THE UNESCO
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Future building

Towards a sustainable habitat

- Bamboo houses mitigate the effects of climate change in **Pakistan**
- **Vienna**'s rooftop gardens
- Interview with **Sénamé Koffi Agbodjinou**, Togolese architect and anthropologist

OUR GUEST

Judith Santopietro, Mexican poet

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Editor-in-Chief: Agnès Bardon

Associate Editor: Katerina Markelova

Section Editor: Chen Xiaorong

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Photo and illustration editor: Danica Bijeljac

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Production: Eric Frogé, Senior Production Assistant

Translation: Peter Coles, Gina Doubleday, Cathy Nolan

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Intern: Wang Wenjin

Co-editions:
- **Catalan:** Jean-Michel Armengol
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THE UNESCO Courier

Contents

Editorial

Architecture is an expression of the way we want to live and engages our future. It is thus at the heart of contemporary issues – in particular sustainable development.

One figure sums up the scale of the challenge: the building sector – including construction and energy consumption – represents 39% of global CO_2 emissions. This illustrates the urgent need to lead a "green revolution" in architecture, not only to preserve our planet, but also to make it a more pleasant place to live.

There is not just one way to achieve this: adapting to the specificities of climate, transforming existing buildings and their uses, or choosing sustainable and non-polluting materials are all options for architects, urban planners, engineers and decision makers. In this new and exciting issue of *The UNESCO Courier*, you will find inspiring and promising initiatives which have been boldly and creatively explored.

The idea of an alternative to "all-concrete" is certainly not new. Certain techniques, like the skills involved in the conservation of wooden architecture in Japan, inscribed as humanity's intangible cultural heritage, are still practiced today. Through initiatives such as the World Heritage earthen architecture programme, UNESCO is promoting and preserving other traditional knowledge, particularly in Africa.

In the 1950s, visionary architects already practiced what was not yet called "sustainable architecture", such as Hassan Fathy and his New Gourna village at Luxor, designed with local materials. In 1960s India, Laurie Baker invented low-cost, environmentally-friendly construction.

Since then, the innovations are multiplying: a wooden tower in Norway, Rio de Janeiro's museum of tomorrow with its systems of solar energy control and water recycling systems, and even a modular building accessible to everyone in Canada, to name but a few.

But the climate emergency urges us to go further and faster, to create a global architecture model that is more sustainable and inclusive. Architecture is not limited to designing structures in wood, stone or glass; it is the reflection of our societies as well as our aspirations to build a better world.

In an interview with the *Courier*, German-Burkinabé architect Diébédo Francis Kéré, winner of the Pritzker Architecture Prize and entrusted by UNESCO with the design of its future Virtual Museum of Stolen Cultural Property, says he wants to "work with nature and not against it". What if this were to become the watchword of the profession?

Audrey Azoulay
Director-General of UNESCO

Future building

Situated in Abu Dhabi (the United Arab Emirates), the Masdar Institute, designed by British architect Norman Foster, is part of the experimental eco-city of Masdar (meaning "source" in Arabic) – a pioneer in the fields of renewable energy, clean transportation, and waste management.

Henrik Schoenefeldt

Professor for Sustainability in Architectural Heritage at University of Kent School of Architecture and Planning (United Kingdom). Since 2016 he has been seconded to the UK Parliament to lead a large research project on the restoration of the Palace of Westminster. His publications include the book, Rebuilding the Houses of Parliament: David Boswell Reid and Disruptive Environmentalism *(2020).*

The energy-intensive building sector alone accounts for 39 per cent of global carbon emissions. In light of this, a fundamental transformation is the only option for the sector to become eco-responsible. Innovative technologies, the role of recycling in the built environment, the use of natural materials, and construction techniques adapted to local conditions are some of the paths to be explored in the quest for more sustainable architecture.

Published in 1987, a report called *Our Common Future* was a turning point. In this document, the World Commission on Environment and Development summarized the findings of a four-year inquiry into the concept of sustainable development. The role of the built environment in achieving sustainable development is only briefly noted in this historic document. However, the building sector is at the centre of questions surrounding climate resilience, public health, safety, thermal comfort, and energy affordability.

Sustainable development is not a set concept; it evolves over time. In the 1970s, the oil crisis gave an incentive to experiment with alternatives to fossil fuels. Today, climate change is our most pressing concern. It has become a fundamental driver of change, namely in architecture where it has incentivized significant technological development. But a sustainable built environment calls also for wider cultural changes, such as updating the curricula of students and requiring established practitioners and academics to acquire new skills and knowledge.

The construction, operation and maintenance of buildings are energy and resource-intensive activities. According to the World Green Building Council, the built environment accounts for 39 per cent of global carbon emissions, 28 of which are associated with the energy required for the so-called "building operations" alone – such as heating, cooling, ventilation and lighting. The carbon emissions associated with construction account for the remaining 11 per cent. As a result, much of the responsibility for humanity's ability to live within the limits of our biosphere is held by engineers, architects, planners, and other professions involved in the design, management, and construction of buildings.

Climate-conscious innovations

The idea of sustainable architecture is strongly associated with certain technologies, such as heat pumps, solar collectors and photovoltaic panels. Yet the transition towards sustainable design also involves embracing more climate-conscious approaches to architectural design and urbanism. These "passive design" approaches look at how fundamental decisions, such as orientation or the intelligent use of glazing and shading, can help to adapt buildings better to the local climate. They can help reduce, and at times eliminate, the reliance on heating and cooling systems.

The principles of passive design are not new. Their use is evident in the design of traditional architecture and mentioned in ancient literature. The famous Greek philosopher Socrates wrote about the relationship between climate and the shape and orientation of buildings, whereas Vitrivius, an architect of Ancient Rome, gave detailed guidance on building design for different climates.

Today, modern technologies facilitate the revival of ancient climate-responsive design tradition. One example of passive design is the German PassivHaus standard, which focuses on optimizing energy efficiency through air tightness, high levels of thermal insulation and the use of triple-glazed windows. The PassivHaus also utilizes "active" techniques of mechanical ventilation →

A UNESCO Chair of Earthen Architecture

The UNESCO Chair of Earthen Architecture, Building Cultures and Sustainable Development was inaugurated in October 1998 at the Grenoble National School of Architecture in France. Its aim is to promote the use of earth and local resources for housing and heritage, by encouraging the dissemination of scientific and technical knowledge relating to this form of architecture throughout the world.

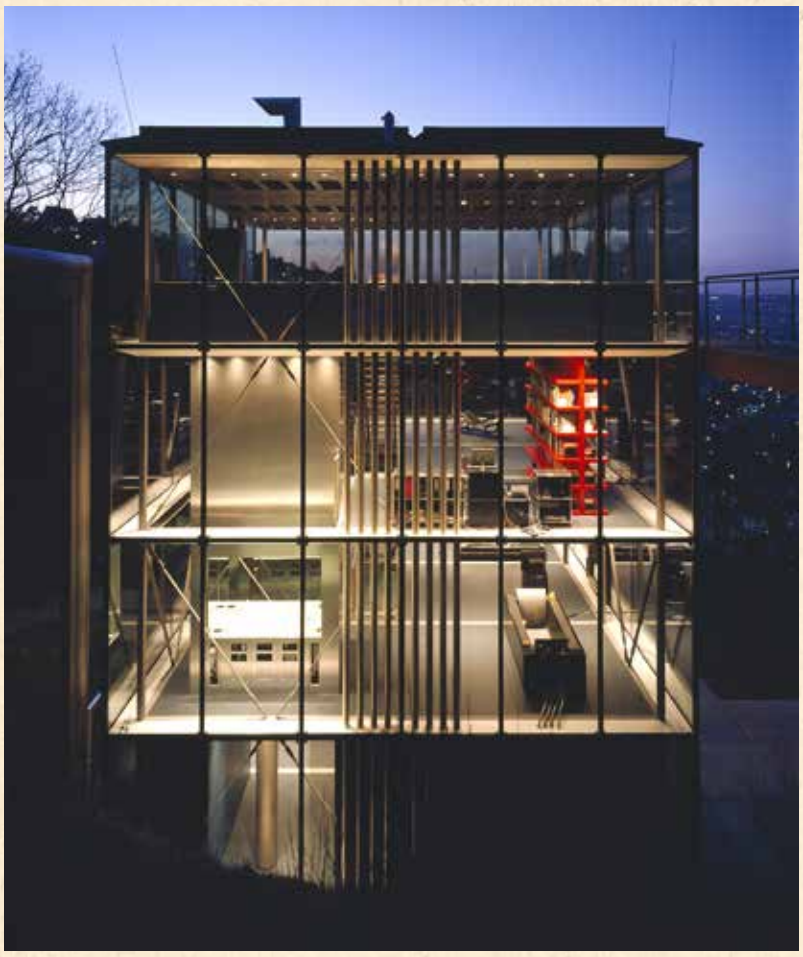
and heat recovery – indeed, a sustainable building is rarely purely passive. Most practices incorporate active systems for ventilation, heating, cooling, as well as renewable energy generation.

In hot climates, on the other hand, the primary concern is to prevent heat from entering and to reduce mechanical air conditioning use. Traditional design for hot climates can be observed in historic cities of the Middle East and the northern parts of Africa, such as Fez in Morocco and Aleppo in Syria. They are characterized by thick walls with small openings as well as shaded courtyards and streets. In the 16th-century city of Shibam in Yemen the same principles have been applied to tall buildings.

These features are in sharp contrast to the architecture and urbanism of modern desert cities such as Dubai in the United Arab Emirates and Doha in Qatar, which are dominated by modern skyscrapers. Even when provided with external shading or special glazing designed to reduce the admission of solar radiation, their demand for mechanical cooling is high. Yet alternative models of development are also being explored in the Arabian Peninsula. Masdar, a new city in Abu Dhabi that has been under construction since 2008, represents an attempt to design a modern city that draws on traditional principles of climate design while incorporating renewable energy technologies.

The hidden emissions of materials

Although building operations account for the majority of the sector's carbon emissions, the carbon footprint of the construction of buildings is not insubstantial. "Embodied carbon" of a building refers to the emissions generated during the extraction and processing of raw materials as well as transportation. Some of the most carbon intensive materials are steel, reinforced concrete and brick. The cement industry accounts for around 8 per cent of global carbon emissions; the construction sector, with its appetite for reinforced concrete, is one of its biggest consumers.



© Roland Halbe

The R128 house in Stuttgart, Germany, is an experimental single-family residence designed by German architect Werner Sobek in 2000. Almost completely recyclable, it uses no fossil fuel energy and emits no greenhouse gases.

> **"Reducing material consumption is key to sustainability**

Embodied carbon can be reduced in many ways, including more efficient use of materials, decarbonizing production, and utilizing alternative, low-carbon materials. The latter has led to an increase in interest in natural resources. These include plant-based materials, such as timber or reed, and locally sourced earth-based construction techniques, such as rammed earth, compressed earth blocks, or sun-dried clay bricks. In 2021 a Swedish firm introduced a method for fabricating low-carbon steel using hydrogen produced with renewable electricity.

Recent projects around the world have demonstrated that the use of engineered timber can help reduce the reliance on steel and concrete in high-rise buildings, such as the 85.4 metre-tall Mjøstårnet tower in Brumunddal, Norway, constructed using glue-laminated and cross-laminated timber.

From a linear to circular economy

Reduction in material consumption is another key goal towards sustainability. Toward this end, we need to move from a linear economy, where building materials are used and discarded, to a circular economy where they are reused and recycled. In the circular economy the materials released during

© Iwan Baan

◥ *The Center for Development Studies (1973) in Trivandrum, southern India, was designed by Laurie Baker, one of the pioneers of low-cost environmentally sustainable architecture.*

demolition are not treated as waste but as resources. This calls for construction systems that are designed to be easily disassembled for reuse.

Timber-framed buildings of England, Malaysia, China or Japan are traditional examples of demountable structures. In contemporary architecture, projects range from "220 Terminal Avenue", a 40-unit modular temporary housing building opened in 2017 in Vancouver, Canada, to demountable arenas used for major sports events. Another illustration of a demountable structure is the Loblolly House by American firm Kieran Timberlake – a hybrid house made up of prefabricated components that can be assembled and disassembled on site using simple hand tools.

Sustainable practice also implicates responsibility for the long-term stewardship of buildings and their materials, encompassing the creation, operation, maintenance and renewal over generations. This also relates to the retention and adaptive re-use of existing buildings, highlighting the intersection between sustainable development and architectural conservation.

Reuse rather than destroy

Adaptive reuse offers a means to avoid demolition, but also the opportunity to reduce energy consumption through retrofit. Much care is given to preservation of historically significant buildings, yet the majority of buildings are regarded as historically insignificant. Many of them undergo demolition after only 30 to 50 years. The global environmental crisis, however, forces us to question this practice. The question arises whether "climate significance" should be introduced as a new criterion for protection, alongside cultural or historical significance.

In France the architects Anne Lacaton and Jean-Philippe Vassal have demonstrated how the renewal of post-war social housing blocks can offer alternative scenarios to demolition. In Freiburg, Germany, the Bugginger Strasse 50 retrofit project of a 16-storey tower block from the 1960s reduced its heating energy consumption by 80 per cent.

Many projects in Europe and North America tend to involve technologically complex and expensive solutions, but the underlying principles of sustainable design are universal and can be adapted to different socio-economic and climatic contexts. In the 20th century, Laurie Baker (1917-2007) in India and Hassan Fathy (1900-1989) in Egypt explored the revival of traditional construction to achieve affordable, climate-adapted housing. More recently the Burkinabé-German architect Diébédo Francis Kéré and the Pakistani architect Yasmeen Lari have returned to principles of vernacular architecture to formulate a language of sustainable architecture for the global South.

