is nudge it in the right direction, whenever there is some element of disease; just to hijack those networks for what we need to get done," he says.





“ Our body has this beautiful system able to maintain homeostasis. ”

Ramadi admits his team isn't the only one to realize that neuroengineering is "a cool avenue to explore" for therapy.

However, one thing he cites as novel is their approach to modulating the nervous system - through the gut.

Ramadi, also a Research Fellow at MIT, is rightly confident of finding success, having previously been selected as one of Forbes' 30 under 30 list in 2023 for taking lab work results to commercialization.

Ramadi recalls a device his team developed and deployed in clinics. Ventilator shortages during the COVID-19 pandemic prompted Ramadi's lab to devise a system for safely splitting ventilators across multiple patients. Using this system, they launched a nonprofit and partnered with manufacturers to get the life-saving mechanism to market.

Building on that success, Ramadi says they recently secured a large grant with collaborators to develop more advanced versions of their digital pill with the goal of getting them into patients in five years.

The UAE-raised academic reveals he was inspired to help medical staff treat patients after witnessing a disconnect between care delivery and the technological possibilities available to fill perceived gaps.

"Clinical rotations really opened my eyes to the world of medicine and healthcare, and the fancy technologies we develop in labs that make for great papers," says Ramadi. "How realistic is it that they

are going to actually impact patient care? In the short term, very little."

That experience, he says, shaped the way he runs his lab and sets research goals, saying their team "focuses first on unmet needs."

Ramadi continues: "Not to fault them, doctors, nurses, and clinicians are far too busy in their world to consider radical new approaches. We develop a lot of cool tools and we work with them very early on.

Every one of our projects has a clinical collaborator, where they basically influence how we design devices, and it usually ends up being a lot less complicated from an engineering standpoint."

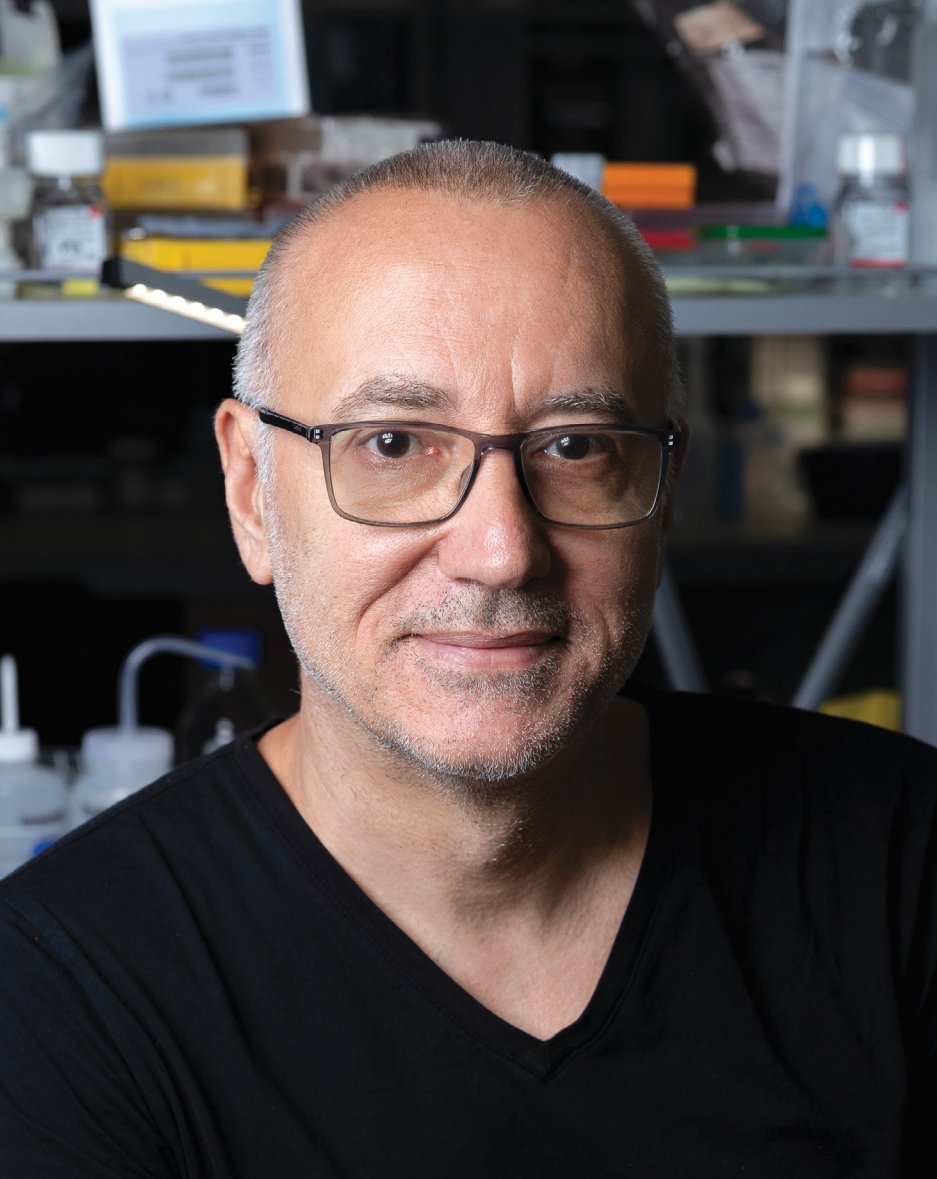
That said, Ramadi, also an associate assistant professor of radiology at NYU Grossman School of Medicine and Langone Health, concedes there could be initial reticence from patients asked to swallow an e-pill.

