A programme designed by the

Louis Roederer Foundation

2024 Edition

# Thinking Sustainability

# Thinking Sustainability

*Thinking Sustainability* is a bold programme created in 2024 by Audrey Bazin, artistic director for the Louis Roederer Foundation, and designed to respond to the ever-changing perspectives and situations associated with sustainable development.

This international programme is built around two key directions:

- The Thinking Sustainability Prize, which rewards a photographer who tackles an issue linked to sustainable development, through the prism of natural sciences or humanities.
- The Thinking Sustainability Research section, which brings together a collection of texts by thinkers and researchers from all over the world, whom the Foundation has invited to write on the subject of their choice.

These fascinating, freely accessible photographs and research projects are produced around the world by people committed to improving understanding of environmental and social issues. Thanks to their expertise, they provide us with food for thought and pave the way for possible changes, whether in the natural sciences or the humanities.

To ensure a diversity of points of view, each edition of Thinking Sustainability sees a complete change of commissioners and members of the jury for the Photography Prize, as well as thinkers and scientists for the Research section. All are selected for their unique voice and vision and the fresh perspectives they bring, often distinctly separate from those usually put forward. These voices, whether emerging or established, have complete freedom to tackle the subject of their choice, suggest a photographer to champion, or vote for the work they wish to support. In this way, we discover a wide range of photographic perspectives and deeply inspired texts. The Louis Roederer Foundation is proud of these cartes blanches, a guarantee of free and visionary expression.

The aim is to contribute to an in-depth reflection on sustainable development, offering solutions and reasoning to anyone who is curious and keen to better understand the issues at stake on a large scale.

The Louis Roederer Foundation, presided by Frédéric Rouzaud, supports contemporary artistic creation and the transmission of knowledge. Founded in 2011, the Foundation accompanies ambitious cultural initiatives led by renowned institutions both in France and abroad. It provides steadfast support to the Bibliothèque nationale de France, the Jeu de Paume in Paris, the French Academy in Rome – Villa Medici, and the Villa Albertine in the United States.

Through the Discovery Award at the Rencontres d'Arles Photography Festival, the Revelation Prizes at the Semaine de la Critique in Cannes and the Deauville American Film Festival, as well as its carte Blanche collaboration with Le Fresnoy, the Louis Roederer Foundation actively fosters the emergence of talented artists. With the Photographic Research Grant from the Bibliothèque nationale de France, its support for international researchers at the Institute for Ideas & Imagination in Paris, and its global Thinking Sustainability programme, the Foundation contributes to a better understanding of the world and enhanced mutual respect. The Foundation also engages in the viticultural domains of the Roederer Collection by initiating cultural actions specific to each site.

To perfect its commitment to the arts, the Louis Roederer Foundation is building its own collection of works by emerging and established artists, whether represented or not, and offers carte blanche collaborations in various artistic fields.

# The Louis Roederer Foundation

“I spent many months putting together a jury and selecting nominators who were different from the usual awards. I wanted new voices as well as established ones.

The nominators, experts in photography, had to represent all the continents (America being divided into two: North and South). They had to be from the continent they were representing, or have lived there for at least five years, to ensure they had an in-depth knowledge of the local cultural ecosystem. They each had three months to select three photographers from the continent they represented (or who had lived there for at least five years) to take a thoughtful look at sustainable development in their own region.

The jury - which had to be interested in the issue of sustainable development - is multinational with experts in photography as well as a poet, a philosopher, a multidisciplinary artist and directors of cultural institutions, in order to benefit from a cross-disciplinary view of the candidates’ proposals. The jury then had three months to explore and study the 54 entries suggested by the nominators. Each member voted for their favourite artist by continent, then for their winner from the six finalists.”

**Audrey Bazin**

**Artistic director,**
**Louis Roederer Foundation**

# Thinking Sustainability Prize

# The jury *of the Thinking Sustainability Prize 2024*

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|---|---|
| Joël Andrianomearisoa | Artist and artistic director, Hakanto Contemporary – Antananarivo, Madagascar / France |
| Emanuele Coccia | Philosopher – Italy / France |
| Yuko Hasegawa | Director, 21st Century Museum of Contemporary Art, Kanazawa – Japan |
| Lekgheto James Makola | CEO, Javett Art Centre, University of Pretoria – South Africa |
| Janet Laurence | Artist – Australia |
| María Wills Londoño | Art researcher and curator – Colombia |
| Tanvi Mishra | Photo editor, curator, and writer – India |
| Vincent Munier | Photographer – France |
| Marie Perennès | Artistic director, Manufacture Saint-Louis, Hermès – France |
| Selina Nwulu | Poet – England |
| María Inés Rodríguez | Director, Walter Leblanc Foundation, Brussels and artistic director, Tropical Papers – Colombia / France |
| Alexandra Tilling | Brand manager, Maisons Marques et Domaines Ltd., Roederer Collection – England |
| Audrey Bazin | Artistic director, Louis Roederer Foundation – France |