By drawing on fundamental building physics, the rising vernacular trend suggests that sustainable architecture is neither dependent on complex technical solutions nor an unattainable goal reliant on future technological inventions. Sustainability requires designers to be resourceful in making intelligent use of the plethora of existing and emergent technologies and principles. ■

The vernacular's return to favour

Leïla el-Wakil

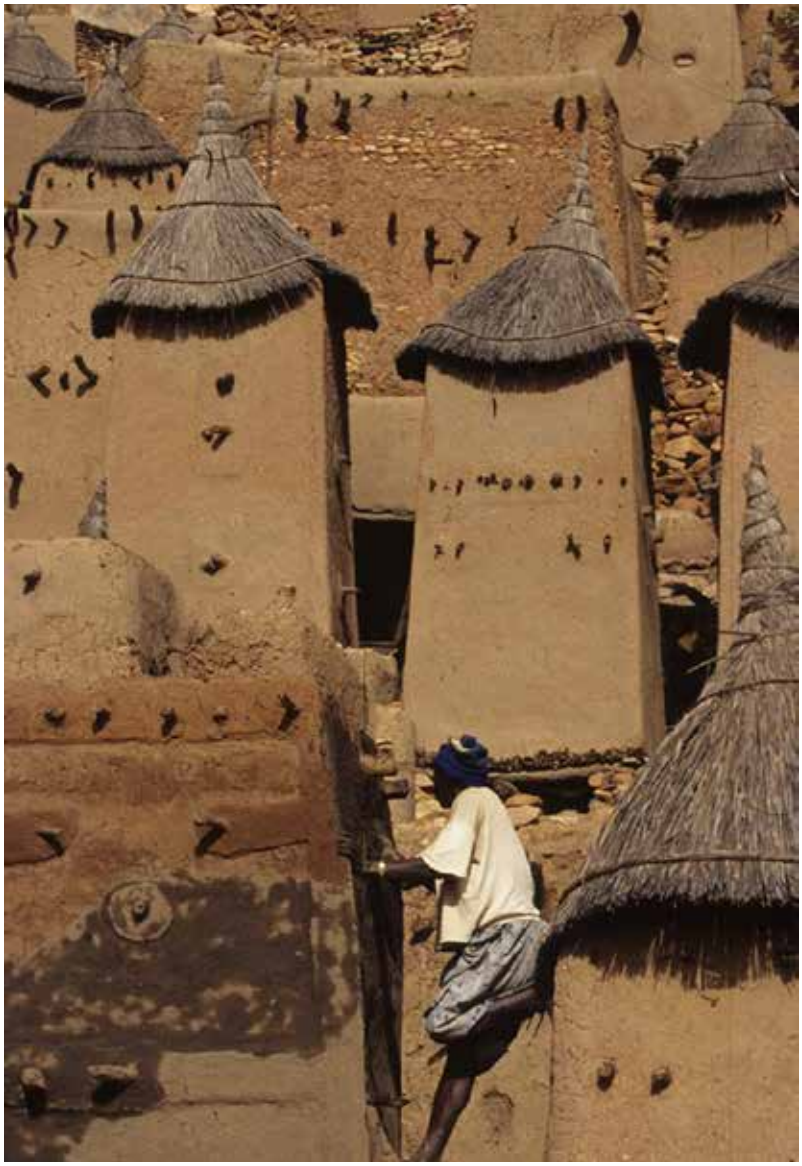
Egyptian-Swiss art historian and architect, she taught at the University of Geneva's Faculty of Humanities and Institute of Architecture until recently. She is the editor of Hassan Fathy dans son temps *(2013) [Hassan Fathi: An Architectural Life], a collective work translated into English in 2018.*

The reign of all-concrete construction has tended to overshadow the merits of vernacular architecture. In recent years, visionary architects have been drawing on traditional know-how to design buildings that are naturally resistant to climate change.

In 1964, an exhibition at New York's Museum of Modern Art (MoMA) marked its era. Titled *Architecture without architects*, it featured a photographic compilation of vernacular buildings collected from all over the world, bearing witness to a collective know-how, localized and passed down through use. The exhibition, organized by Austrian-American writer and architect Bernard Rudofsky, fully rehabilitated architecture without an architect. The exhibition's success is sufficient proof of the interest in this theme: *Architecture without architects* toured eighty museums around the world for eleven years.

From the mud houses of the Dogons in Mali to the dry-stone constructions of Italy's Cinque Terre region, both UNESCO World Heritage sites; from Finnish wooden *mökki* to troglodyte houses, vernacular architecture is everywhere. This type of construction is renowned for the skill of its craftsmen, the simplicity of its means, its respect for the environment and the common sense of its genius.

Rudofsky's contribution did not only put the spotlight on vernacular construction, it also fertilized architectural thought and creation worldwide. Architects such as Finland's Alvar Aalto, India's Charles Correa and Sri Lanka's Geoffrey Bawa drew inspiration from the traditions of their homelands.



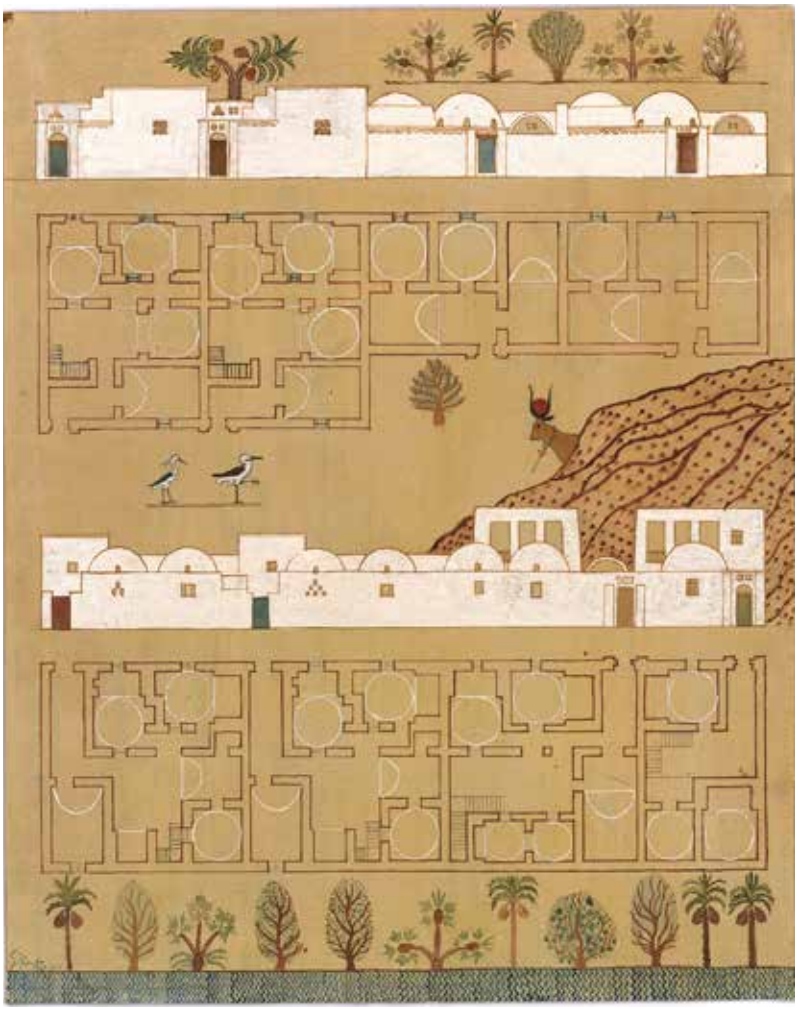
◥ *Mud houses built on the face of the cliff in Bandiagara, Land of the Dogons (Mali), added to UNESCO's World Heritage List in 1989.*

The hell of reinforced concrete

A champion of architecture without architects, Hassan Fathy from Egypt made a name for himself worldwide with the publication of his book, *Architecture for the Poor, An experiment in Rural Egypt* (1969), a thrilling account of the construction of New Gourna, a model village on the west bank of Luxor. A fervent adept of his country's ancestral skills, he claimed to be a descendant of the female pharaoh Hatshepsut, a prolific builder, when he revived the use of mud bricks, a poor material that encouraged people to build their own homes in the villages of Upper Egypt.

In a satirical play titled *The Hell of Reinforced Concrete* (1964), he describes the globalization of architecture and urban planning. In it, he also denounced the inappropriate use of reinforced concrete in the extreme climate of the Sahara, which turned the new town of Baris into an unlivable furnace. In contrast, he praises the old village of mud houses, clustered along narrow covered alleys, which protect the inhabitants from the heat and sandstorms. For Fathy, a return to the teachings of tradition is essential.

Thick earth or stone walls provide better thermal insulation than thin reinforced concrete walls. The combination of the *moucharabieh* (projecting window with carved wooden latticework) and the *malqaf* (called *badgir* in Iran), literally "wind catcher", makes it possible to cool and ventilate house interiors naturally, infinitely better and at lower energy cost than air conditioning.



◥ *A 1946 plan of the New Gourna village settlement on the west bank of the Nile River, designed by Egyptian architect Hassan Fathy.*

The heritage of earthen architecture

The UNESCO World Heritage Earthen Architecture Programme (WHEAP) was established in 2007 to improve the state of conservation and management of earthen architecture sites worldwide. An inventory made in 2012 revealed that more than 150 World Heritage properties were totally or partially built with earth – ranging from mosques and palaces to historic city centres and cultural landscapes – representing over 10 per cent of all properties listed.

During its ten years of existence the programme carried out pilot projects, such as rehabilitation activities in Djenné, Mali, and the safeguarding of New Gourna Village in Egypt, and conducted capacity building, research and development activities. The World Heritage Centre continues to cooperate with the programme's key partner, the International Centre on Earthen Architecture (CRAterre), in identifying, conserving and managing earthen architecture. A research laboratory based in Grenoble, France, CRAterre disseminates knowledge and know-how about raw earthen construction worldwide.

Hassan Fathy was inspired by the very layout of the introverted Arab-Muslim house, structured around its interior courtyards and gardens, to create remarkable holiday homes along the Saqqara road south of Cairo, such as Mit Rihan, which illustrate his conception of appropriate architecture. In 1980, he was awarded the Aga Khan Prize for his life's work, and set an example for many other architects in the region, including Ramses Wissa Wassef, Abdel Wahid el-Wakil and Omar el Farouk.

As of the 1960s, experiments in returning to raw earth technology spread from the Maghreb to the Mashreq. They culminated in the creation of associations such as The Nubian Vault, which provides the most destitute in sub-Saharan Africa with mud houses, giving people back the possibility of building their own homes.

This enthusiasm for raw earth has spread far beyond the region's borders. Founded in 1979, CRAterre, a laboratory based in Grenoble (France), has demonstrated Western interest in this technology. It has contributed to its expansion worldwide.

Bamboo framework

Today, there are many devotees of raw earth in its traditional forms, such as Anna Heringer, whose egg-shaped raw earth structure built for the 2016 Venice Biennale evokes the thatched mud huts found in Maharashtra, in central western India. Young firms, such as Terrabloc in Geneva, have developed stabilized earth blocks with a percentage of cement that allows them to comply with Swiss standards by improving earth's strength and durability.

Other types of material, such as wood, have sparked a similar resurgence in interest. This is hardly surprising, given that a wooden building is able to capture carbon dioxide. Major firms are returning to this material, and even high-rise buildings are springing up. In 2019, Øystein Elgsaas erected an 18-storey wooden tower in Brumunddal, Norway.

Traditional bamboo frameworks from Asia and Latin America are also increasingly popular. Colombian designer Simón Vélez, who vaunts the merits of this "vegetal steel", combines his bamboo constructions with contemporary principles to create lightweight, durable structures, such as the "nameless" church in Cartagena (Colombia). Others have followed suit.

> **Bamboo constructions combined with contemporary principles create lightweight, durable structures**

© Voll Arkitekter AS / Ricardo Foto

Inaugurated in Brumunddal (Norway) in 2019, Mjøstårnet ("the tower of Lake Mjøsa") is one of the world's tallest timber buildings, standing over 85 metres high.

The current shift in focus is making professionals take a more responsible approach to the question of architectural design and its materialization. All the lessons of the past are worth re-examining from a sustainability perspective: the science of siting and orientation to take advantage of sunlight and prevailing winds; the use of biosourced materials drawn from the local environment; recourse to low-tech and artisanal skills; common sense linked to careful observation of the *genius loci* and old buildings.