"We need to not dictate remedies to patients," adds Ramadi, who says his lab's existing digital pills could be mass-produced for about one US dollar."

"What we're starting to do is listen to them and ask what they are comfortable with, what they're not comfortable with, and we incorporate that into the design."

But with education, including reassurances on safety and the capsule harmlessly exiting the body, he believes such technology use could be commonplace in 10 years. ■





## How Invasive Species May Hold the Key to Conservation

Researchers at NYUAD are studying pests to learn how they have adapted to survive in extreme environments.

What do the Red Palm Weevil, South African Clawed Frog, and Mesquite tree have in common?

All three are harmful invasive species that have spread rapidly around the world, transported unwittingly by human activities. They wreak havoc on native environments, decimating crops and outcompeting indigenous species. But, the three are also excellent survivors that hold valuable secrets for adapting to climate change.

By studying species that can spread and thrive outside their native environments, Professor of Biology Stéphane Boissinot and his team are learning how organisms adapt and survive in extreme environments.

Boissinot is an evolutionary biologist who works at the interface of field-based, molecular, and computational approaches to address fundamental biological questions.

His team at the Boissinot laboratory is two years into a five-year study of three model species, tracking them across the world and using gene sequencing and phenotypic characterization – the study of observable physical characteristics – to understand the interplay of genetic and behavioral adaptation in different environments, including the extreme temperatures and desert environment of the UAE.



“It’s important to determine why some species can adapt, and why some can’t.”

“It’s important to determine why some species can adapt, and why some can’t,” Boissinot says.

He says the study is a “very global collaborative project” with members of the team traveling regularly to the countries where the target species originated from and have spread to, to collect samples.

They are building a detailed picture of the path the invaders took as they spread across the globe, and the genetic and behavioral adaptations that occurred along the way.

Originally from tropical South East Asia, the Red Palm Weevil, has spread across much of the Middle East, Africa, and Europe, chewing its way through date, oil, and coconut palms, causing hundreds of millions of dollars in damage.

“In this group of insects, there are five other species that are pests of the palm, but only one of them has spread worldwide,” Boissinot says. “Some species have an intrinsic ability to adapt and to invade, and I think that’s important to understand what makes those species successful invaders.”

The Red Palm Weevil arrived in the UAE, one of the world’s biggest exporters of dates, in the 1980s and has since become a major problem for farmers.

Studying the insect may lead to valuable insights into how to slow its spread and reduce its impact, but the more interesting outcome from the study may be what is learned about adaptation to extreme environments, Boissinot says.





“So here you have a species that started in a tropical wet environment that adapted to the arid environment of the Emirates and then became invasive in Europe where you have a winter, something they have never experienced anywhere. So you have multiple steps of adaptation to very different conditions as that happened very rapidly. So that’s why we’re interested in those species.”

By studying invasive species that thrive in new environments, scientists can observe the genetic changes that occur as a model of accelerated evolution.

“Invasive species adapt to that climate in a very short timescale,” Boissinot says. “So we can use that as a model to try to understand how an organism can adapt to extreme heat.”

The extreme, arid environment in the UAE also allows scientists to test environmental scenarios that will become more widespread with rising temperatures and changes to rainfall rates around the world. For example, the UAE’s natural climate today could provide a glimpse into what Spain’s summers will be like in 20 years.

“If we understand how an organism can adapt to an extreme hot climate like we have here, and in a timescale that is very short, because invasion occurred in the last 30-40 years, then maybe we can learn something about how an organism can adapt to very fast climate change.” ■





## The Networks that Drive our World

The past four years have shown millions of people how seemingly distant events from around the world can significantly impact their lives at home.

Sanjeev Goyal's research explores how human connectivity and the global nature of economics impacts everything from the food on our table to the holidays we take, and the professions we choose.

Professor of Economics Goyal studies how globalization can benefit societies and produce challenges when they are disrupted – as demonstrated by the effect of Russia's war with Ukraine on grain and gas supplies.

When networks flourish, the implications are tangible, as Goyal's work demonstrates: goods, services, and information flow smoothly through networks.

However, these same connections may become a conduit for the flow of disease, economic shocks, and misinformation under other circumstances as demonstrated by the COVID-19 pandemic, the Ukraine war grain shortage, and AI-generated content leading to social media misinformation campaigns. So it is vital to understand the principles that have guided networks throughout history.

“You need networks to survive.”

While China's ambitious Belt and Road initiative is arguably the world's largest emerging infrastructure and institutional network, Goyal stresses that the concept of network is far from a modern construct.

"We've always had networks," says Goyal. "Maybe 2,500 years ago, most probably hunter gatherers had their networks, and people living in the Roman Empire had important networks – transport networks, international trade networks – you need networks to survive."

"My research tries to uncover very simple, basic principles; how networks form, how networks affect behavior, how you can intervene in networks to have maximum impact."

Think about economics at its most basic, Goyal explains, and we think of production and consumption; people making decisions, allocating resources, what to produce and how, who to buy from or sell to, through to consumers deciding what to eat, holidays to take, and medical treatments to have.







and family," he says, introducing notions of connectivity and, therefore, networks.

"Those are the questions I'm interested in at a very fundamental level and in studying them I'm essentially bringing a new set of concepts, a new set of ideas, which have to do with graphs or networks, into economics."

Over the past 30 years, Goyal has introduced ideas from sociology and mathematical concepts to core economic concepts – competition and incentives and strategic thinking – to expand the methodological kit of economics.

Part of Goyal's research explores how geopolitical events can impact individuals and the interconnectedness of economic systems, but it also delves into the nuances of technological advancements in society and international relations.