# Nominators *of the Thinking Sustainability Prize 2024*

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|---|---|---|
| Africa | John Fleetwood | Photography curator, educator and director of the platform photo: Johannesburg, South Africa |
| | Oulimata Gueye | Critic and curator, Senegal |
| | Jean-Sylvain Tshilumba Mukendi | Project and artistic coordinator, Picha, Lubumbashi Biennial, DRC |
| North America | Magalí Arriola | Director of Museo Tamayo, Mexico City, Mexico |
| | Steve Evans | Curator and executive director of FotoFest, Houston, United States |
| | Jane'a Johnson | Critic and curator, United States |
| South America | Claudi Carreras Guillén | Independent curator and photography researcher, Brazil |
| | Sofia Dourron | Art historian and curator, Argentina |
| | Sara Hermann | Chief curator, Centro Cultural Eduardo León Jimenes, Santiago de los Caballeros, Dominican Republic |
| Asia | Rahaab Allana | Curator and publisher, Alkazi Foundation for the Arts New Delhi, India |
| | Joselina Cruz | Director and curator, Museum of Contemporary Art and Design (MCAD), De La Salle-College of Saint Benilde, Manila, The Philippines |
| | Sunyoung Kim | Senior curator, Museum Hanmi, Seoul, South Korea |
| | Abhijan Toto | Curator and writer, Thailand |
| Europe | Giulia Colletti | Art historian and curator, Italy |
| | Marina Fokidis | Curator and writer, Greece |
| | Alona Pardo | Director of Programming, Arts Council Collection, London, England |
| Oceania | Elias Redstone | Founder and artistic director, PHOTO Australia, Australia |
| | Ane Tonga | Artist and curator, Tāmaki Makaurau, Aotearoa, New Zealand |

Ana Elisa Sotelo & Sadith Silvano, Petition to the plant spirits, Portraits of the Multiverse

Photo Prize Winner

# Ana Elisa Sotelo

## *South America*



**Presented by :** **Sofia Dourron**

"Ana Elisa Sotelo's practice not only provides an insight into the contemporary languages of photography and its potential by producing entanglements between the captured image and the ancestral Kené embroidery and painting techniques and history. It also deals with issues of sustainability questioning the colonial fracture that separates the human from the non human and produces an extractive world-system. I nominated her for the Prize because I believe this mode of approaching art practice is essential to shifting the way we perceive and experience the world."

**Nature and human interaction with the natural world are central themes in Ana Elisa Sotelo's visual work. After a life-altering spinal fracture in 2016 led her to discover the healing power of nature and traditional Amazonian medicine, her work has increasingly documented the intertwining of natural and spiritual health. Her featured series, *Portraits of the Multiverse*, presents an interaction between photography and embroidery. Ana Elisa Sotelo has collaborated with the Peruvian artisan Sadith Silvano to create a dialogue between the visible and invisible worlds, underlining the deep connection between the Amazon and her ancestral art. In this way, she reminds us of the urgent need to preserve this irreplaceable ecosystem and its cultures. Anna Elisa Sotelo has won multiple awards for her work, including the International Women in Photography Award in 2021 for her project *Las Truchas*, which celebrates the women swimmers of in Lima, Peru, a symbol of community resilience during the pandemic.**

↳ **https://www.anaelisasotelo.com/**

**"*Portraits of the Multiverse* is an ongoing visual investigation between Sadith Silvano, master of the Shipibo Konibo "Kené" artform and myself. Kené art illustrates the underlying vibrational makeup of the universe. This collaboration stems from a need to make the invisible visible and consists of embroidered photographs and accompanying videos. In this work, I showcase elements of Amazonia, while Sadith reveals the immaterial energy that flows across the jungle through embroidery. The images are captured on the banks of the Shanay-Timpishka and Nanay Rivers. Currently, this area, like much of the Amazon, is undergoing mass deforestation at an alarming rate. Primary forest is being cleared to make way for farmland, resulting not only in the loss of flora and fauna but also in a cultural shift and a change in the relationship between the people of the forest and the land. In a landscape where territory and culture are inextricably linked, the disappearance of forests leads to the disappearance of the spirits and soul of the jungle. The Shipibo people of the Amazon have been representing and making this world visible for thousands of years through the "Kené" art form. Shipibo women are trained from a young age to "see" and understand "Kené." They access this world through song and the intake of sacred plants that reveal visions of this energy. Shipibo artist Sadith Silvano makes this world visible by embroidering "Kené" onto my photographs. Each piece represents an encounter between two universes: the material and the immaterial.**