Even more radical, though it may seem less creative, is the culture of re-use that needs to be relearned today. In order to avoid wasting resources, unthinkable in the past, it is not only materials but most of all existing buildings that must continue to be used, by adapting them to new purposes and new needs. ■

Zofeen T. Ebrahim
Pakistani journalist

Bamboo houses mitigate the effects of climate change in Pakistan

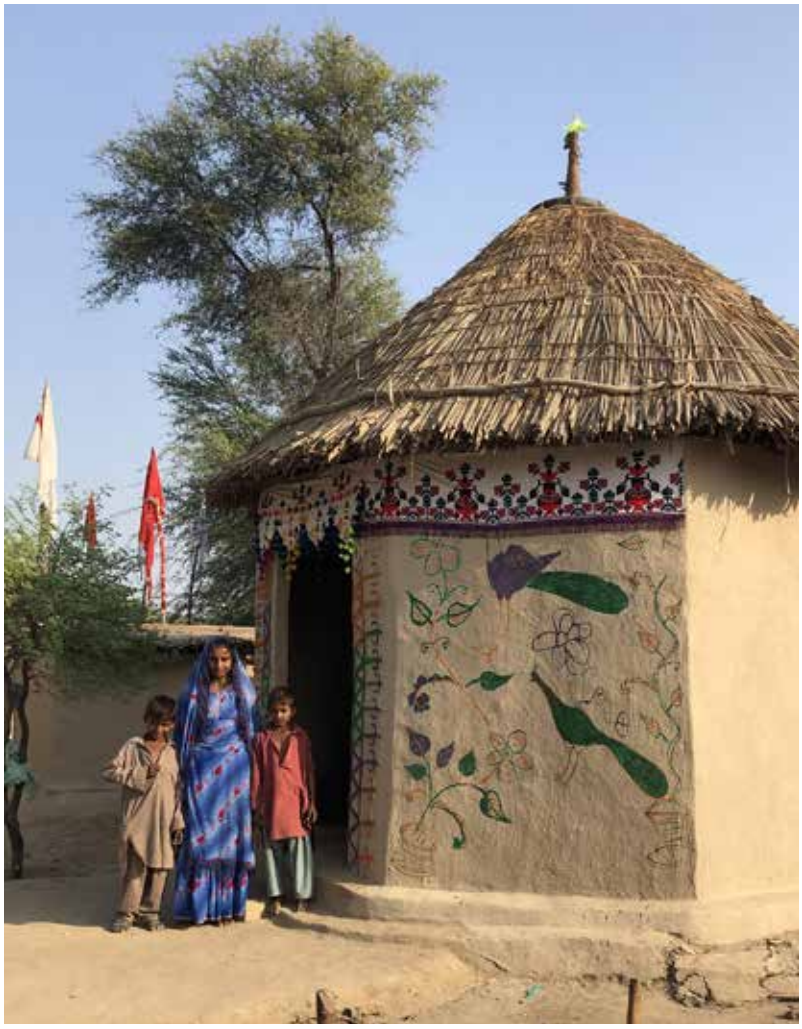
In 2022, heavy monsoon rainfall left a large part of the population homeless in southern Pakistan. Yasmeen Lari, a world-renowned architect, has designed new houses that are flood- and earthquake-resistant while still incorporating traditional bamboo and mud construction techniques.

"No more leaky roofs for me," remarks 22-year-old Devi when asked what she liked best about her new house. Like most of the inhabitants of the village of Akhund Jo Khoo situated in Sindh province, some 200 kilometres from the port city of Karachi, Devi lost everything in 2022 in the torrential rains that swept through the region.

Having lived under a tattered tent with her two sons, aged seven and eight, for almost a year, she recently moved into a new *chaunra*, a traditional one-roomed house of this desert region. She is not alone. Sadqa Pakistan, a Pakistani social enterprise has built more than 70 homes in her village.

Pakistan witnessed its most devastating monsoons between June and September 2022, resulting in floods that submerged a third of the country

> **"These houses will not collapse, not by wind, rain or quake**



© Zofeen T. Ebrahim

Devi and her two sons standing outside their house, which was built by social enterprise Sadqa in the village of Akhund Jo Khoo in Sindh province (Pakistan).

and affected 33 million people. The Post-Disaster Needs Assessment (PDNA) carried out by the government estimated the total damage at US$14.9 billion, and economic losses at about US$15.2 billion.

In the hardest-hit province of Sindh, home to 50 million residents, up to two million houses were damaged, 75 per cent of which were mud houses.

Flood-resistant houses

Like her old home, the new *chaunra* Devi is living in is also made of mud and bamboo. But the new house is much more resistant than the old one. Yasmeen Lari, the world-famous architect behind these houses, has combined indigenous knowledge with science and engineering to make them flood-proof.

The elevated structure of the houses prevents water from penetrating inside in the event of flooding. The bamboos used are cured to make them termite-proof and the earth used for the walls is strengthened by adding lime and rice husk. The roof made of bamboo and covered with reed matting, finished with layers of thatch allows movement of air and keeps the interior cool. The steep conical roof keeps the interior protected from rainwater ingress.

Lari has also developed a mud- and lime-plaster stove that counters the negative health and environmental effects of cooking with open fires. Her eco-alternative is fueled by agricultural waste like cow dung or sawdust bricks, substantially reducing firewood consumption.

"These will not collapse, not by wind, rain or quake," says the octogenarian architect. Her organization, the Heritage Foundation of Pakistan, has been working on humanitarian architecture, building disaster-resilient homes to mitigate the effects of climate change for two decades now. It has built up to 10,000 homes since 2022.

Yasmeen Lari: "Starchitect" turned humanitarian

The first female architect of Pakistan, Yasmeen Lari is an architectural historian and humanitarian architect. Born in 1941, she graduated from Oxford Brookes University (United Kingdom). Her architectural firm designed some of the most iconic projects in Pakistan during the second half of the 20th century. Today she is best known for her involvement in the intersection of architecture and social justice.

In 2023 Lari received the Gold Medal of the Royal Institute of British Architects (RIBA). The prestigious award is given in recognition of a lifetime's work to a person or group of people who have had a significant influence on the advancement of architecture.

Yasmeen Lari is also involved in heritage conservation, notably as a UNESCO consultant. She has for example conserved structures at Makli and the Lahore Fort, two Pakistani sites inscribed on the World Heritage list.

A young artisan learning to build the conical-shaped roof of a chaunra *(one-room house) in Bhoriyoon village in Pakistan.*

The inside of the octagonal roof of the chaunra, *made of bamboo and thatch.*

Zero-waste village

These homes are also easy to repair and replace. Their materials can be easily transported and reused if a household decides to move. "Most importantly, Yasmeen Lari is involving the rural communities in the process so there is a sense of ownership," says Hira Zuberi, a Karachi-based independent architect.

But building homes for the poor is not enough to take them out of the vortex of poverty. "There is a huge potential among the people living on the margins. When they get trained, they become economically empowered," Lari stresses. Her aim is to reduce dependence on charity and dole-outs.

Beyond providing decent housing for disaster victims, Lari aims to create a virtuous circle. One example is the zero-waste system she has developed in Pono, a village in Sindh's district of Tando Allah Yar. The villagers have built energy-efficient mud stoves, a shared toilet between two families, a solar panel between twelve households and a hand pump between eight families, all built within a budget of 43,000 Pakistani Rupees (US$150.85). "They have started growing their own vegetables. They are keeping chickens. The waste from the toilet is turned into compost."

> **"Transmitting knowledge to local populations helps reduce their dependence on charity and dole-outs**

© Zofeen T. Ebrahim

The mud and lime-plaster stoves designed by Yasmeen Lari are less damaging to the environment and health than open-fire stoves.

A thousand new homes

"We wanted to provide shelter for the homeless villagers, so we started looking up low-cost housing designs. Lari's was not only the cheapest, it was also the nicest," Dr Asad Ali, the founder of Sadqa Pakistan, says. A pediatrician and infectious disease specialist at the Aga Khan University Hospital in Karachi, he has been working on solving chronic malnutrition among rural communities in Matiari.

So far, 550 homes have been built in nearly 35 villages by the enterprise, with another 60 to be built by the end of 2023. Sadqa Pakistan also provides a washroom to be shared between three households and energy-efficient stoves modeled after Lari's.

Although the project is funded by donations, the residents participate in the process. Devi provided the workers with earth from within the village for them to mix the plaster. With that plaster she coated the walls made of straw matting. "Once the structure is put up, the homeowners help plaster the exterior and interior walls," explains Dr Umrani, a volunteer.

Local training

Training plays a key role in such projects. Sadqa Pakistan is following Lari's pattern of imparting knowledge through a local training initiative. Jaman Rai, an 18-year-old student, was among the six men who went to Thatta to get a five-day, hands-on training at Lari's Heritage Foundation of Pakistan's training centre at Makli. After their return, they set up their own training centre in the village of Bhoriyoon. "A domino effect has started," says Rai. "We have trained nearly five dozen men and several of them have set up their own practice."

Rai, now a master trainer himself, makes a decent living of 30,000 Rupees (US$105) per month. The first house he built after the training was his own, to replace the one that had washed away in the floods. Having now built nearly sixty houses, Rai firmly believes these will stay put in the strongest of gusts and in the most ferocious of rains. ■

Barbara Hallmann

Journalist in Havelberg, Germany

Vienna's rooftop gardens

In the Austrian capital, green roofs have been flourishing on the tops of buildings for years, acting as islands of coolness on hot days and helping to reduce carbon emissions.

At 34-38 Kegelgasse, in Vienna's 3rd district, stands one of the city's architectural curiosities. Built in the 1980s by Friedensreich Hundertwasser and adorned with odd, coloured shapes, this building has become a source of inspiration for generations of ecologically-minded architects. Standing right next to a glass building, this quirky house is an oasis of green, with no fewer than 250 trees and shrubs growing on its roof and balconies.

Hundertwasserhaus may be the most emblematic of Vienna's roof-garden buildings, but it is by no means the only one. Hanging gardens have been on the increase here for several decades now. A 2011 survey by the city authorities identified almost 1,070 hectares of roof space suitable for a garden. At the time, almost one in four of these spaces had already been planted, and projects continue to flourish. A Swedish furniture shop recently opened a public roof garden at its city centre branch. Meanwhile, a luxury department store is soon to inaugurate a new building with a 900-square-metre garden on its roof.

Hanging vegetable garden

These suspended spaces are more than just a passing fad – they also meet a genuine need. The benefits of green spaces are well known and documented, providing important islands of coolness in summer while helping to reduce carbon dioxide emissions. But in major cities there is not enough space to create new parks and gardens. In order to absorb a growing population and avoid covering over any more open surfaces, cities are effectively forced to become more dense.

> **"More than just a fad, green roofs meet a genuine need**

Today's buildings are almost always made of materials that absorb and retain heat, such as concrete, while their height means that they cannot benefit from the natural shade of trees. The heat given off by air conditioners, traffic, and industry all help to turn cities into veritable furnaces when temperatures peak.

That's why roofs are becoming increasingly popular in the face of climate warming. A study carried out in Vienna in 2018 showed that if all flat roofs were planted and sloping roofs covered with reflective materials, the number of heatwave days in the city centre could be reduced by almost 30 per cent.

The Operation Grüner Daumen association has been working for over ten years to encourage urban gardening, particularly in the Mariahilf district, one of the most densely populated in the capital, where some rooftops now have vegetable gardens. Mike Graner, its founder, is convinced that, in the long term, these initiatives can help to change attitudes. "When residents grow their own fruit and vegetables, they are confronted daily with the challenges of horticultural production and the effects of climate change," he explains.

These suspended green surfaces also have benefits for the buildings – the plants help to stabilize temperatures, thus protecting the roof and extending its lifespan. A study carried out by the city of Vienna authorities shows that a green roof, if it meets current technical standards, is ultimately less expensive than a roof covered in gravel.

Habitat for insects

These benefits are even greater when solar panels are installed on the roofs of buildings. "It's not a matter of whether to install solar panels or plant a roof garden. By combining the two, you produce low-carbon energy and benefit from the cooling effects of the plants," explains Irene Zluwa, a member of staff at the GrünStattGrau Research and Innovation laboratory in Vienna, with a Ph.D in soil cultivation.

The roof garden generates energy, acts as a water reservoir, improves air quality and reduces noise. Properly maintained, it can even create a habitat for certain species of insect. The building's residents also benefit. "A solar-panelled roof protects the garden from the sun, wind and rain. It's more pleasant and the garden can

© Paul Bauer

◥ *The Hundertwasserhaus built in Vienna in the 1980s by Friedensreich Hundertwasser, hosts on its roof no fewer than 250 trees and shrubs.*

be enjoyed for longer in the year," says Irene Zluwa.

But there are a number of obstacles to the widespread use of these hanging gardens. While private individuals can do as they please with the roof of their house, the situation is more complex when it comes to using an area on top of a building belonging to a third party. Mike Graner's association has installed its garden on the roof of a car park owned by the city of Vienna. "In this case, the council welcomed the initiative. But private landlords are much more cautious about projects of this kind, which are technically complex and not very lucrative," he laments. "Most property developers prefer to reserve the top floor for housing, to make it more profitable," confirms Irene Zluwa.

Despite these obstacles, roof gardens are gaining ground around the world. Sites such as Greenroofs, which list new projects, bear witness to this. Irene Zluwa remains optimistic about their development. "The number of projects is increasing, which makes it easier to share experiences and encourages others to take the plunge." ■

Interview by
Laetitia Kaci
UNESCO

Sénamé Koffi Agbodjinou:

"Today's African city is the product of a rupture with nature"

Sénamé Koffi Agbodjinou is a Togolese architect and anthropologist. To help residents think about and build the intelligent, sustainable city of his dreams, he has created L'Africaine d'architecture, a platform for research and experimentation open to everyone. Through his projects, he advocates for a city inspired by traditional African habitats that fit into their environment and use local resources.

What are the specific characteristics of African urban planning today?

The African city is not an extension of the village, but the product of a rupture with nature. Cities were built on the Western model, with concrete, metal and glass. For a long time, workers went there to earn their living. In the evenings, they would return home to their families, their collective living spaces and the bush ecosystem into which the village was integrated.

Over the next few years, Africa's urban population is set to triple. If the city is to become a more peaceful place to live, it needs to rediscover its link with nature, drawing inspiration from ancient approaches. Traditional building methods, which had to work in harmony with the immediate environment, cultivated a more organic connection with nature.

But it's not about caricaturing vernacular architecture or duplicating the village model. The solution is not to reproduce the old, but to mobilize local resources, drawing also on the latest technological developments.

Is it possible to reconcile tradition and new technologies?