Technology enables the creation and maintenance of networks, so the professor examines the evolution and complexities of networks in the digital age, including how networks shape behavior and vice versa.

Goyal says social media has made people more aware of the power of economics and how it touches their lives.

The Ukraine war, for example, impacted global dynamics – as well as individuals when domestic fuel bills rose and grain couldn't reach African kitchens.

A physical network, in the form of the Nord Stream pipeline, was disabled, says Goyal, and new networks emerged as Europe strived to operate without Russian supplies.

As China's Belt and Road project emerges and grows, Goyal is keen to highlight geographical competition for what he calls "hub status" in global connectivity, particularly in the context of Beijing's intercontinental ambitions.

In the UAE, he added, we are well aware of the great benefits that arise when a city like Dubai becomes a global hub for shipping and air travel.

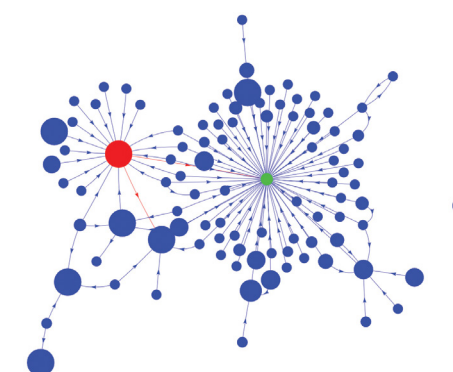
At the heart of that and economics, it seems, cooperation and more is required to get things done.

Goyal, who also works on the topic of identity and trust, brings it all together by recalling a cab journey on a recent Hong Kong trip.

"I didn't have the cash, but the driver wouldn't let me leave the taxi to visit an ATM," he reveals. "He wanted me to leave my computer with him, but I couldn't possibly because I didn't trust him – and he wouldn't let me go to get the money because he didn't trust me."

Which brings to light the importance of trust in any transaction, and prompts the questions that is crucial to Goyal's research: Is trust embedded in networks?

"We are hoping to answer this very simple, very profound question." ■







## Finding the Route to Gender Parity

**Andrea Vial's** research is looking to answer a simple question: Why do men and women flock to different roles?

Andrea Vial is powering the drive to solve the planet's gender segregation puzzle. The social psychologist is providing science that change-makers can use to finally put an end to gender inequality.

Vial's Social Roles & Beliefs Lab investigates how biases and expectations on social groups contribute to inequality and employment segregation. Their primary goal is to understand the psychological processes that contribute to the persistence of group disparities in the global workforce.

“Our personal ultimate goal is to understand the processes that shape the segregation that we see around us.”

The Argentinian Yale graduate seeks to answer a few fundamental questions through her research: Why do men and women flock to different roles? What are the psychological processes behind gender employment discrimination? And what are the conditions under which individuals in non-normative roles and domains can thrive?

To answer these questions, Vial takes an interdisciplinary approach, drawing from social-psychological, sociological, organizational, and developmental perspectives. A common theme in her research is looking at what traits are viewed as required for success, and beliefs about groups, or group stereotypes.

The titles of her published research might provide more context. With titles like "Heavier lies her Crown" and "You've come a long way... Maybe: How moral emotions trigger backlash against women leaders" it's clear that Vial is striking a topic that almost all women in leadership positions have experienced.

"Our personal ultimate goal is to understand the processes that shape the segregation that we see around us," she says. "Ideally, the science is then leveraged to perhaps change things."

Throughout the world, men and women are paired with different jobs, roles, and designations - a key and persistent example being that men occupy the bulk of leadership positions while women continue to perform a majority of care-oriented jobs.

Part of the Social Roles & Beliefs Lab's research aims to understand the psychological mechanisms that shape this segregation with a view to informing social policy and education interventions to ultimately better promote inclusivity.

"Not only the research I do, as a social psychologist in the area, but the research of many others can inform social policy and can inform policies and structures within organizations," Vial explains. "Hopefully, we can shed light on how those structures relate to individual psychological processes that then feed into these disparities."

Vial, who is also Global Network Assistant Professor of Psychology at NYU, says the media, in a very broad sense, also "promotes" cultural-level stereotypes and gender norms, from educational textbooks to TV and advertisements.

Crucially, she says that these cultural-level stereotypes shape people's interests and goals - the sense of what they can do - but, perhaps more importantly, she says it can even influence their sense of what they can't, or shouldn't do.

Much of the Social Roles & Beliefs Lab's research within this complex, multi-layered subject area falls into one of four different lines of inquiry; leadership cognitions, gendered workplace cultures, the transmission of social biases, and stereotyping and prejudice.





Vial and her colleagues also investigate the social processes, the discrimination mechanisms or economic penalties that influence an individual's choices, along with the psychological barriers that may challenge advancement.

She says that even when people develop an interest in roles that are counter-stereotypical – women in STEM, or physically intensive roles – there can be a number of processes that end up chipping away women's self confidence in a way that doesn't necessarily feel like it's gendered but more personal. That, in turn, affects how people choose to use their time.

Theories in social psychology suggest that, even when granted greater freedom of choice, people still choose a life that is "simplified by these scripts."

"When we think about a fish swimming in water, the fish doesn't know that they're surrounded by water," Vial says. "This kind of metaphor has been used to think about these cultural stereotypes...we're already embedded in them, these things just become natural, they're part of the ambient noise."

Today, she says, we're in an environment where society is questioning these stereotypes more than ever before. Certain cultures have implemented rules and mechanisms that aim to improve equality in the workplace.

However, not enough is being done. In fact, she admits sometimes the research is depressing and the pace of progress in global society and workplaces misleading.

Hence, Vial is realistic for the decades ahead.