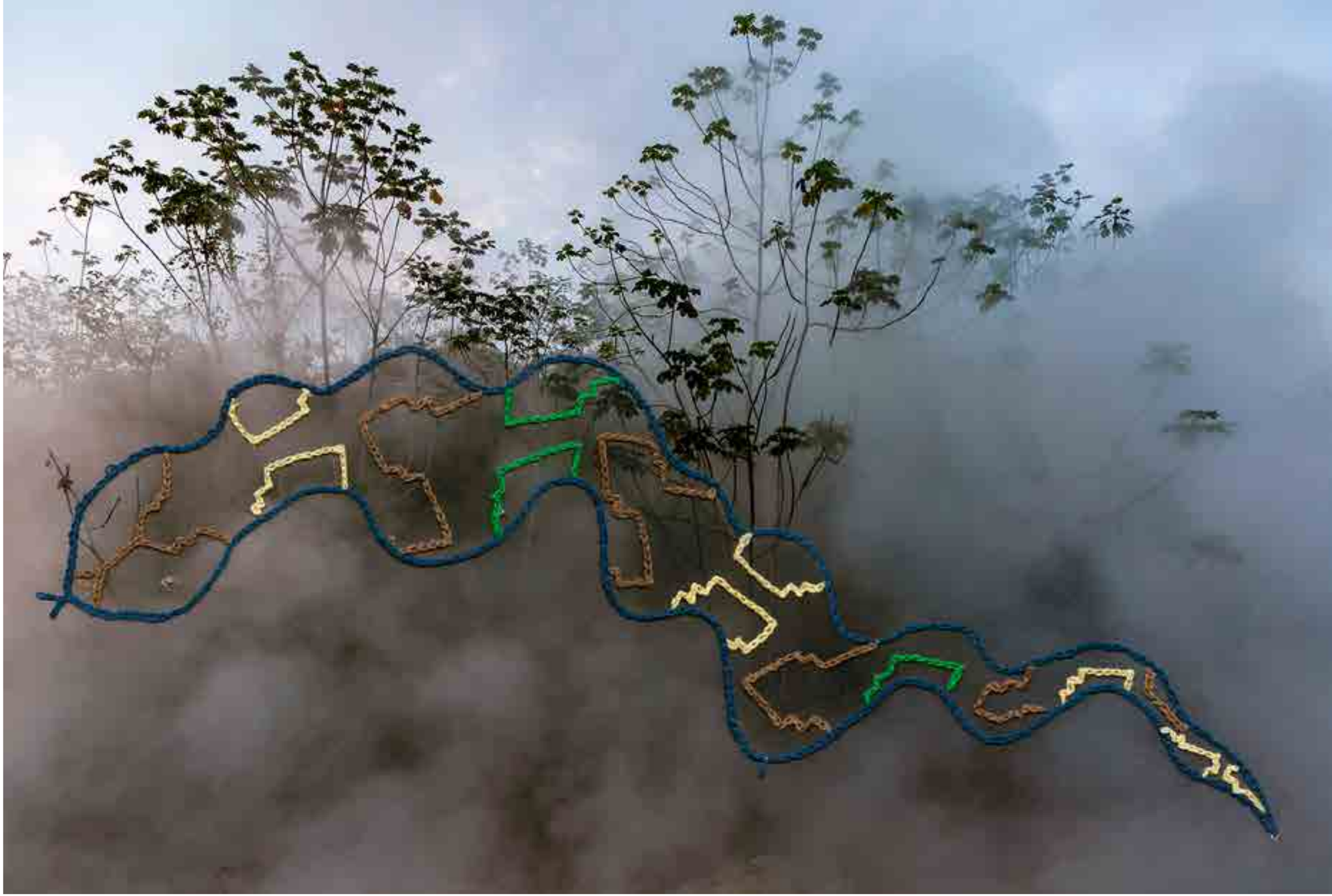
**In a transition from the invisible world to the visible and back to the invisible, this series develops a dialogue about the Amazonian multiverse. It is a visual encounter between two languages that capture light through different means: photography and embroidery.**

**The result is this series of embroidered photographs that depict the rich diversity found in the Amazon, encompassing not only biodiversity, but also the culturally rich traditions of its people and art. Each piece seeks to document the importance of this vanishing landscape, highlighting the cultural and environmental aspects of Amazonia".**

**Ana Elisa Sotelo**

Mermaid Spirit

The Spirit of the Jungle



The Spirit of the Jungle

Came Renaco, Healing Tree

Ayahuasca, Master Plant

# PICTURES ALSO SING: PHOTO-EMBROIDERY IN THE MULTIVERSE

**VO**

Photographs also sing. Their voice is an embroidered thread on their bodies made of paper. Such words come to mind when I see the artistic work of Ana Elisa Sotelo and Sadith Silvano. The photo-embroidery series *Portraits of the Multiverse* is born from the confluence of two different graphic epistemes that met at the Boiling River in the Peruvian Amazon, in the Ucayali basin, land of the Shipibo-Konibo people. Ana Elisa went there searching for healing with ancestral Amazonian medicines made from the bark of the Came Renaco trees growing on its banks. When she was undergoing her plant therapy, she made pictures of the river sanctuary and its steam. Back in Lima, she took her photos to Sadith in Cantagallo, the urban Shipibo-Konibo community in the polluted and hectic heart of the Capital.