It is possible, provided you work with African professionals living in Africa. Today, we tend to take our inspiration from "smart cities", which are based on technologies developed in California's Silicon Valley. But the engineers who work there are not familiar with our reality.

That's why I'm proposing the creation of innovation laboratories in African villages based on a model I call "initiation enclosures", i.e. entirely open places where the younger generations are trained in digital tools and work

© Yves Regaldi

A takienta *mud house and granary for storing cereals in the village of Warengo, in northern Togo. Koutammakou, the land of the Barammariba, was inscribed on the UNESCO World Heritage List in 2004.*

© Lucille Reyboz

Sénamé Koffi Agbodjinou (front right) on the Tammari school construction site in 2006. The school was built using local raw earth construction techniques.

together. This would enable young people in the same environment to grasp contemporary issues and build African cities that are better adapted to people and the environment.

What is your definition of sustainable architecture?

I find the concept too influenced by a modern, Western vision. Many people confuse sustainable with permanent or solid. Sustainability is not just about using materials that stand the test of time without deteriorating, but about creating architecture that can be renewed endlessly.

Traditional African building materials, such as rammed earth, quickly show their limitations when viewed solely from the point of view of their resistance over time. But an earthen house or mosque is not meant to last forever. Every year, the inhabitants get together and redo the plastering. It's also what binds the villagers together. It's a time for festivities and big celebrations, and it's the social glue that holds the village together.

Why did you feel the need to study anthropology in addition to architecture?

Architecture is a projection on the ground of what we imagine a society to be. According to the collective imagination, a little earth and straw is all you need to build an African building. But this is a vision that focuses on appearances alone. To understand how life is organized within a habitat, it is essential to understand the structures of social organization. Anthropology should play a more important role in architectural studies. This would make it possible to take account of the realities on the ground and avoid many blunders. ■

> **“Sustainability is about creating an architecture that can be renewed endlessly**

© L'Africaine d'architecture

An architectural presentation of Maison Gbébé, an international living cultural heritage centre in Agouegan, southern Togo. Project management: Sénamé Koffi Agbodjinou.

Retrofitting existing buildings: the added value

Repurposing an old building is always more sustainable than demolishing it. Using a tectonic approach to architecture allows buildings to be rehabilitated in a way that respects their original structure, while improving their energy performance and meeting the needs of their occupants.

Natalie Mossin

Head of Institute at the Royal Danish Academy of Fine Arts – Institute of Architecture and Technology, she served as President for the UIA World Congress of Architects 2023. She has authored and edited articles and books including An Architecture Guide to the UN 17 Sustainable Development Goals.

Henriette Ejstrup

Assistant professor at the Royal Danish Academy of Fine Arts – Institute of Architecture and Technology, she is educated as an architect specializing in restoration and conservation and has a Ph.D from the Center for Industrialized Architecture.

On the outskirts of Aarhus, a port city on the east coast of the Danish peninsula, lies a small single-family house from the 1960s. Its architectural features draw on a local functional tradition, defined by yellow brick walls, large areas of glazing and a gable roof with eaves. The building was among the first big-scale prefabricated housing produced in Denmark for the rising middle-class, serving a post-Second World War generation who built and owned their own houses in the suburbs. Perceived as ordinary, their typology has not been subjected to heritage protection.

As the houses welcome a new generation of owners, many of them are extensively renovated and gutted of their original features. In this case, the new owners of the house wanted energy optimization. CJ Arkitekter, a Danish company, suggested removing a recent 18-square-metre extension and restoring the original floor plan and facades, contradicting a general tendency of adding more square metres to family houses. The building was insulated, old windows were replaced with energy efficient ones, and original details were preserved or repurposed when possible. Restoring the original architecture by subtraction, rather than addition, resulted in an optimized home with a better indoor climate and lower energy consumption.

This is an example of the application of the theoretical field of tectonics in renovation and restoration. A tectonic approach begins with the structural design of a building but takes into account its material and immaterial dimensions as well. A building's architecture and history are seen as a meaningful contribution to society, collective memory and everyday life. Analyzing and understanding the historic intentions of a building enables architects to transform it in accordance with its original constructional principles and its layers of cultural meaning.

> **"According to the tectonic approach, the identity of a place is as important as materials and construction methods**

A call for change

In July 2023 in Copenhagen, Denmark, the UIA World Congress of Architects concluded with the presentation of the "Copenhagen Lessons" consisting of ten principles of conduct needed for the built environment to reach for the United Nations 17 Sustainable Development Goals. Among them, lesson three states that "existing built structures must always be reused first". This principle aligns with the Intergovernmental Panel on Climate Change (IPCC) report on the climate crisis mitigation potential of retrofitting existing buildings in the western world.

Adaptive reuse, renovation and reconstruction as well as rebuilding offer broad fields of alternatives to the demolishing of existing buildings that fail to deliver to current needs. After decades marked by a rapid rate of demolition and construction,

The transformation of three buildings in the Grand Parc housing complex in Bordeaux (France) by Lacaton & Vassal, Druot, Hutin in 2017. The apartment blocks dating back to the 1960s were upgraded with winter gardens.

the emergence of transformative new technologies and global reckoning with environmental urgency, proponents of heritage practice are backed by a number of arguments.

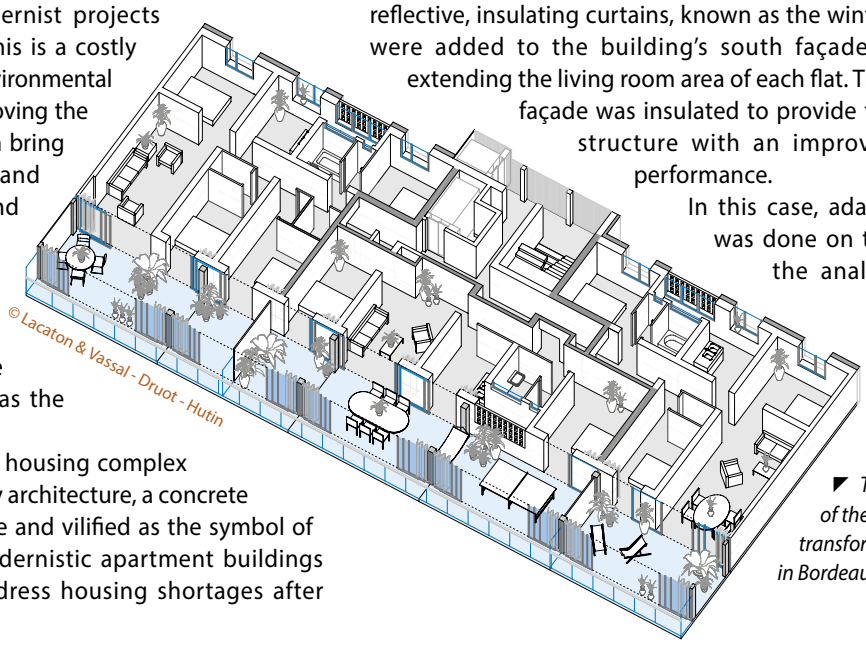
A costly strategy

Over the past 20 years, around 150,000 housing units have been demolished in France, with the aim of replacing worn-down modernist projects with contemporary ones. This is a costly strategy with a significant environmental impact. In comparison, improving the pre-existing architecture can bring significant environmental and economic benefits. The Grand Parc case from Bordeaux, France, shows how adaptive reuse was achieved by analyzing the existing structure, its problems, the original intentions, as well as the people occupying it.

The Grand Parc is a mass housing complex characteristic of 20th century architecture, a concrete construction erected at scale and vilified as the symbol of social challenges. Such modernistic apartment buildings were originally built to address housing shortages after the Second World War. Unfortunately, the construction techniques of the time had multiple negative consequences for the indoor climate and viability of the constructions, resulting in social pressure and stigma in many of these housing areas.

The architects in charge of the project created a strategy based on respecting residents' appreciation of an otherwise overlooked building. Big balconies with sliding doors and reflective, insulating curtains, known as the winter gardens, were added to the building's south façade, therefore extending the living room area of each flat. The northern façade was insulated to provide the existing structure with an improved energy performance.

In this case, adaptive reuse was done on the basis of the analysis of the →



The floor plan of the Grand Parc transformation project in Bordeaux (France).

© Philippe Ruault

The Grand Parc project illustrates how an overlooked structure can be transformed into comfortable and energy-efficient housing. This transformation cost three times less than demolishing the old building and constructing a new one.

existing structure, its problems and original intentions, as well as the community inhabiting it, solving this with passive energy approaches and modern technologies. The approach consisted of working with the strengths of the structure while improving its performance and real estate value.

© Philippe Ruault

The addition of winter gardens and balconies provides each apartment with more light, an extended living space, and a panoramic view of the city of Bordeaux (France).

Rebuilding history

Another example comes from the German capital of Berlin, where the Kapelle der Versöhnung was built in 2000 as part of a larger memorial complex. The chapel narrates the history of a 19th-century church that was situated in the borderland between east and west when the Berlin Wall was raised. It stood unused until 1985 when it was demolished. When the Wall fell, only rubble remained.

Longing to rebuild a united city, the modus operandi of the Berliners was to remove as much evidence as possible of the division of Berlin, but the parish decided to reuse the rubble. A rammed earth chapel was rebuilt on the site. Red brick rubble from the old church was used as an aggregate for the earth construction. In this way, the parish was able to deliberately use the tectonics of the new building to take back the ownership of history and narrate the complex story of a societal trauma.

These examples of retrofitting have in common that the initial assessment was based on the tectonics of the building by linking design, materials, construction methods and structural logic with a sense of place, purpose and identity. Not only is this approach more sustainable, but it also enables architects to enhance the tangible and intangible values of a building and the community it is situated in.

A building can thus be transformed in accordance with its original construction principles and its layers of cultural meaning. This approach has the power to bring out the meaningful contribution of a building to society, to the collective memory and to everyday life. ■

Anuliina Savolainen
UNESCO

Nyasha Harper-Michon, a constructive woman

To be sustainable, a city of tomorrow must be more inclusive and accessible, says Nyasha Harper-Michon, an architect based in the Netherlands. She is striving to get the message across to the construction industry and young architects. Social media plays a key role in her strategy.

Sometimes inventing a new world order requires unearthing the foundations of the old one. For Nyasha Harper-Michon, an Amsterdam-based architect, this led to her breakup with a certain man.

They don't have much in common. On a top shelf designed for this 1.80-meter-tall man, she could barely reach a jar. Where he maintains a regular pattern of daily commuting to work, her workplace and schedule vary from day to day. To move around in the city, he drives a car whereas she cycles or uses public transportation. In short, their needs and uses of the city are very different.

Nevertheless, the city, its housing and urban spaces were tailor-made for him. "He's the Reference Man. I have designed for him many times, that's what we learn to do in architecture school. He is used as the standard, the archetype of the average person for whom everything is designed: our houses, our cities, the size of our streets, the chairs that we sit on, even our mugs," she says. "Designing solely for this guy creates a very exclusive world: it excludes those who do not resemble him, like women, older people and people with disabilities."

And yet, it took her a while to wake up and realize how incompatible they were. "See how ubiquitous and pervasive it is, that even I myself could have been so blind to it!" she exclaims. This realization profoundly changed her approach to architecture.

Nyasha Harper-Michon in Amsterdam (the Netherlands) in 2023.

An activist-architect

At an early age, Nyasha Harper-Michon already knew she wanted to become an architect. She was born in 1993 in Paris, France, to a family of Trinidadian origin. Later, she studied architecture in Paris and Amsterdam.

However, in her studies and early practice, she felt a growing disconnect between what she was learning and what she thought architecture could be. "I guess it's a bit of a mixture between my multicultural background and my millennial purpose-seeking mindset," she ponders, "I started to feel that architecture could do so much more to create a more regenerative, inclusive and net-zero built environment to live, work, be in." In other words, an environment where everybody belongs.

Her vocation remains intact, but instead of building houses she now practices her profession in another way. She has become an "archtivist": a term coined by her for architects and design professionals driving environmental and social reform to foster positive changes. As a strategic development manager for UNStudio, an architectural design practice based in Amsterdam, she liaises with real estate and building industry actors on creating social and environmental value in the building realm. In parallel, she teaches in two Dutch universities.

She is also a sought-after public speaker and influencer. Her calling takes her from local WomenMakeTheCity movement meetings to global venues, such as the World Congress of Architects in Copenhagen, Denmark, in July 2023.

> **"Houses and cities designed for the reference man exclude all those who do not resemble him**

The event's theme, "Sustainable futures: leave no one behind", itself emphasizes a change in attitude within the industry towards more inclusive architecture. For Harper-Michon, the climate crisis and social inequality are inextricably intertwined.

"When talking about sustainability we like to think of the environmental aspects first: things like energy efficiency or carbon emissions are measurable and easier to grasp and tackle. The social aspects are much harder to quantify. But you can't really tackle the climate crisis if you ignore this dimension."

The oasis of green

Change can sometimes be achieved through very concrete actions. Installing benches, for example, encourages the elderly or people with reduced mobility to go outside instead of staying at home, because a bench allows them to take a rest. Another example: green areas reduce summer heat in cities and increase residents' well-being. But it will only work if the change is equal.

"We know that affluent neighbourhoods tend to be greener than lower-income ones. But we cannot have

Barcelona, new World Capital of Architecture for 2026

The city of Barcelona (Spain) has been designated World Capital of Architecture for 2026 by the Director-General of UNESCO, Audrey Azoulay, on the basis of a recommendation by the joint UNESCO-UIA Committee, chaired by the French architect Dominique Perrault.

In 2018, UNESCO and the UIA (International Union of Architects) launched the "World Capitals of Architecture" initiative to highlight the key role of architecture, city planning and culture in urban identity and sustainable urban development. Every three years, UNESCO designates the host cities of the UIA World Congress as World Capitals of Architecture.