"Ideally, we work towards a world where this kind of research is obsolete, when there are no inequalities," she concludes.

"If I'm frank, I sadly don't see that happening anytime soon across the globe. Progress is there for the most part, but it's not linear. So, in my own lifespan, I don't think that I will run out of work to do." ■





# A Breath of Fresh Air

**Melina Platas's** research aims to change the very air we breathe, from Abu Dhabi to cities in Africa.

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As the sun rises on another Californian summer day, the world around Melina Platas bleeds into a surreal painting of despair. Just miles from her home, scorching flames greedily consume the once-lush landscape, casting sinister shadows that creep closer with each passing moment. The air, thick with the acrid scent of burning wood, chokes her senses as the worst wildfires in US history rage on.

Returning to her home in Abu Dhabi, Platas left the haunting orange skies far behind, but the memories of the 2020 California wildfires persisted. Back in the classroom at NYU Abu Dhabi, a passion for change took hold, driving Platas to join an international effort that could one day change the very air we breathe.

"For about a week of the fires, the sky was constantly smoky, and you just felt like you couldn't escape it," says Platas. "I had just had a baby and I felt totally powerless to protect myself or my family. When I came back to the UAE, I started paying more attention to air pollution levels here and in other places around the world and I was shocked to discover how high they are. That's when I started to question how I could tackle the problem."

While investigating worldwide data, Platas was horrified to learn that air pollution is the world's fourth biggest killer, responsible for 10 million deaths a year. Like most of the population, the US expatriate had seriously underestimated the health risks of air pollution. But unlike many others, the assistant professor of political science found herself in a position to raise awareness.

“  
My end goal is to bring down levels of pollution around the world and I don't think that's too ambitious.”

After graduating with a BA in Human Biology from Stanford University in 2007, Platas spent two years in Uganda working as a journalist, reporting on infectious disease, health policy, public health, and the effects of politics on healthcare. On returning to Stanford, she achieved a PhD in Political Science. Since moving to the UAE in 2016, Sub-Saharan Africa has remained at the center of her research.

"After COVID-19 and the 2020 wildfires, I began investigating the air pollution levels in Abu Dhabi, particularly paying attention to NYUAD's CITIES air initiative, which provides real-time air quality data around campus. The more active part of the research, however, took me back to Uganda, where the threat of air pollution is seriously underestimated."





Platas discovered that air pollution levels in the Ugandan capital of Kampala were equal to cities in India and China, which contain some of the world's most polluted cities according to a report by IQair. However, unlike those cities, a survey she carried out in April and May 2023 showed awareness levels were quite low.

To tackle this, Platas joined forces with AirQo, an air quality monitoring organization that is setting up low-cost air quality monitors around Africa. Today, she has helped serve as a link between air quality researchers and the Ugandan media and has a second, more representative, survey in the works.



"The sources of pollution in Africa are quite different to more developed countries," she says. "One of the major causes is biomass burning, like using charcoal for cooking or burning waste, and there's also a lot of old vehicles on the road that produce harmful emissions. The public needs to know because it implies different solutions, and there's a lot that individuals can do to combat it."

She says that step one is about measuring and getting a better sense of what people's levels of knowledge are. Step two is thinking of ways to decrease levels of pollution.

One vital way to achieve this is through government-backed initiatives like the USA's Clean Air Act of 1963, which is a federal air quality law intended to reduce and control air pollution nationwide.

"There are some things individuals can do, in particular in this context, but it also requires government action to really push the needle," she says. "I've been in

conversation with the public health directorate of the Kampala Capital City Authority, and they're aware of this issue and are working on new policies to address air pollution."

Back in Abu Dhabi, Platas is pushing to have air quality monitors installed in school classrooms to address air pollution in the emirate.

"The UAE government is very proactive in implementing health policy and COVID-19 showed us how seriously public health is deemed," she says. "Progress is very quick here and compliance is high so I'm confident that if it is made a priority then air quality will improve drastically."

"My end goal is to bring down levels of pollution around the world and I don't think that's too ambitious. I certainly don't think I'm single-handedly going to do this by any means, but if governments, organizations like AirQ, and the media pull together, we can ultimately save lives." ■





# How Virtual Reality could help Unpack Racial Bias

From a simulated tai chi class to tackling racial stereotypes, **Domna Banakou** is empowering change through the world of virtual reality.

Inside a room at NYU Abu Dhabi, the long, flowing linens typically worn by participants of a tai chi class have been replaced with wires, computers, and virtual reality headsets.

From the outside, it's a bizarre scene, but it's nothing compared to what Domna Banakou's test subjects are experiencing.

The clinical psychologist is not so concerned with the participants' tai chi technique but is rather observing their reactions to seeing themselves in the mirror, completely transformed as a different race and color.

Back in the lab, Banakou scrutinizes every movement as it plays out in the virtual world. Each subtle shift in body language and every flicker of emotion adds another layer to her understanding of the complex interplay between body representation and racial perception.

"I am particularly interested in how altering this body representation can lead to changes in behaviors, attitudes, and perception," says Banakou, who is an assistant professor of practice of interactive media. "By playing with this concept of body transformations and manipulating scenarios in the virtual world, we can explore people's behavior, specifically their implicit racial bias."

Banakou combines technical expertise and experience in research methodologies to understand and promote the use of virtual reality in the field of psychology, with her research taking her around the world.

In her experiments, Banakou dresses participants in a full-body motion



“By playing with this concept of body transformations and manipulating scenarios in the virtual world, we can explore people's behavior.”

capture suit with a head-mounted display, giving them total control over the body of a corresponding VR avatar of a different race.