"Tell me what you see in these photos I took of my relationship with the river and its plants," she requested and explained she had drunk Came Renaco and Ayahuasca during her healing journey. "I felt many things, but don't know what happened. I could only take pictures of what I was seeing, as a visitor." Sadith looked at the photos with the eyes of someone who was raised in a family of visionaries. Since she was a child, she grew up surrounded by Kené and learned to find it, even if it were not visible, guided by the visionary skills she inherited from her elders. When Ana Elisa suggested she should intervene with her ancestral art in her photos, Sadith patiently hollowed out the embroidery path, opening pores on the paper before passing the thread through.

Kené is a visual language of geometric patterns composed of strokes of varying thickness and color generating games of light and contrasts between background and figure. Its purpose is not so much to explicitly reproduce the figures of the beings around, as to reproduce what makes these beings capable of action. Kené catches the eye, forcing it to complete the figures that insinuate themselves between the lines without ever remaining fixed.

Unlike photography, it does not capture the light of surrounding beings to reveal their images, but rather reveals and cleans up their usually invisible energy circuits, illuminating them through traces of color. This bright full energy, or as expressed in Shipibo-Konibo, Koshi, is a key feature of powerful cosmic beings with shiny skins, providing them with a hypnotic and fierce beauty. Such is the case of the spots on anacondas and big cats, both animals standing at the top of the forest predation chain, or the star-pierced path of the firmament and the veins of plant leaves that grant health, thought and skills.

The work of crisscrossing photography and embroidery was done in polyphony, sometimes with convergent melodies, other times in independent routes. "Water is a very strong healing space to me," claimed Ana Elisa, who swims regularly and water is a constant motif in her work. In the pictures Ana Elisa took, Sadith saw, dancing on the river steam, the designs of Ronin, the cosmic "mother" of water and Ayahuasca. According to Ana Elisa, when she drank Ayahuasca as part of her therapy, the very plant "called out for other plants" to come and gather in her healing. Sadith had also drunk Ayahuasca. "In my case, I got to talk with Mother Ayahuasca who is La Abuelita (The Endearing Grand Mother). She told me there are many kinds of Kené designs, the ancestral and the contemporary. Each woman works in her own way following her inspiration". That's why Sadith embroidered on the picture of an Ayahuasca leaf with red, yellow and green threads, some more recent curved designs as well some older designs with right angles, placing their lines "face to face". Such a "duality", she explained, "represents us, humans".

In each new picture, each artist told her own life story. While Ana Elisa saw that she had taken a photo of her extended hand requesting help from the river and plants, Sadith saw that her own hand was portrayed as a vehicle of knowledge from her mother and sister. "Our hand is magical; you receive, you also give. Thanks to my hand´ s energy I am now the woman I am. I can do what I set my mind to, thanks to my Kené."

The flow of Kené Sadith embroidered on the picture moves onto Ana Elisa´ s hand. The designs enter the photograph through its frame with a thick line tinted with blue, which moves in steps with broken angles and is superimposed on a thinner golden line, which moves in curves. Both threads arrange themselves on the palm of the hand forming a head-shaped pattern. Then, the golden embroidery frays over the wrist. It gives the impression of floating above its veins or, depending on how you look at it, of surging from its blood as a spring of Kené dancing up into the sky.

Such a game of perspectives is what Sadith calls "face to face": It applies everywhere, curved and broken, thick and the thin, what receives and what gives, what comes and what goes. Everything has its pair. "Duality" everywhere engenders the perceptive dynamism of Shipibo-Konibo art. The ghostly aesthetic of the river captured by the camera lens contrasts with the neat strokes of the Kené the camera did not see, calling into question what is real. Portraying the multiverse may mean trying to encompass all the versions of worlds that make it up, but this is never possible. Each version has its other side, which is never just its reverse image; and when one side is seen more clearly, the other one shallows, and transforms, in an incessant play between background and figure. Kené invites the viewer to flow along with multiplicity knowing that the visible and the invisible coexist in motion and may never be encapsulated in a fixed thoroughly comprising image.