The designated city becomes a global forum at the forefront of discussions on contemporary urban planning and architectural issues, as well as the world's most pressing challenges. After Rio de Janeiro (Brazil) in 2020 and Copenhagen (Denmark) in 2023, Barcelona is the third city to receive this title.

© Boris Séméniako for *The UNESCO Courier*

> **If used wisely, social media can be a powerful tool for shaking things up**

green areas for our affluent citizens only," she stresses. "Green policies have to be coupled with initiatives of affordable housing, inclusionary zoning and the like. By thinking holistically, we can create both natural and socially inclusive neighbourhoods."

Nyasha Harper-Michon has been directly involved in implementing such ideas through her work with the Amsterdam municipality on urban planning in Zuid Oost, a borough undergoing urban renewal. "It's an area grappling with friction between the community and municipal urban endeavours amid ongoing gentrification. Those shaping the plans often lacked intimate knowledge of the community, so it is also about trying to build connections and create common ground," she explains.

In her efforts to advocate for a more open city, the architect uses social networks extensively to reach out to young people, who are often very concerned about the future. Nyasha Harper-Michon observes this among her students. "There's a lot of anxiety, and at such a young age. It's worrying, but it can also motivate them to take action."

Social networks can be an effective tool to raise awareness among youth. Harper-Michon sees social media, despite its downsides, as a part of the solution: it can be used to share knowledge and to create a sense of community. "If used wisely, social media can be a powerful tool for shaking things up and influencing decision-making."

Change, however, is generally a slow process in urban planning. A city cannot be transformed overnight. Today Amsterdam is considered one of Europe's most sustainable cities with its "green" buildings and wide network of cycle paths. Yet this wasn't always the case. It wasn't until the 1970s that the city began investing in cycling infrastructure due to the high death rates of cyclists and pedestrians. It took a lot of protests and forty years of urban planning and policy work to create the Amsterdam we know today.

Therefore, patience and perseverance are essential virtues. This is something Nyasha Harper-Michon tells young architects, whose urge for instant gratification and the need to question established practices often collides with the slow pace of construction processes. "Buildings built today were designed five-ten years ago, so the impact of the new ways of doing things are not immediately visible. But we need to be patient!"

The first tip she gives aspiring "archtivists" is to open their eyes. "Think of how you experience the city and share this with others. You'll realize that we all experience the same space in different ways. Showing the example by biking to class or work or making a nice garden in front of your house can already make a difference. Or you can take it further and lead a group, or even go into politics. Everyone has their path." ■

The archi-tech generation

Saili Sawantt,
Journalist based in Mumbai, India

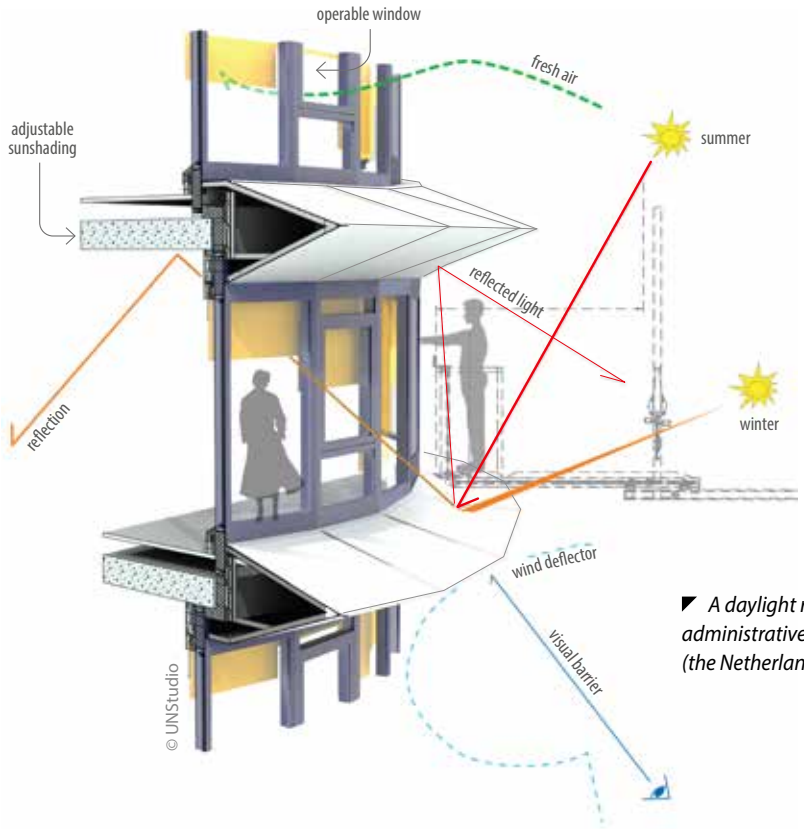
From 3D-printed houses to prefabricated skyscrapers and the use of digital twins, cutting-edge technology holds promises for building at a lower cost and in a more sustainable manner.

Generative design

Generative design, assisted by artificial intelligence (AI), refers to an approach in architecture where algorithms are used to generate multiple design alternatives. For architects, this means that AI becomes their partner in the design process, offering the ability to quickly evaluate various building layouts that are aesthetic and functional. By setting certain parameters like maximizing natural light, enhancing airflow, or minimizing material use, these algorithms can put forward more sustainable solutions. For architects, AI can be an invaluable tool, provided they possess solid decision-making skills to avoid being overwhelmed by the many possibilities it offers.

Mimicking reality with a digital twin

A digital twin is a 3D visual replica of a physical building. It gives architects access to an evolving model, allowing them to test their ideas in the virtual environment. Digital twins can compare the digital model with the real structure over time. The technology also assists in choosing materials and processes that reduce the carbon footprint of the building over its lifecycle. Although this technology itself requires considerable amounts of energy, its use can reduce a building's energy usage by a significant percentage. For instance, by using a digital twin, Dutch architects were able to reduce the Hague City Hall's energy consumption by 39 per cent.



A daylight redirection device in an administrative building in Groningen (the Netherlands).

Daylighting and thermodynamic modelling

A well-analyzed daylighting strategy can significantly reduce electricity consumption. Various tools and software exist to help architects harness natural light, which benefits occupants' health and reduces peak electricity demand, particularly during hot summers. From the positioning of the walls to the type of windows, the aim is to optimize the use of daylight in buildings.

3D printing and robotics

In Alcobendas, Spain, the first-ever 3D-printed pedestrian bridge by The Institute for Advanced Architecture of Catalonia made headlines in 2017. Automation opens up opportunities for experimenting with new materials, aesthetics and forms. 3D-printed buildings can be affordable, flexible, and climate-resilient. Although the technology still widely relies on carbon-intensive concrete, 40 per cent reduction in materials is among the promises of 3D-printing in construction. Moreover, the technology can cater to rapid urbanization. For instance, in 2022 Denmark-based company Power2Build completed Africa's largest 3D-printed building in Angola, a 140 m^2 residential structure, in just 30 hours.

© ICON, Lennar

The largest automated 3D construction project in the world is currently underway in Georgetown, Texas (United States): a neighbourhood of a hundred houses.

Modular construction

"Building in batches", or modular construction, reduces a significant amount of construction time and errors, bringing down over-consumption and wastage of materials. It involves manufacturing completed or partially completed parts in a factory with the help of digital tools and modelling methods. The process can be mind-blowingly fast. In 2015, a 57-storey skyscraper was constructed in a mere 19 days in Changsha, China, with giant LEGO-like blocks assembled at the site. But modular construction doesn't have to be limited to huge structures. The ModSkool school in Delhi, India, made with indigenous materials, is designed to be rapidly dismantled and moved in the event of flooding.

The new, green BIM

Implemented since the 1970s, Building Information Modelling (BIM) is an approach for digital information management to improve building and infrastructure quality. BIM software offers digital representation of a building's characteristics. It enables professionals in the built realm to consider the sustainability of materials and design in the digital environment before taking the project live. The United Kingdom's push for BIM standardization led, in 2019, to the introduction of the international ISO 19650 standard, recognizing the need for strict standards and governance locally and globally. BIM also offers "intelligent management" features. Take, for example, the Edge in Amsterdam, also known as the "smartest building in the world". A smartphone application allows users to interact with the building: reserve workspaces, control light level, or adjust the temperature of the space they're in.

© PLP Architecture / photo: Ronald Tilleman

Finalized in 2015, the Edge building in Amsterdam, also known as "The Computer with a Roof", is equipped with 28,000 sensors that utilize data generated by building users to optimize space management and occupation levels.

Katy Gillett

Journalist based in Dubai, the United Arab Emirates (UAE)

Solving a concrete issue with salt in Dubai

Could brine waste from seawater desalination plants offer an alternative to cement? This solution is put forward by Wale Al Awar who advocates for eco-responsible architecture.

Wael Al Awar's office sits in In Deira, an older area of Dubai. The building was constructed over a salt flat, or *sabkha*, a geological formation characterized by a lack of vegetation and very high levels of salinity. It was the sabkhas of the United Arab Emirates (UAE) that inspired the Lebanese architect and his Japanese business partner, Kenichi Teramoto, in their curation of the 2021 UAE National Pavilion at the Venice Biennale of Architecture, which won the Golden Lion for Best National Participation. Called "Wetland", the exhibition examined the potential for making sustainable building materials using recycled brine waste from desalination plants.

© Federico Torra

The "Wetland" project, awarded the Golden Lion for Best National Participation at the Venice Biennale of Architecture, explores ways to create construction materials using brine waste from seawater desalination plants.

Salt has been used in buildings for centuries. Siwa, an urban oasis in western Egypt, was founded on a *sabkha* and became the home to one of the earliest civilizations in 10,000 BC. Abodes were created using *kersheef*, a traditional material mostly assembled from salt, and these still stand today. But over time, the tradition has been lost. In Dubai, like in other parts of the world, concrete has taken over, with serious consequences for the environment. The cement industry is responsible for about 7 to 8 per cent of the world's direct CO_2 emissions and it's a fundamental building block for concrete. It is lime, the binder in cement, that is the real problem, as calcium carbonate has to be heated to produce calcium oxide (lime) which releases CO_2 as a byproduct.

Off the beaten track

Countries such as Japan, for example, where Al Awar and Teramoto also have an office, have historically built with local materials such as bamboo – and still can. In the UAE, however, the use of local materials is a challenge. In the past, the building sector relied on coral. But large-scale use of this resource is not a viable option for a population that has grown from some hundreds of thousands to over nine million in the last fifty years. "As an architect, you really need to understand what your responsibility is," says Al Awar. "In the UAE, there is no wood or bamboo. We had to really think outside the box to find an alternative and try to do what was good for the climate."

As Al Awar sought alternatives to cement, he came across the *sabkhas*, which account for more than five per cent of the country's land mass.

> **"We need to move away from resource extraction and think of a circular economy instead**

Al Awar and a team of scientists from the American University of Sharjah analyzed the minerals and salts and found magnesium oxide. Building on this discovery, Kemal Celik, an assistant professor of engineering at New York University Abu Dhabi, helped find a way to replace lime with magnesium oxide to create new synthetic blocks that were later used in the structures that formed Wetland.

Brine as a solution

Sabkhas may have been the inspiration, but they were not the material source, as extracting from them would be a "crime", says Al Awar. They are also carbon sinks. "If we say, 'Let's build with sabkhas', I don't think they would last five years." Rather than destroy these natural environments, the solution was to use brine from desalination plants.

◥ *The Al Ruwais* sabkha *site, situated some 240 kilometers west from Abu Dhabi. Such highly saline geological formations are characteristic of arid regions that have been exposed to seawater.*

The UAE – the second-largest desalination market in the world after Saudi Arabia – generates about 14 per cent of the world's total desalinated water output, according to the Abu Dhabi Department of Energy. These plants supply potable water to millions, but the leftover waste of highly concentrated saltwater goes back into the Gulf, increasing its salinity. This has an impact on marine and coral life. "We thought this is a win-win situation where we can take this byproduct and really work with it," says Al Awar.

The technique of using brine in construction is still in its very early stages. "It was just the beginning of what eventually could be and hopefully will be," says Laila Binbrek, the director of the National Pavilion UAE. Al Awar and Celik have been looking into this since then, and exhibited a new prototype at Dubai Design Week in November 2023.

Magnesium oxide could be a feasible solution for any country with desalination plants. But it is not a material that should be exported; solutions need to be found close to home. "The problem of the climate crisis is the idea of universal materiality," he says. "If you look to the past, people built from their environment, they never built from other people's environment."

A building in Dubai shouldn't look like a building in Singapore, adds Al Awar. "We need to move away from extraction and think of a circular economy. I urge each architect to look at their city and see what the industrial wastes are. Laila Binbrek agrees. "Sometimes you don't realize the solution is probably right under your nose." Or in Al Awar's case, right under his office. ■

Interview by
Chen Xiaorong
UNESCO

Wang Shu: "The sustainable architecture 'system' has developed into a movement"

Wang Shu, a winner of the prestigious Pritzker Prize, revisits Chinese architecture by combining recycled materials with traditional craftmanship. As the founder of Amateur Architecture Studio he strives to design projects that integrate harmoniously with their environment.

In 2012, you were the first Chinese architect to be honored with the prestigious Pritzker Architecture Prize. What does this achievement mean to you, and how would you describe the defining features of your architectural style?

The Pritzker Architecture Prize underscores the profound impact architects make on the global architectural landscape. I see this honour as a form of recognition for Chinese architecture – a proof that Chinese architects have moved beyond mere imitation and developed a contemporary, distinct architectural language. It was a turning point not only for Chinese architects but also for architects worldwide, since prior to this, the prize had mostly been awarded to Western architects.