The study showed that identifying with another race or culture in this way could lead to a reduction in implicit bias. Banakou hopes the results of her research could one day lead to positive change in society and everyday life.

Originally from Greece, Banakou graduated from Corfu's Ionian University with a BSc in computer science, before a love for games and VR led her to University College London and an MSc in computer graphics, vision, and imaging. From there, she completed a PhD in clinical psychology and psychobiology at the University of Barcelona before moving to Abu Dhabi two years ago.

"I combined the technical parts with psychology and science," says

Banakou. "You need to understand how people's minds work to really delve deep into changing behaviors and perceptions."

Similar research has gone into training police forces, educating children, and rehabilitating criminals. NYPD officers underwent such training to understand the treatment of black suspects, in an effort to tackle police violence and bias.

Banakou believes that further studies could be used to benefit large sections of society.

However, there are important ethical, societal, and legal considerations regarding the use of virtual reality and Banakou is conscious that the technology can be potentially dangerous if not closely controlled in real life scenarios.

For example, she says the technology will soon get to the

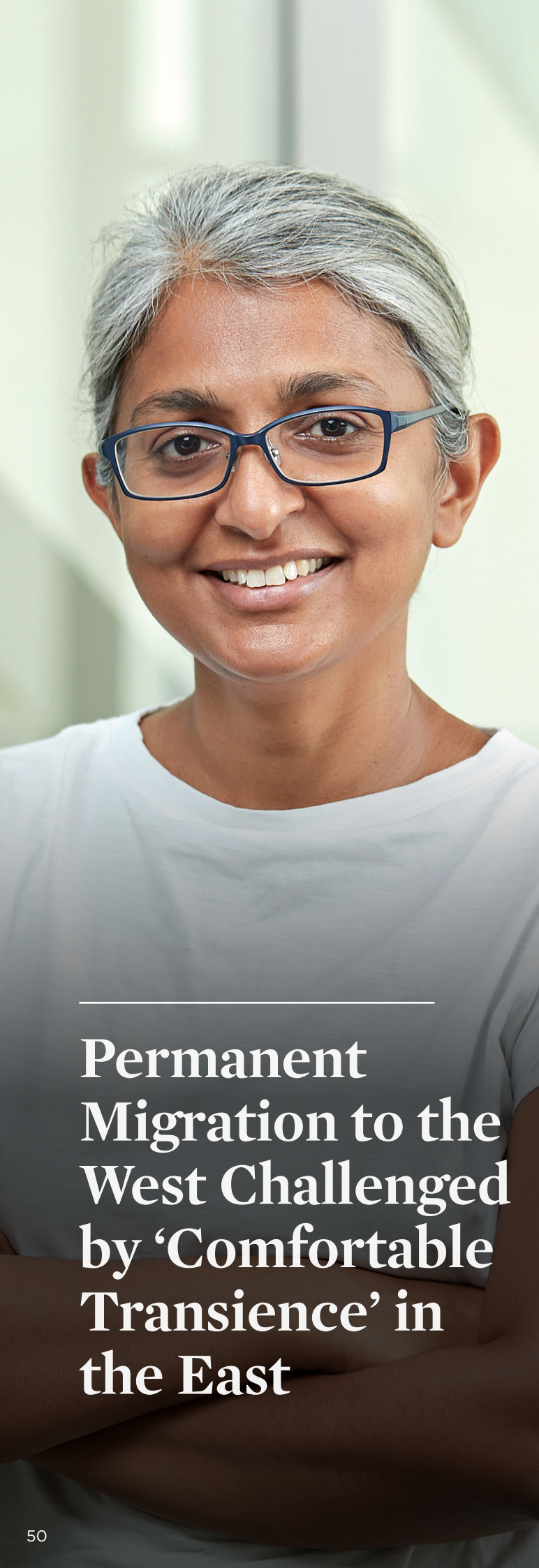
point where it becomes difficult to distinguish whether something is real or virtual. This brings into question privacy concerns for individuals who could be subject to having their likeness emulated in virtual reality. AI-generated videos have already caused concerns in our inability to distinguish between authentic content and that which has been altered.

This has led some countries to establish ethics committees for virtual reality in a bid to protect individuals.

Banakou says an international effort is needed to prevent misuse of the technology but that, ultimately, virtual reality can provide unique experiences to better society.

"It's up to us to use it as a force for good that can change the way we live for the better." ■





A new dynamic shift in traditional migration patterns has seen the UAE emerge as a home for many.

For decades, skilled migration trends from lower or middle-income countries showed a westward drift as these workers sought a better life in the West and eventual permanence through naturalization.

However, for international migration scholar Anju Mary Paul, the UAE offers an opportunity to examine alternative stories and patterns of skilled migration.

Big Arabian Gulf cities like Dubai offer skilled non-Western migrants an enticing mix of "the best of the West and the East." They are becoming attractive permanent destinations, rather than stop-off points on the way to somewhere else.

"People talk about how they're able to have a lifestyle which is equivalent to, maybe even better than, what they could have in a Western country, but at the same time, all of the comforts of home," says the professor of social research and public policy.

Paul's research over the last two years, interviewing over a hundred non-Western expatriates from South Asia, the Middle East and North Africa, as well as Sub-Saharan Africa, reveals that many of these skilled migrants prefer to stay in the UAE, rather than move onward to the West.

The demographic transition in the UAE supports this. The UAE has grown substantially over the last thirty years, with a more than five-fold increase in population since 1995. Although the last census was conducted in 2005, the estimates show that the high-skilled foreign population in the country has grown substantially in the last 20 years.