In the last picture of the series, the embroidered cloak embellishing the bather/mermaid's tail "represents me," both artists said. Ana Elisa made a picture of herself swimming in her favorite "healing space" and Sadith saw in it her own image, "my own empowerment, my livelihood". Like a mermaid´ s cloak, she explains, "Kené is my faithful companion. It never leaves me." She now lives and works in Lima, but even in the midst of urban frenzies, her Kené unlocks the healing energies hidden in Ana Elisa´ s picture. Their photo-embroidery casts spells. It wraps us with the Amazon´ s breathing waves. I wish I were a mermaid too. Maybe that's why such a seemingly dissonant phrase comes to mind: photographs also sing. Their bodies breathe in and out with the needle of Kené. This photo-embroidery series is a masterfully achieved work of creativity and thought, each artist experimenting with their techniques in pas de deux, "face to face".

**About the author :**

**Luisa Elvira Belaunde is an anthropologist and specialist in indigenous peoples of the Amazon. Within the area of indigenous ethnology, she has specialized in female perspectives, both in terms of their own cultural aspects and processes of change, interconnection with national society and interculturality. In the last decades, the proximity to Amazonian thought and creativity has led her to become interested in indigenous arts, especially in the Kené Shipibo-Konibo, on which she wrote a public policy document that culminated in the patrimonialization of indigenous graphics.**

Came Renaco Bark for preparing medicine

Irene Barlian, Land of the Sea

**Presented by :** **Joselina Cruz**

"The subjects of Irene Barlian's photography are deeply pertinent to the climate crisis facing our planet. I feel that this series, *Land of the Sea*, are images that speak unequivocally to the reality of climate change from a place not often associated with the narratives of the climate emergency. Indonesia and its neighbors in the region of Southeast Asia is a geographical space that is hardly included in climate change narratives or agendas. Irene's impactful photography shares not only the story of batik makers grappling with how their livelihood is being lost, but how their entire city and their way of life is shifting in response to the imminent loss of land as it continues to be engulfed in water."

# Irene Barlian

# *Asia*

Based in Jakarta, Irene Barlian makes short videos that tell cultural, social, and environmental stories. Her series *Land of the Sea* reveals the reality of climate change in Indonesia from the perspective of local communities, focusing on the role of women and their efforts to reduce environmental impact. Accompanied by analyses from climate experts, these videos go beyond traditional documentary practices. They aim to raise awareness of the climate crisis and share our experiences, highlighting the resilience of communities already affected. Irene Barlian's work is published worldwide. In 2022, she received the Objectifs Documentary Award and was shortlisted for the Leica Oskar Barnack Award.

↳ https://www.irenebarlian.com

*"Land of The Sea* is a story about the impact of climate change in Indonesia through the unique perspective of the community that resides in the region. The story highlights the perspective of women and explores the concept of local wisdom in mitigating environmental issues. I aim to portray a hopeful narrative with a sense of agency and innovation unique to the area, community, or culture. The project began in November 2020. I have covered several cities on Java Island and other islands, including Aceh. I collaborate with local communities to create a short video showcasing easy-to-understand, distinctive mitigation efforts carried out in each region. Additionally, I team up with a writer to provide comprehensive context, and a climate expert to supply relevant data. The goal is to create a platform where people in Indonesia can understand, learn from, and be inspired by storytelling. Hopefully, this will lead to a systemic change in the country.
The most significant element of my ventures is devoted to personal projects, and I consider the traditional documentary approach to be the core of my practise. However, I started exploring other media, such as video and sound, to bring the audience closer to the story. I hope that this project will raise awareness that climate change is already happening and spark conversations around the issue. On a deeper level, *Land of The Sea* is created for a profound understanding of what our future could be, to learn from those who have already been impacted but resiliently survive and adapt, and as a wake-up call."

Irene Barlian

Land of the Sea

Land of the Sea

Land of the Sea



Adam Ferguson, Lake Huffer, *Big Sky*



**Presented by :** **Elias Redstone**

“Australia is experiencing some of the extreme impacts of the climate crisis, from bush fires to floods that are having a deep societal impacts. Adam Ferguson’s long term project "*Silent Wind, Roaring Sky*” explores the complex realities of contemporary life in the Australian Outback that charts the impact of the environment on often remote communities. Through this project he explores the rituals of rural life, shrinking small-towns, Aboriginal connection to Country, pastoralism, the impacts of globalisation and the adversity of climate change. In doing so, he questions the Australian identity in the context of the complex realities of contemporary life.”