In the speech at the prize ceremony, it was stated that I had developed a unique approach to architectural creation, or an "architectural language of my own". The goal of this language, in the face of rapid modernization, is to not forsake history and tradition but to create a bridge between them and modern style and ensure that traditional architecture remains relevant in today's world. Nature, memories, and the nuances of language ("词句" or *Ci Ju*) are some of the core elements of my architectural language.

> "Traditional Chinese architecture prioritizes elements such as ventilation, rain control, temperature regulation, and lighting optimization

Together with Lu Wenyu, your wife and co-founding partner of Amateur Architecture, you have designed world-renowned works such as the Ningbo Museum and the Xiangshan Academy of Art, both constructed of recycled materials. How would you define "sustainable architecture"?

When sustainable architecture is brought up, we often place ourselves within a Western context. However, traditional Chinese architecture inherently possesses a recycling system that prioritizes elements such as ventilation, rain control, temperature regulation, and lighting optimization. It places a strong emphasis on the harmonious coexistence of the household or family.

The sustainable architecture 'system' has developed into a movement that has gained international recognition in recent years. In 2007, I received the Global Award for Sustainable Architecture in Paris, which exemplifies this tendency.

Since 2000, an increasing number of architectural projects in China have adopted this approach. The Xiangshan Campus of the China Academy of Art, which I designed, is the earliest and the most typical example. It is not just a singular architectural piece but a cluster of structures that extends its scope to an urban scale, addressing the challenges faced by cities and offering solutions. It was included in the New York Times list of 'The 25 Most Significant Works of Postwar Architecture' in 2021.

What are the challenges of sustainable architecture in China?

China, with a truly immense scale of construction activity, can play an important role in this area. I believe that China's most substantial contribution to global sustainable development in the 21st century lies within the realm of construction.

Architectural sustainability in China should draw upon its rich, traditional culture as the foundation for crafting our unique approach. For instance, over 50 per cent of China's traditional dwellings are constructed using rammed earth.

© Iwan Baan

◥ *The Lin'an Museum in Hangzhou (2020), designed by Amateur Architecture Studio, uses traditional materials and building techniques to forge a modern museum.*

Can you tell us about your collaboration with the International Centre on Earthen Architecture (CRAterre), a UNESCO partner?

I was impressed in the early 2000s by the groundbreaking rammed earth structure of the Kapelle der Versöhnung constructed by the Centre in Berlin. When I had the opportunity to meet them in the mountains of Grenoble, France, it dawned on me that CRAterre had been diligently researching new rammed earth techniques in collaboration with UNESCO for over three decades. I found this very inspiring.

In 2011, the Centre assisted us in establishing our own laboratory and extended unwavering technical support. By 2013, I had designed and overseen the construction of a massive 9,000-square-metre rammed earth building at the Xiangshan Campus in Hangzhou. This structure marked a significant milestone as it was the largest rammed-earth building in all of Asia at that time.

Last year, I completed the National Archives of Publications and Culture, also in Hangzhou, where rammed earth is prominently featured.

You promote an architectural approach known as "critical regionalism". Could you explain this concept?

The concept of 'regionalism' was introduced in Europe at the end of the 1970s as a response to the prevailing trajectory of modern architecture which had been heavily focused on science and technology. With modernization, this approach had inadvertently caused substantial harm to local and indigenous cultures worldwide. In the contemporary context of sustainable development, the challenge is to rejuvenate the 'regionalism' approach, restoring its capacity for critique and vitality. My work has sought to make a meaningful contribution to this endeavour on a global scale.

Critical regionalism extends beyond mere replication of traditional symbols, aiming to discover a harmonious coexistence between traditional and modern culture. This includes using traditional artisanal techniques, even for large-scale architecture projects, but also cutting-edge technology.

Could you share the journey that led you to become the globally renowned architect you are today?

My early exposure to calligraphy as a child laid the groundwork for my lifelong passion to understand the Chinese aesthetic tradition. Once I entered the realm of architecture, I sensed boundless opportunities for exploration.

During my second year of undergraduate studies, two pivotal pamphlets, *Toward a New Architecture* by Swiss architect Le Corbusier and *The Bauhaus Manifesto*, left an indelible mark on me with their critical architectural discourse.

In addition to these influences, I conducted extensive research into vernacular architecture. Back in the 1990s, my unconventional architectural ideas often met with hurdles when it came to securing major projects. However, these limitations led me to smaller-scale projects, where I had the opportunity of working closely with skilled artisans and traditional craftsmanship – an experience rarely accessible to designers within standard design institutes. I firmly believe that to have global impact I must be grounded in Chinese culture, making it the cornerstone of my architectural endeavours. ■


ZOOM

Photos:
Thandiwe Muriu / Institute

Text:
Katerina Markelova,
UNESCO

Thandiwe Muriu, fairy of optical illusions

Act as if it is impossible to fail could be the mantra of Thandiwe Muriu. It is one of the African proverbs that she has matched to her photos in the series *Camo** (for "camouflage"); in this way the Nairobi-born photographer adds a dimension to her images, creating a dialogue with the collective memory of her country.

Draped in *ankara* print fabrics, the bodies of the women blend into a décor with the same pattern, creating a visual illusion that is created without digital effects. A pop and publicity aesthetic – the field that Thandiwe Muriu comes from – will not be used to dupe the viewer.

Beyond the splashy colours and the carefully planned poses, the photos of Thandiwe Muriu aim to express the power of African women. And more subtly, their invisibility in society. Transformed into quirky fashion accessories, the lemon press, tea balls and hairpins reflect the inventiveness of these women who, lacking resources, infinitely recycle and reuse ordinary objects. Her work is seen as a veritable manifesto for Kenyan women.

Exhibited around the world in Paris and New York, Shanghai and Marrakesh, laureate of the 2020 People's Choice Award at the Photo London fair, this self-taught photographer has shaped a solid reputation on the international art scene. Her success, however, does not stop her from regularly meeting with students to show them that art is not just a discipline for men. *As far as the brook flows, it does not forget its source* is another African proverb. ■

* The book *Camo* will be published in April 2024.

A diamond does not lose its value due to lack of admiration.

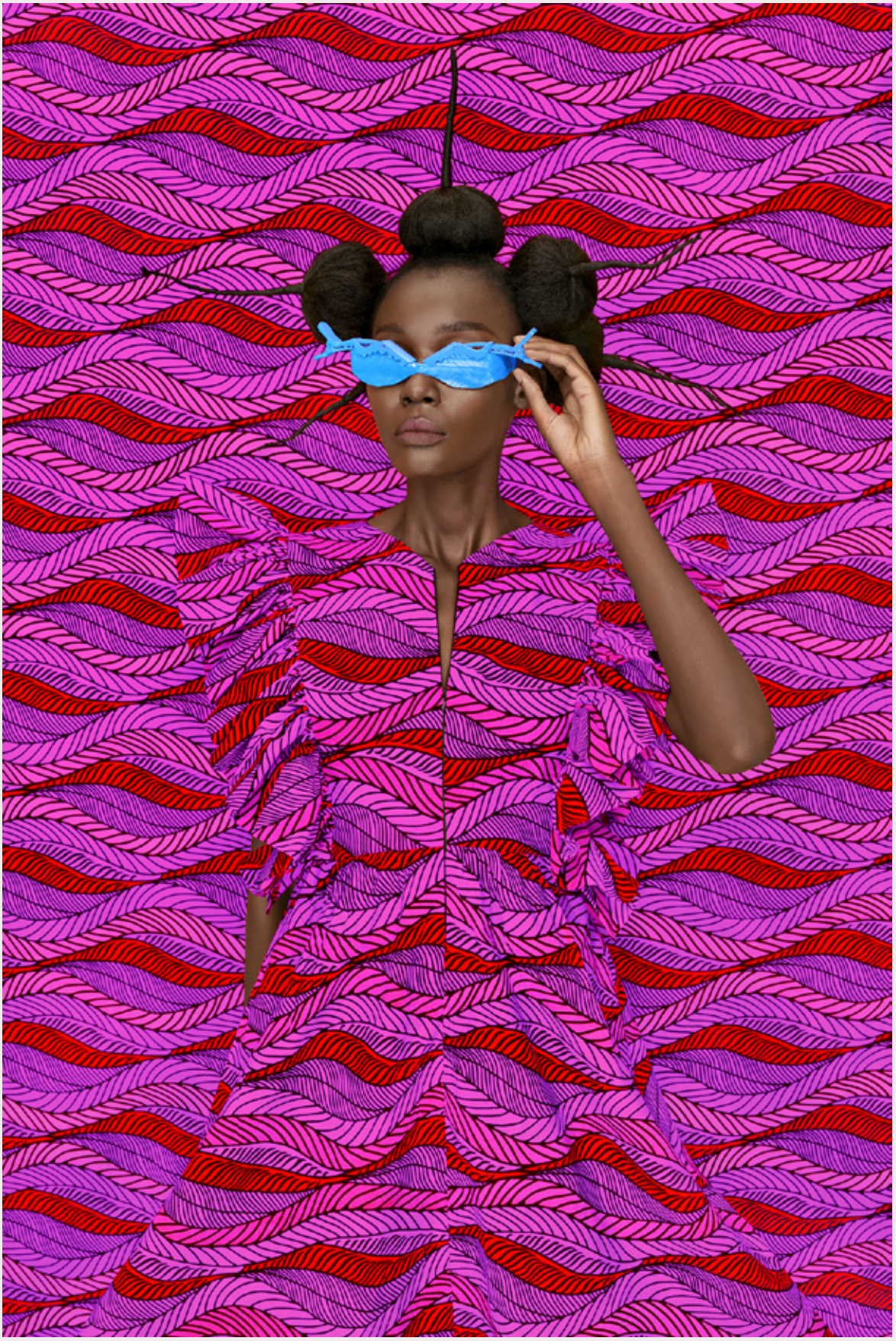
African proverb

He who is destined for power does not have to fight for it.

African proverb

When your sister does your hair, you do not need a mirror.

African proverb



A great leader is an ordinary person with extraordinary wisdom.

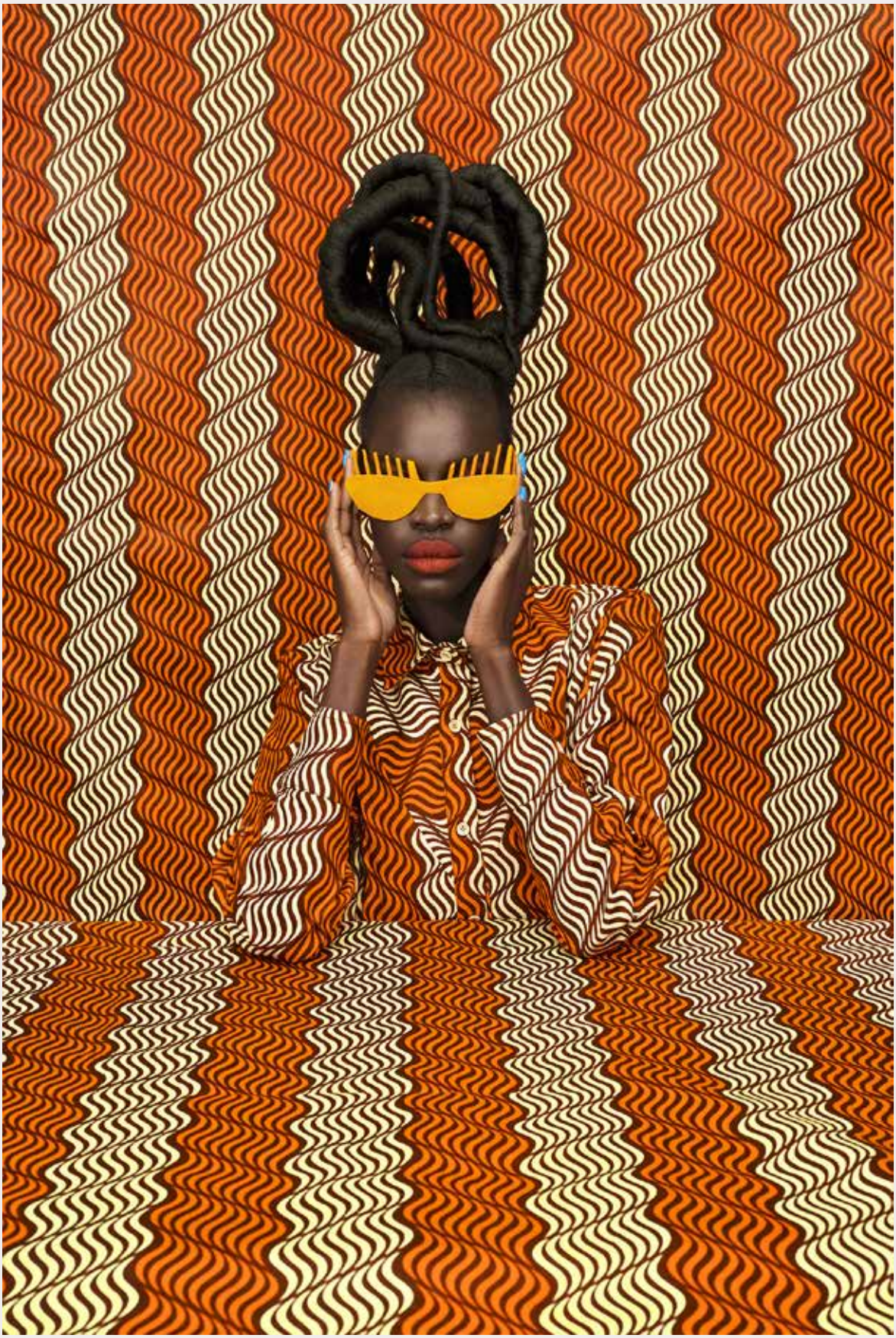
African proverb

It is not what you are called, but what you answer to.