Furthermore, domestic policies have been put in place to encourage long-term residency in the country. Within three years of launching the "Golden Visa" scheme in 2019, the UAE has issued more than 150,000 long-term visas to residents in the country, with Dubai recently reporting a 50 percent increase in such visas issued in the first half of 2023.

The 10-year Golden Visa currently offers the longest period of security to most migrants in the UAE given that Gulf countries offer few, if any, pathways to citizenship or guaranteed permanence for migrants.

Instead, one of the concepts Paul examines is the idea of "comfortable transience" among skilled migrants from non-Western countries living in the Gulf.

This is where migrants opt to continuously extend their time in countries like the UAE rather than returning home or moving on to a Western country in search of greater permanence and citizenship.

"I think the Western expatriate experience in the UAE, or the Gulf as a whole, is very different, because it's understood to be circular. So you'll be here for x-number of years, and then you go back home," Paul says.

"For non-Western skilled migrants, this is such a comfortable place that the idea of returning home becomes less and less appealing for most of them.

Often they're coming from countries where the economy is really weak, or safety is an issue, or there is corruption and chaos."

And in Western countries, they fear downward class mobility and re-domestication because of the loss of cheap domestic help, loss of safety, and the potential for racial discrimination.

This leads many non-Western skilled migrants to second-guess their initial intention of moving on from the UAE to the West, according to Paul. She says migrants begin to ask, "Should we keep imagining that the West is our dream destination, or should we actually just keep trying to extend our temporary time in the UAE for as long as possible?"

She calls this state of being "comfortable transience."







"They know they're transient, they know they can't settle down, but it's so comfortable and safe, and the money is good, and they're geographically proximate to their home countries."

Paul says it's very hard for migrants to sacrifice the comfort, high-paying jobs, and social status that the UAE provides for a riskier move to a Western country – even if that move might give them permanent residency or citizenship.

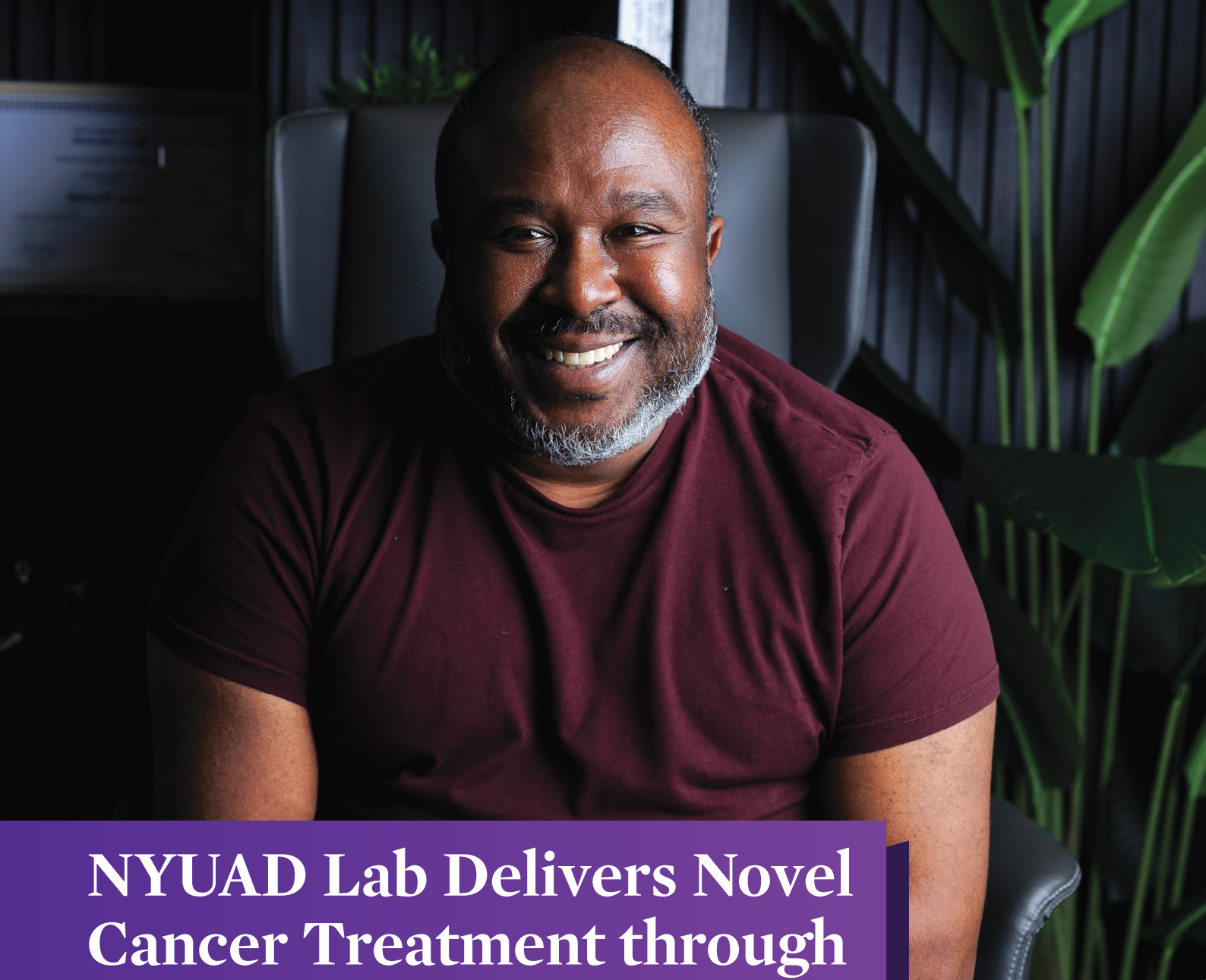
"Granted, not everybody makes this choice. But one of the things that we found in interviews was that a significant proportion of people are saying, 'You know, actually, this is where we want to stay... And we just want to try and stay here indefinitely.'"