**Renowned for his photographic work during the war in Afghanistan, Adam Ferguson travels the world documenting key geopolitical phenomena and social issues, highlighting the effects of globalisation and climate change, particularly on rural populations. His featured series *Big Sky*, emerges as a photographic meditation on Australia's climate crisis, blending childhood recollections with contemporary observations on Aboriginal ties to the land, diminishing towns, and evolving pastoral and mining landscapes. Winner of numerous prestigious awards, Adam Ferguson was also named Photographer of the Year 2022 by the World Photography Organization for a series of collaborative portraits he made with migrants on the US-Mexico border.**

↳ **https://adamfergusonstudio.com**

**“My mum was born in Yeoval, a farming village in regional Australia, also known as the childhood home of Banjo Paterson, the famous Australian poet who romanticized life in the Australian bush. Every Christmas until my grandfather died, our family would hold a slide night where photographs displayed my grandmother, grandfather, and their five daughters dressed in white English pomp for a country show or the horse races, as well as images of my great-grandparents on their wheat and sheep farm. These family memories became my own impressions of the Australian bush and of European settler identity. My family history epitomizes a rich social fabric that once enmeshed the Australian Outback and its iconic bush towns. Pastoralism has been an integral part of its history, transforming the region's environment, culture, workforce, and driving the national economy. However, the realities of the bush are complex and layered. The country’s occupation and colonial legacy have resulted in the deep dispossession of first-nation traditional custodians from their lands, language and culture, and desecration of earth, and landscape.**
**In recent years the centralisation of business, globalization, a transition to large-scale mining, the mechanization of farming, and a population shift to larger regional centers have reshaped the environmental and cultural landscape. The country has also suffered from extreme weather linked to climate change – bushfires, flooding, and drought. According to the Intergovernmental Panel on Climate Change, by the end of the century, drought will become more common and severe across the planet’s mid-latitudes and the subtropics. Australia’s changing landscape is a harbinger of things to come.**
***Big Sky* is a photographic response to Australia's climate crisis. Drawing on childhood memories and traveling documentation, I observe fading yet iconic events, shrinking small towns, Aboriginal connection to Country, pastoralism, and mining. By presenting a vivid account of Australia in the Anthropocene, I attempt to challenge and position archetypal tropes of the Australian landscape with the complex realities of contemporary life in the Outback.”**

**Adam Ferguson**

Drought #3

Governess

Drought

Ngaanyatjarra elder

Christmas Tree

Red Kangaroo

Maya Goded, Healing, Earth and Body



**Presented by :** **Magalí Arriola**

"I nominated Maya Goded's for the Louis Roederer Foundation Prize because she conceives her photographic practice as a political gesture. From early on, Maya Goded has given visibility to major social themes and concerns in Mexican society–such as women's rights, gender violence, *afro-descendent communities*– that, until recently, had been mostly represented at the margins of the art scene."

**Maya Goded has established a significant body of research focused on gender-based violence and female sexuality and exploring the deep links between violence against women, environmental issues, and territorial rights. Launched in 2018, *Healing, Earth and Body* explores the profound connection between women from Mexico, Central, and South America and their geographies through ancestral knowledge, healing, spirituality, and land defence. Standing at the forefront of resistance to modern progress and consumerism, these women embody the struggle against the exploitation of Latin America's biodiversity and strive to preserve their culture and environment, thanks to a holistic vision of the world that sees humans and nature as one. Her work has earned international awards, grants, and recognition. Her project, *Plaza de la Soledad*, which captures the lives of sex workers in Mexico City, was adapted into a documentary that premiered at the Sundance Film Festival and highly awarded.**

↳ **https://mayagoded.net/en/photography**

**"My project emerged from a journey I began in 2018, seeking to connect with women from Mexico, Central, and South America who are deeply rooted in their geographies through ancestral knowledge, healing practices, spirituality, and land defense.**
**Today, I cannot envision feminism without a profound respect for the Earth. My focus is on recognizing humans as part of life on our planet, not its center. I aim to capture these struggles where healing becomes both a personal and communal act, transforming into a political and vital response to violence. These women propose alternative systems through small-scale community experiences, striving to build a sustainable reality in harmony with the environment. In a world devastated by so-called modern progress, which falsely justifies a divide between traditional and civilized peoples, and driven by monetary greed for territories, the exploitation of forests, lakes, rivers, animals, plants, and people, these women engage in a daily battle. They heal generational wounds inflicted by this war and protect our connection to the land.**
**The women I have walked alongside are mediators between humankind and nature, constructing a different reality where local sustainability ensures life in harmony with the environment. Their healing gestures on personal and community levels become acts of political defiance against the violence that bleeds the planet. This logic of war seeks to divide advanced communities from those considered backward, creating a final conflict between unchecked consumerism and the ancient alliance with nature.**
**Latin America, with its rich biodiversity, has always attracted the attention of multinationals and now organized crime groups, eager to exploit its natural resources. This has led to widespread violence. However, indigenous and farming communities have reclaimed significant land areas, preserving harmony through resistance and a worldview that sees humans, nature, and land as one. The women of these communities, as cultural guardians and defenders of natural resources, have become the leaders of an ecological consciousness that stands in stark contrast to Westernized culture.**
**My work involves traveling and primarily using photography and video. I also conduct interviews with the women I work with. In each village, I incorporate various forms of documentation: collecting objects, recording personal photos of the community, and gathering different materials to form the final work. All this material is compiled in personal notebooks, creating a rich tapestry of their stories and struggles."**