African proverb

He who loves, loves you with your dirt.

African proverb

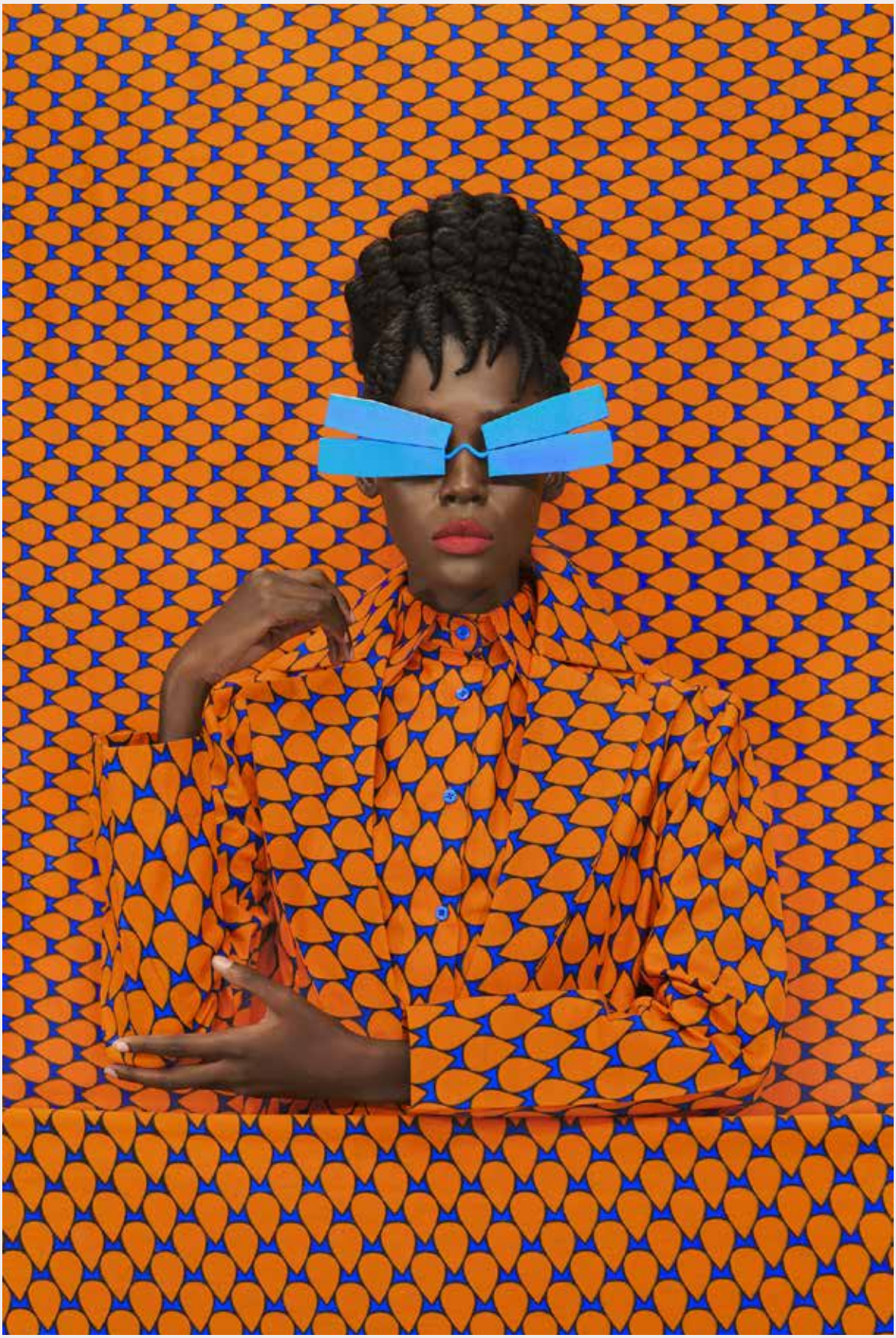


You must act as if it is impossible to fail.

African proverb

Life is lived forwards, but understood backwards.

African proverb



A man cannot sit down alone to plan for prosperity.

African proverb

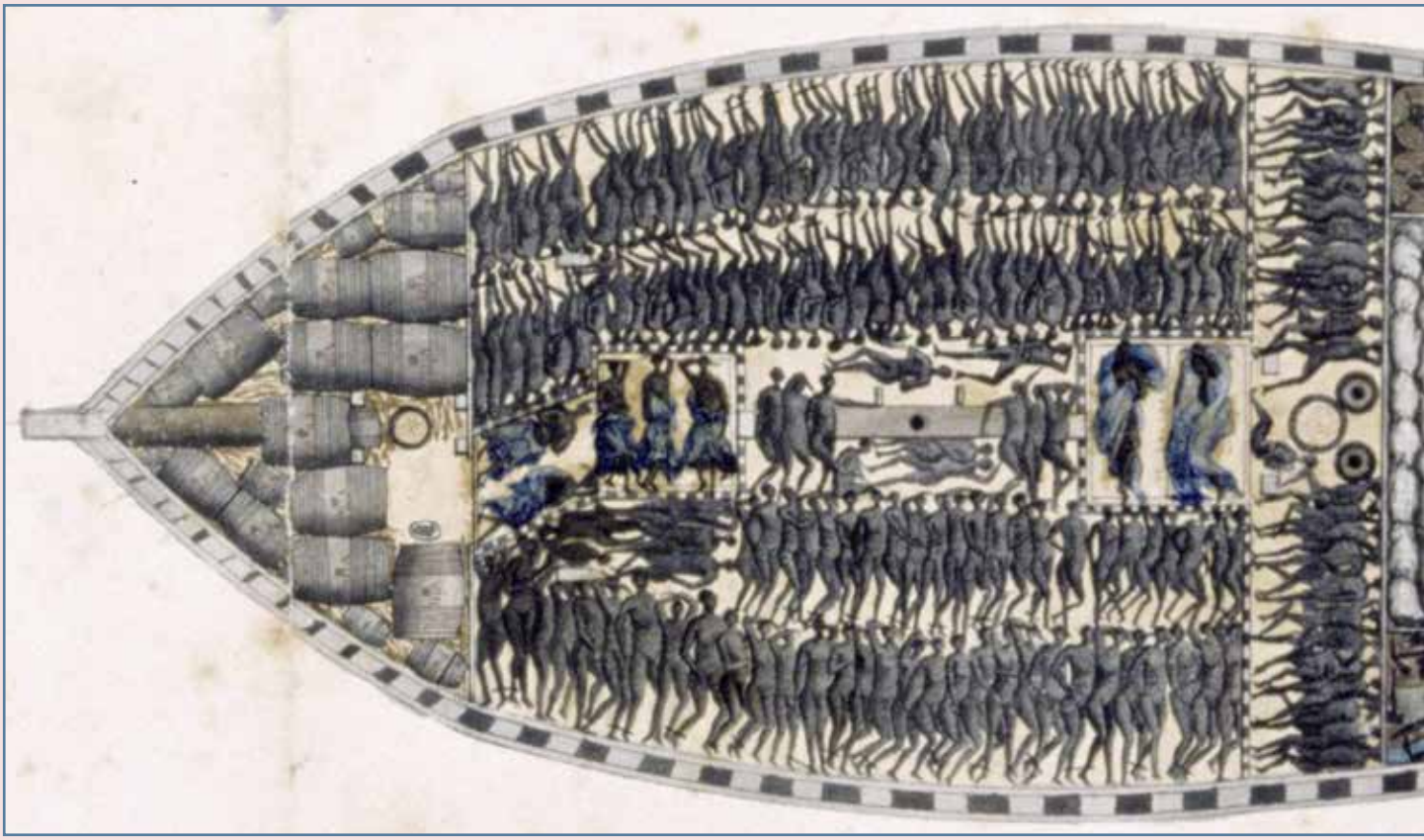
A person is a person because of other people.

African proverb

IDEAS

A deep dive into the transatlantic slave trade

Off the coast of the island of Gorée – a symbol of human exploitation – African researchers are carrying out underwater explorations to locate and identify the wrecks of slave ships. Their mission is not only to document the history of the transatlantic slave trade, but also to approach it from a different perspective.



Detail from a drawing: the tween-deck of the Marie-Séraphique, *a slave-trading ship from Nantes, loaded with 312 enslaved persons (1770). Document preserved in the Château des ducs de Bretagne – Musée d'histoire de Nantes (France).*

Madick Gueye

Doctor of underwater archaeology, coordinator of the Slave Wrecks Project, Cultural Engineering and Anthropology Research Unit (URICA) at IFAN, Cheikh Anta Diop University, Dakar (Senegal).

Today known as a place of memory dedicated to the slave trade, the island of Gorée was the largest slave-trading centre on the African coast from the 15th to the 19th century. Thousands of human beings passed through this small island some five kilometres from Dakar, Senegal, before being used as forced labour in American plantations.

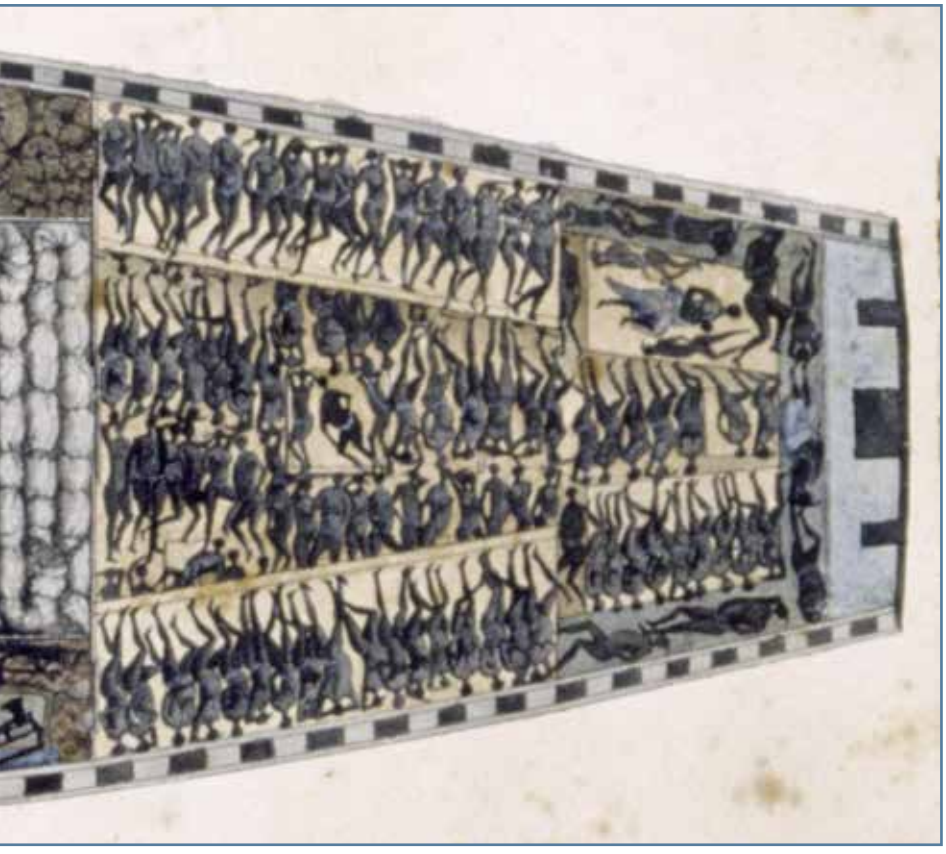
It is estimated that nearly a thousand slave ships wrecked between Africa and the Americas. Only a tiny fraction of these wrecks are known and documented today. Consequently, a huge amount of mapping work needs to be undertaken. Tracking down these archeological remains and exploring the underwater sites would help obtain invaluable scientific data and shed light on the tragic history of the triangular trade.

The waters surrounding the island of Gorée, inscribed on the World Heritage list in 1978, are an important part of this history. This is why, in 2016 and 2017, a team of research divers from the Institut fondamental d'Afrique noire (IFAN) at Cheikh Anta Diop University in Dakar, undertook two underwater archaeological research missions off the coast of the island. Using a magnetometer to detect the presence of metals, combined with a navigation system and a depth sounder, we were able to cover the entire coastline of the island within a radius of 500 metres, recording the data generated with the aid of software. The subsequent work of cataloguing enabled us to identify 24 archaeological sites, confirming the richness of Senegal's underwater cultural heritage.

The Middle Passage

The team then carried out dives in some of the sites. We had a clear mission – to assess the potential of the sites, measure their extent, map the apparent structures and study their environment. This was a decisive factor in the conservation of the remains. So far, IFAN has identified two major sites: *HMS Sénégal*, which was shipwrecked in 1780, and a second site dating from the early 19th century that requires more in-depth archaeological assessment before it can be fully identified.

In Senegal the research focuses on the Middle Passage, the transatlantic stage of the triangular trade linking Europe, Africa and the Americas, a field that still remains largely undocumented. Given its strategic position and major role in transatlantic trade relations, Senegambia – historically a geographical area corresponding to the Senegal and Gambia river basins – appears to be a privileged area to be explored.



> **“The Senegalese waters are home to many slave shipwreck sites**

For over four centuries, thousands of European slave ships sailed along the coast of West Africa, with the main trading points centred on the coastal regions of Saint-Louis, Gorée, Rufisque, Portudal, Joal, Albreda and Rivières du Sud.