Paul says the migration studies field is catching up with the different types of transience but there is still a tendency to think of migration in terms of moving to settle down.

Transience does not always mean precariousness and people are now more likely to move multiple times over the course of their lives, she says.

"I do think that the narrative about the Gulf, especially coming out of the West, is very one-dimensional. It needs to be broadened to recognize that." ■





## NYUAD Lab Delivers Novel Cancer Treatment through Light Therapy

A multidisciplinary team led by **Mazin Magzoub** has engineered a novel drug delivery system that overcomes issues presented by light-based cancer therapies.

Light-based cancer therapies hold great promise as a non-invasive alternative to chemotherapy, radiation, and surgery. But their progress has so far been stymied by issues that a multidisciplinary team working out of NYUAD's Experimental Research Building is looking to solve.

Led by Associate Professor of Biology Mazin Magzoub, the team has engineered a novel drug delivery system that overcomes the shortcomings of the relatively new cancer treatment; low solubility, poor stability, and the inefficiency of techniques used to isolate and target tumors.

“ You can actually diagnose, treat, and then monitor the progression of the tumor. ”

The team addresses these issues by combining two complementary light therapies into one treatment. Photodynamic and photothermal therapy both harness light to kill tumor cells. The first uses a laser to activate a photosensitizer that attacks the cells with molecules called reactive oxygen species, and the second uses photothermal agents to essentially cook the tumor by converting the light into heat.

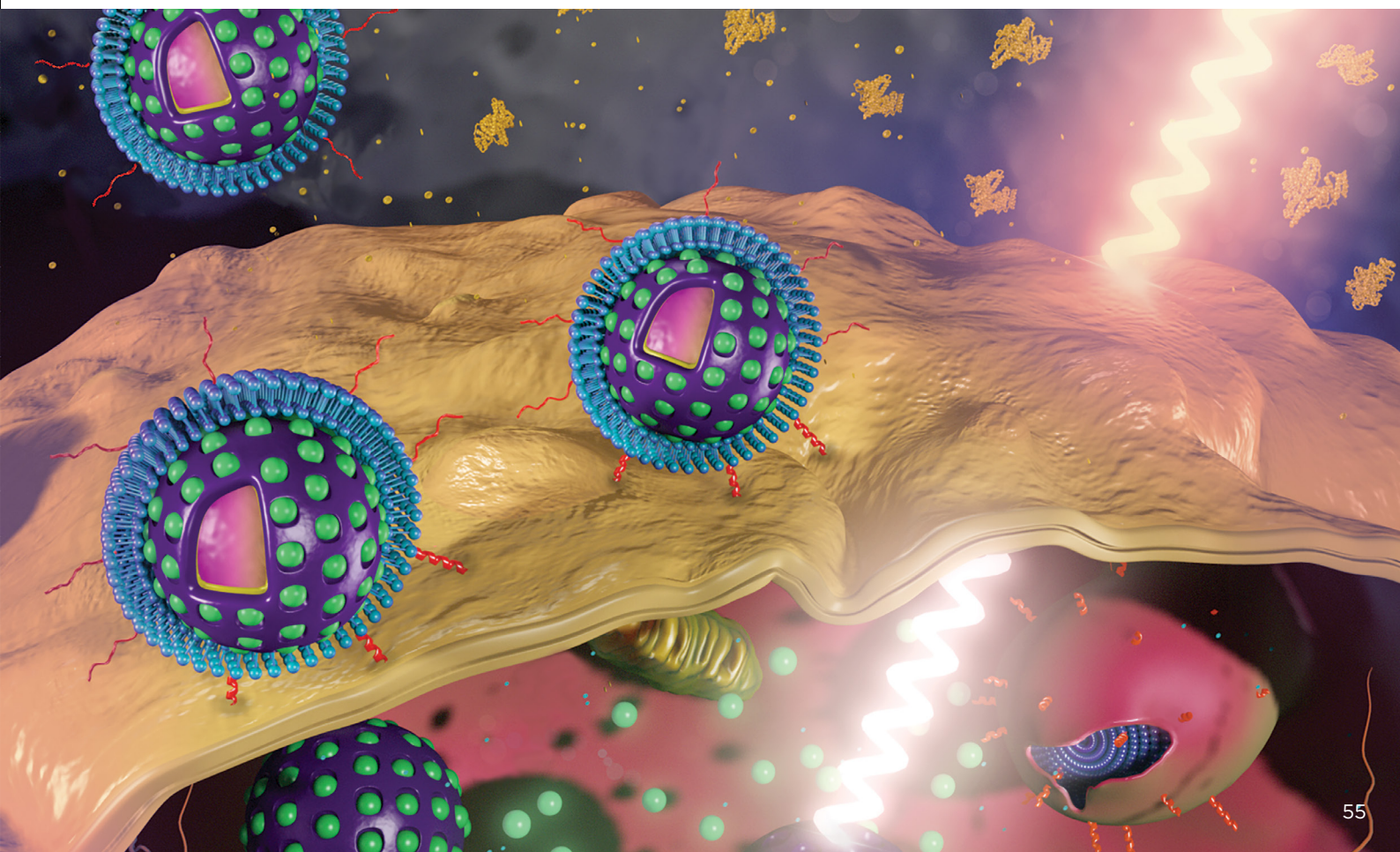
“The great thing about those approaches is that, by using light,

they're non-invasive, or minimally invasive, but also they can be localized, so you can target the tumor,” says Magzoub.