**Maya Goded**

Healing, Earth and Body, Mexico 2021

Healing, earth and body, Mexico 2020

Healing, earth and body, Bolivia 2022

Healing, earth and body, Panama 2018

Healing, earth and body, Mexico 2019

Healing, earth and body, Mexico 2019

Pierrot Men, The washerwoman of Tsaranoro Valley



**Presented by :** **John Fleetwood**

“Pierrot Men photographs our people and our land. His work is about the simplicity of being. As humans, we have received this land to work, eat and live from, in our time. It is our ultimate and foremost sense of belonging. As humans we are, and belong with, nature. And his photography is way to make these moments last, for us to share the beauty of our people and our land.”

**Inspired by a visiting artist, Pierrot Men left school at 14 to devote himself to art, despite his family's disapproval. In 1974, he opened his first photo lab, shooting weddings, baptisms, and family portraits with a Soviet Zenit E camera and an old Kodak 6 x 9. Influenced by the work of African photographers Seydou Keita and Malick Sidibé, he worked to reconcile his personal projects with his professional commitments. His featured series, *Madagascar*, explores the symbiotic relationship between the Malagasy people and their land – a place where traditions of rice-growing, sustainable livestock farming and beekeeping are combined with an ethic of environmental conservation. His work is a poignant reminder of the vital need to live in harmony with nature in order to pass on a preserved world to future generations.**

↳ **https://www.pierrotmen.com/**

**“Madagascar, my homeland, is a natural treasure with countless facets. When we talk about sustainable development, we must acknowledge the deep connection between the Malagasy people and their environment. This Indian Ocean island is a rich tapestry of cultures, traditions, and biodiversity, where natural sciences and humanities uniquely converge.**
**In the heart of Madagascar, most people live in harmony with nature, viewing the land not merely as a resource but as a source of life. Rice terraces extend as far as the eye can see, sculpted from the hills by generations of dedicated effort. These fields embody the agricultural wisdom passed down through generations, harmonizing with natural cycles to produce food while preserving the ecosystem.My photographs capture this harmonious relationship between humans and nature. They depict the Malagasy working their fertile lands, harvesting rice, the staple of their diet. You'll observe the calmness of this primarily rural population, far from the chaos of urban life, where existence flows with the rhythm of the seasons.**
**I also photograph the scars of Madagascar, such as deforestation, but the coexistence of the Malagasy with their environment remains stronger.**
**However, sustainable development in Madagascar goes beyond agriculture. Its forests are home to an incredible diversity of life, including unique endemic species. The local communities understand the importance of preserving ecosystems. They practice sustainable livestock farming and traditional beekeeping, ensuring that their natural environments remain untouched. For most Malagasy people, sustainable development is not just a concept but a way of life. It is how they preserve their heritage while adapting to a future-oriented world. It’s a valuable lesson for the world, emphasizing respect, harmony, and balance between humans and nature.”**

**Pierrot Men**

Love from the fields

The Isalo oasis

Fisherman and mangroves

Prayer, offering and nature's blessing

The gleaners' garden

The song on one side is not audible on the other side

Mónica de Miranda, Whistle for the wind





**Presented by :** **Alona Pardo**

"Exploring the legacy of colonial structures of power, the afterlife of slavery, the oppression of women and their interconnectedness with nature, Mónica de Miranda's expansive and poetic practice – which encompasses film, photography, installation, sculpture, and sound – pivots around themes of resistance and liberation, ecological justice, feminist histories, and racial struggles. Frequently casting nature as a space of nourishment and healing, Mónica de Miranda's complex work considers how nature has been instrumentalised by colonial powers through the violent processes of extraction, the subjugation of women and other marginalised communities and the overlooked Black histories of Portugal."

**Portuguese-Angolan visual artist, filmmaker, and researcher. Mónica de Miranda combines politics, gender, space, and history in an interdisciplinary body of work that lies somewhere between documentary and fiction. Her award-winning work brings together drawing, installation, photography, film, and sound, always with a focus on resistance, affective geographies, and ecologies of *care*. Her featured series, *The Island* delves into decolonial ecology, exploring the spiritual and metaphysical connections among humans, soil, territory, and natural resources, while revisiting the history of enslaved Black communities along Portugal's Tagus and Sado rivers from the 15th to 18th centuries. It navigates the African diaspora's complex narratives within European colonial history through an eco-feminist and Black feminist perspective, offering a metaphorical space that embodies isolation, refuge, and utopian ideals of freedom.**