Obstacles to navigation, such as poor visibility and sandbanks, as well as rivalry between European powers, caused many of these vessels to run aground. Reconstructing what life was like on board and the hardship endured by these men and women is one of the aims of our research.

Training at sea and in the classroom

These initial explorations were carried out as part of the Slave Wrecks Project, initiated by the Smithsonian Institution's National Museum of African American History and Culture in Washington, DC (United States). The aim of the international network of researchers set up by the project is not only to document the history of the transatlantic slave trade, but also to approach it in a new way by placing people at the heart of the story.

> **The Cheikh Anta Diop University has established the first African-led marine archaeology team in West Africa**

Training is an essential dimension of this initiative bringing together Africans and African-American descendants to study underwater archaeology, both at sea and in classrooms. Since 2014, the Slade Wrecks Project has been able to train a network of researchers at IFAN's Archaeology Laboratory in diving and marine archaeology techniques and technology. It has thus been instrumental in setting up the first African-led marine archaeology team in West Africa.

Underwater archaeological sites enable us to re-examine the stories and legacies of the slave trade. By promoting knowledge, the underwater archaeology of the slave trade fosters reconciliation and promotes social justice.

The desire to document slave trade history by studying underwater remains is not something new. Since the late 1980s, researchers such as Max Guérout, a French underwater archaeologist, have been working on the subject. He led two diving missions to the Gorée area in 1988, as part of UNESCO's programme to safeguard the island. The work of Professor Ibrahima Thiaw, a Senegalese archaeologist and specialist in the living conditions of the slaves on Gorée, has also been instrumental in the development of this discipline in Senegal.

© Jane Hahn

Professor Ibrahima Thiaw and his students on a mission off the coast of the island of Gorée in 2016.

© VWpics / Hemis.fr

The House of Slaves on the Island of Gorée.

A very present past

The transatlantic slave trade is not only a thing of the past – Senegalese social landscapes are still strongly marked by the stigma of slavery. Racial stereotypes arising from the slave trade have had a profound impact on intercultural and interracial relations.

The question of the role played by the African continent in the export of black slaves continues to be debated. This topic, sometimes reduced to simplistic statements, has been the source of misunderstandings and even tensions with Afro-descendant Americans. Africans were undeniably implicated, but the moral and political economy of the slave trade is highly complex and

Survey carried out during an underwater archaeology training at a wreck site ten metres from the coast of the island of Gorée.

cannot be reduced to clichés or hasty interpretations.

In this context, a better understanding of the past and of the complexity of the transatlantic slave trade is essential to foster dialogue and heal the wounds of the past, wounds which are sometimes still open. Moreover, by involving the local population in the research we will help them take ownership of the black slave trade history.

Provided, however, that the ruins and remains can continue to reveal their secrets to future generations. In fact, underwater archaeological sites face a number of threats. Several dozen meters below the surface, micro-organisms, marine fauna and the mechanical effects of the sea, currents and even fishing gear can destroy wrecks.

Buried in the sediment, sheltered from light and in an oxygen-poor environment, organic matter is well preserved. But once brought to the surface, the objects are fragile and need to be preserved with appropriate conservation treatment. This is particularly true of iron objects and wood. Indeed, the archaeological objects excavated by Max Guérout in the late 1980s are already deteriorating.

Senegal does not yet have a conservation laboratory, an essential element for continuing underwater archaeological excavations. The creation of such an establishment is therefore imperative for the future of our research and, more broadly, for the documentation of the history of the transatlantic slave trade.

OUR GUEST

Interview by
Laura Berdejo
UNESCO

Judith Santopietro:

"You can rebuild yourself through writing"

© Elena Lehman

Born in the Mexican state of Veracruz, the poet Judith Santopietro now lives between her homeland and the United States. The experience of migration, a core element in her personal history, is central to her work. It is also key to the writing workshops she runs for migrant women living in the United States. Written in Spanish, her mother tongue, her texts borrow from Nahuatl, Quechua and Aymara, not only in sound but also in their vision of the world. She has published *Palabras de Agua* (2010) [Words of Water] and *Tiawanaku. Poemas de la madre Coqa* [Tiawanaku. Poems from the Mother Coqa] (2019).

What role does writing play in your life?

Writing plays a vital role in my life. I came to the United States in 2012, lived in Texas for a few years, then I returned to Mexico. I go back and forth between the two countries. In addition to my own publications, I run literature and writing workshops with women from Mexico's indigenous peoples who live in the United States.

The women who take part in these workshops don't just write as an exercise; it's an opportunity for them to express things that are deeply buried, to put into words experiences that are sometimes very harsh. The aim is not to heal through writing, but rather to use it as a trigger, to initiate a process that leads them to question their identity. This is important for women who live in a country where they didn't grow up, and who recreate a community to protect themselves and to embellish their lives, particularly around food, religious rites or festive moments. For me, this is an important aspect of the story, as it helps to dispel the idea that migration is synonymous with suffering. Moments of pain do exist, of course, but they don't sum up the experience of these women.

> **“Andean Spanish has been strongly modified, in its very syntax, by the contribution of indigenous languages**

Your latest collection of poems,* Tiawanaku. Poemas de la madre Coqa*, recounts the journey of an Aymara woman – an indigenous population spread across Argentina, Bolivia, Chile and Peru – through the Andes mountains. What's your connection with this character?

Tiawanaku, which is the name of an ancient archaeological city in Bolivia, tells the story of a displaced woman who flees her country, Mexico, in the midst of a war between drug cartels, to reach the Andes. This character is very close to me. I did in fact travel by bus from Lima in Peru to La Paz in Bolivia. The trip took over 30 hours.

I wrote this book at a time when I was unable to distance myself from the violence I had experienced, which is why the narrative is in the first person singular. Today, having taken part in projects on migrants and refugees in Mexico, working with groups searching for missing persons[1], I know just how important it is to put one's traumas into words. You can rebuild yourself from this experience.

This trip was an opportunity for you to familiarize yourself with Andean cosmogony. How do these languages influence your work?

The Spanish I use rubs shoulders with Quechua, Aymara and other Andean languages. It wasn't a conscious decision on my part, it just happened naturally. During this trip, I was writing non-stop. I recorded everything I saw. I was looking for my place in this world that I was crisscrossing, listening to.

At first, I had trouble understanding the Spanish spoken in the Andes, but I persevered. By listening carefully to this mixed language, I came to realize there were links between the concepts conveyed by Aymara, Quechua and other Altiplano languages. I also realized the extent to which they had permeated Spanish.

1. In Mexico, forced disappearances and the discovery of mass graves linked to the war between drug cartels have claimed countless victims in recent years. As of 2023, the Ministry of the Interior counted over 110,000 missing persons.

© Andi Landoni for *The UNESCO Courier*

Does the revitalization of indigenous languages involve deconstructing the linguistic hierarchy?

A new version of *Tiawanaku* is about to be published in Mexico. On this occasion, my editor suggested that I italicize words and concepts from other languages. I refused because I didn't want to give the impression of a linguistic hierarchy. I didn't want these terms from other idioms to appear as intruders. Instead, I wanted to show how Andean Spanish was strongly modified, in its very syntax, by the contribution of the indigenous languages that pre-existed it.

These languages carry with them a wealth of precious knowledge. Concepts such as *quipu*, which is a knot or link in Quechua, or *ajayu*, cosmic energy, express a whole way of seeing the world, animate beings and natural phenomena. I learned this through the oral histories of my village, but thanks to the language. Nahuatl, the language of my ancestors, has words to designate animate beings and distinguish them from those that are not. The same is true of many other indigenous languages. Stones can thus be inhabited, or even endowed with a spirit. In rituals, the terms used refer to divinities, and are pronounced to act and heal.

It took me a long time to understand that the Spanish spoken in my home was totally imbued with Nahuatl. Recognizing the terms hidden within it was like a revelation. The problem is that these languages are now threatened with extinction.

How can we restore the cosmogonies transmitted by native languages?

I think the process of active listening is fundamental. When I design and run writing workshops, usually for a migrant audience, and when I tackle certain themes with vulnerable populations, I use this listening process first and foremost. Writing comes next. It's a way of releasing emotions, of putting them in order.

Listening allows us to access otherness. As well as bringing us face to face with people, it enables us to grasp their concerns and their experiences of migration. We don't take enough

time to reflect on the reasons why these people have left their country, or what they have endured during their journey. Through the process of active listening, we can uncover their family stories, show more empathy and better understand the world.

Your work falls somewhere between prose and poetry. What does the poetic form offer you?

For me, poetry is a means of dialoguing with existing cosmogonies. It tears apart reality to let images emerge, giving us a glimpse of the strange and unusual in everyday life.

If we compare it to a work of prose, a novel or a story, poetry opens up unsuspected worlds that we otherwise miss. Prose, on the other hand, allows us to unfold longer narratives.

What advice would you give to those who are starting out as poets?

Just one piece of advice: experience what is elsewhere. You mustn't just be the voice that speaks, but first and foremost the one that listens and observes. You have to know where you want to take your writing, and to whom. When I write, I don't think about the idea of a poem; I ask myself what is my voice in the world and how to direct that light. While it goes without saying that you have to read classical poets and contemporary authors, it's also essential to be open to authors who write in other languages, in order to change your perspective.

I loved reading some of the poets of the indigenous nations of the United States and Latin America: I was surprised by these new ways of conceiving nature, human beings, women, birth, the principle of hope and the struggle for one's territory.

It's also important to remember that not everything has to be published. Active participation in the life of the community, sharing poetry and stories, is important in its own right. Finally, you shouldn't try to use these works or publish them.

What projects are you currently working on?

I'm writing my first novel, and I feel reborn as a writer. It's the story of an indigenous woman – a strong, determined woman who, in the difficult circumstances of migration, takes control of her destiny.

At the same time, I'm writing a book about forced disappearance in Mexico. I want to tell the story of the leading role played by women in the search for information on victims. I want to describe their solidarity and the steps they take, but also their rituals and the difficulties of all kinds they encounter. You could call this book 'documentary poetry'. Just as I like to write in new places and contexts, I like to experiment with new literary genres. ■

"Writing is a way of releasing emotions, of putting them in order

© nomadcook

Africa: the next world leader in fashion?

Gina Doubleday

UNESCO

The fashion scene in Africa is booming. Thanks to a young and growing population, urbanization, and digital technologies, fashion is driving creativity, economic development, and innovation here. Cities such as Abidjan, Casablanca, Dakar, Johannesburg, Lagos, and Nairobi are not just financial hubs but also hotspots for fashion and design. Challenges remain, however, including a lack of investment, limited educational systems, a need for intellectual property protection, and sourcing materials affordably. Despite this, UNESCO's report *The African Fashion Sector: Trends, challenges and opportunities for growth* published in October 2023 shows that the continent holds all the cards to become one of the world's next leaders in fashion.

Local materials fuel a thriving industry

37 out of 54 African countries produce cotton.

Organic cotton fibre output in sub-Saharan Africa grew by over 90% from 2019 to 2020.

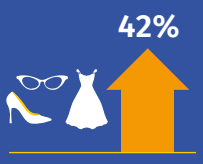
But in 2022 over 81% of the cotton produced was exported and not used locally.

Pan-African fabrics like African lace, bazin, and wax print are often imported from outside the continent.

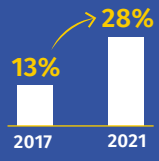
Local materials such as raffi, tree bark, jute, kenaf, coir, sisal, kapok, and abaca are in-demand with designers seeking sustainability.

Fashion Made-in-Africa

90% of the fashion sector in Africa is made up of small and medium-sized businesses, whose profits directly benefit populations.



A 42% increase in demand for African haute couture is expected over the next 10 years.



Growth in e-commerce attracted **28% of Africans in 2021 compared to 13% in 2017.**

32 African countries organize fashion weeks on a regional and international scale.

Population under-25s: 50%

Middle class population: 35%

Demand in Africa is growing for Made-in-Africa fashion, especially among young people: the under-25s account for half of the continent's population, and among the burgeoning middle class, more than a third of the population.

Challenges

TOP FIVE CONSTRAINTS TO DEVELOPMENT IN AFRICAN FASHION

1. 59% — Lack of investment
2. 49% — Lack of educational opportunities
3. 45% — Cost and availability of local textiles
4. 44% — Lack of adequate infrastructure
5. 38% — Cost of imported textiles

Potential solutions

- **Inclusive policies for the fashion industry**
- **Infrastructure development**
- **Ensuring decent work conditions**
- **Leading the way for sustainable fashion**

Major fashion events

1. Morocco Yarn and Fabric Sourcing Show **(Casablanca)**
2. Africa Sourcing and Fashion Week **(Addis Ababa)**
3. Glitz Africa Fashion Week **(Accra)**
4. Cameroon Fashion Week **(Yaoundé)**
5. Design Indaba **(Cape Town)**

Source: *The African Fashion Sector: Trends, challenges and opportunities for growth* (UNESCO, 2023)

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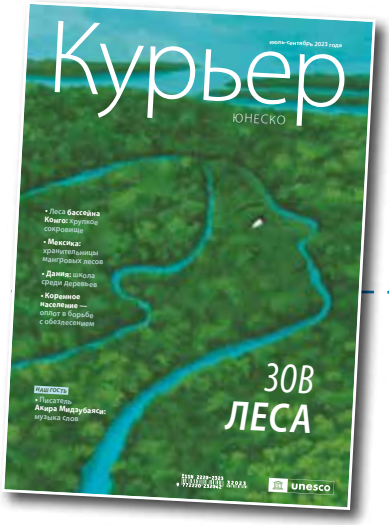

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