To be effective, photodynamic therapy requires molecular oxygen, but tumors tend to be low oxygen environments. And, when it comes to photothermal therapy, cancer cells have the ability to adapt and protect themselves from damage by increasing the production of heat shock proteins, making it difficult to entirely eradicate a tumor using this method.

“These limitations have hindered their use because, although the potential is there, it has meant that neither technique was alone sufficient to give us complete destruction of the tumor tissue,” Magzoub says.

The research team found a solution that more effectively delivers both therapies at once using biocompatible nanospheres, a drug delivery system measuring only a few nanometers, to transport the photosensitizer and photothermal agents to tumor cells.







"By combining both techniques, we're able to actually enhance the effects of both," says Magzoub.

"The heating increases the blood flow, which increases the accumulation of oxygen, which increases the efficacy of the photodynamic therapy and the reactive oxygen species produced by photodynamic therapy inactivates the heat shock proteins that protect against the thermotherapy."

While chemotherapy is currently considered the most effective treatment for many cancers, it is highly toxic and is generally delivered indiscriminately, damaging healthy tissues while eradicating cancerous cells. This means it can come with a host of very unpleasant side-effects for patients, including hair loss, anemia, and nausea.

Light-therapy, if delivered effectively, is a highly targeted approach. The nanospheres in this case exclusively target tumors, which are more acidic than healthy tissue. This means that the light-therapy agents are only activated inside tumor cells, which could potentially result in far fewer side-effects for patients.

"Chemotherapy works, it's the most effective strategy, so if you're going to replace it with something else, of course, you want it to be something that not only minimizes the side effects, but also enhances the outcome," Magzoub says. "You want to lower the negative and increase the positive."

As well as the therapy itself, the method allows for multiple types of diagnostic imaging throughout treatment. Photothermal therapy heats up the tumor, allowing it to be tracked using thermal imaging, while the photosensitizer used in photodynamic therapy is fluorescent. On top of this, the nanospheres have an added contrast agent that is used to enhance MRIs.

"You can actually diagnose, treat, and then monitor the progression of the tumor," Magzoub says.

Alongside cancer therapeutics, the team at Magzoub's lab is also focused on amyloid diseases, including Alzheimer's disease, Huntington's disease, and Parkinson's disease.

One of the big challenges in treating these diseases is finding a way to deliver treatment safely across the blood-brain barrier, a semipermeable membrane that regulates molecule and chemical movements between the blood and the brain.

Magzoub says the benefit of working across both cancer and amyloid diseases within the same lab is that it allows for cross-disciplinary collaboration, which could result in better solutions for both types of disease. ■





## Shooting for the Moon

Work happening in and around **Tarek Abdoun's** research center could have implications for humankind both on-the-ground, and off-world.

Tarek Abdoun and his team are working on research that is truly out of this world.

As program head of civil and urban engineering, Abdoun is using his knowledge of the resilience of critical infrastructure – such as bridges and buildings – to develop sustainable construction materials that could one day be used to build lunar settlements.

Abdoun's Sand Hazards and Opportunities for Resilience, Energy, and Sustainability research hub, or SHORES, brings together interdisciplinary talent to focus on sustainability, resilience, and renewable energy in the GCC with the goal, among others, to reduce carbon emissions. But a major collaborative project is with the Mohammed Bin Rashid Space Centre.

"As civil engineers, we're looking into ways of building settlements on Mars and the Moon," Abdoun explains. "It's early stages, but we created soil in our lab similar to lunar soil, to see how to build with it and use 3D printing technology to create something."

It's a simple engineering challenge. Breaking through Earth's gravity to reach space requires an immense amount of energy. The heavier the load, the more energy it takes – according to NASA, a 1 kilogram weight reduction in load on every flight can reduce fuel consumption by 750,000 liters over a one-year period.

So if humanity is aiming to build intergalactic settlements, astronauts will have to source the raw material from the planets and moons they are on. Abdoun and his team are conducting research using these conditions to see how structures can be built without having to carry the materials from Earth.

“As civil engineers, we're looking into ways of building settlements on Mars and the Moon.”

This in turn is helping inform his lab's other research.

"Generally speaking we look at resilience, sustainability, and renewable energy," said the Egyptian. "So, we look at the suitability of critical infrastructure like bridges, buildings, some reclaimed islands...we look at both natural and manmade hazards."

Meanwhile, SHORES is also working with Abu Dhabi Municipality to create a real time monitoring system for infrastructure, including bridges. This could potentially prolong asset life expectancy, produce efficiencies, and reduce the risk of accidents and catastrophes.

Abdoun says his team is now putting a testing facility in place,

which will be the first in the Middle East. The geotechnical centrifuge tests the stiffness, strength, and carrying capacity of foundations for structures. The facility will conduct tests that could help inform the building practices of cities like Abu Dhabi and settlements on the moon alike.

Abdoun launched SHORES shortly after arriving in NYUAD. He co-leads research activities along with NYUAD faculty Kemal Celik, Mostafa Mobasher, Borja Garcia de Soto, and Waleed Elsekelly.

"We're looking at technology relevant to the GCC desert environment, where the challenges and opportunities are very different...that's our focus," he explains.

The team's scope of work is broad. And, in some cases, has commercial appeal. At present, SHORES is collaborating with industry and agencies on a variety of projects including one with Abu Dhabi Ports Group that seeks to explore new sustainable materials that could enhance coral reefs.

The aim of SHORES is to develop technology that has an impact on a wide range of industries – from urban infrastructure to space exploration.

"Needless to say, a lot of the work we do could have huge consequences, both commercially and in terms of humankind's advancement. That's the goal, we want to make an impact on these industries." ■