↳ **https://Monicademiranda.org/**

**"*The Island* explores decolonial ecology, addressing the spiritual and metaphysical connections between humans, soil, territory and natural resources, while simultaneously reviving and recapturing the memory of enslaved Black communities that inhabited Portugal's Tagus and Sado rivers in former rice cultivation lands during the 15th to 18th centuries.**
**The works contemplate the complex experiences of the global African dispora within the history of European colonialism. Interweaving factual and fictional narratives, *The Island* explores a long trajectory of Black presence in Portugal, drawing from African liberation movements, migratory experiences, and identity formations through a Black feminist lens. It is a metaphor for a utopian place of isolation, refuge, and escape: a space for collective imaginaries that speak to new and old forms of freedom. The body of work is anchored in an eco-feminist perspective that prioritizes diversity and care considering soil as an organic repository of time and memory, where ancestral and ecological trauma linked to colonial excavations continue to unfold. The film is a fabulation of real stories and, in a way, a manifesto to find another space and future that oppose hegemonic power structures and the persistence of these systems of oppression today.**
**Symbols and narratives provide a safe space where new ecologies of care can be built between ourselves and the earth. As human beings, we impose uniformity on the land, create walls of division and separation, and uphold notions of private property that distance our species from the natural law of diversity to which all beings belong.**
***The Island* rethinks Black history and identity in European history, offering a debate around ecology, nature, and place, addressing an important contemporary challenge: climate change in the age of the Anthropocene. The series explores forgotten narratives by bringing a counter gaze to colonial and patriarchal history, and, in parallel, creates space for questions about belonging and the construction of identity in the contemporary era. *The Island* draws attention to pertinent matters of agency by foregrounding modes of imaginative and intersectional world-building through subtle references of racialized, spatial, and temporal cartographies with imbued symbolisms. It urges us to consider different modes of being in order to develop an astute consciousness between the past, our bodies and the (is)lands we inhabit, and everything they hold towards regenerative and possible futures."**

**Mónica de Miranda**

The lunch

Mother and daughter

Dressage

Groundwork

The bath

Mirror me

“The award ceremony, in the presence of Ana Elisa Sotelo, took place on 7 November 2024 in Paris, at Reid Hall, a place that is particularly dear to me.

Reid Hall, Columbia University's home in Paris for the past 60 years, houses the Columbia Institute for Ideas and Imagination, an epicentre of creation and reflection that, since its creation in 2018, brings together Columbia scholars with artists and scientists from all over the world in a year-long residency. What particularly appealed to me was the Institute's international dimension and its clear desire to encourage exchanges between artists and researchers.

The Thinking Sustainability Prize is worth €8,000. In addition, a critical essay written by an art historian from the same continent as the winning photographer will be commissioned.”

**Audrey Bazin**

**Artistic director,**
**Louis Roederer Foundation**

# Award ceremony

# Thinking Sustainability Research

The Research section of the *Thinking Sustainability* programme brings together a selection of texts by thinkers and researchers from all over the world - ecologists, philosophers, economists, sociologists, scientists etc. The Foundation invited them to write on a topic of their choice with the aim of contributing to a better understanding of the many facets of sustainable development.

“The sustainable development we imagine is linked to our experience, which is necessarily local. It cannot be the same in Brazil, Senegal, India, Australia or Japan. I asked researchers to write on the subject, choosing one representative from each continent. They were all given carte blanche. A text by Barbara Cassin on the notion of Kosmos will introduce this Research section. I have also invited Brazilian scientist Patrícia Muniz de Medeiros to present her research into new food products that respect the ecosystem and offer farmers decent living conditions; Senegalese architect Nzinga Biegueng Mboup will share her thoughts and achievements in bioclimatic construction; and German playwright Tobias Rausch will talk about the representation of ecology in the theatre to recreate the link between us and nature through the arts. All the texts are fascinating!”

**Audrey Bazin**

**Artistic director,**
**Louis Roederer Foundation**

Faithful to its commitment to share knowledge, the Foundation published all the finalists' texts and photography projects on the Internet. Making the entire Thinking Sustainability programme freely available means we can offer these new perspectives on sustainability to as many people as possible.

# The authors of the 2024 edition

Introduction **Barbara Cassin, philologist and philosopher, Doctor of Letters and researcher at the CNRS, is a member of the Académie française.**

Africa **Nzinga Biegueng Mboup, architect, Dakar, Senegal. Renowned for her expertise in bioclimatic design and construction using locally sourced earth and biomaterials, Nzinga Biegueng Mboup co-founded the Worofila architectural practice in Dakar, whose architectural language is rooted in an understanding of climate, materials and tradition.**

North America **Michael Burger, executive director, Sabin Center for Climate Change Law, New York, USA. The Sabin Center develops legal techniques to combat the climate crisis and advance climate justice. Michael Burger leads a team at the forefront of national and international efforts to reduce greenhouse gas emissions and promote adaptation to climate change through pollution control, resource management, land-use planning and climate finance.**

**Yves-Marie Abraham, Associate Professor, École des hautes études commerciales (HEC) Montréal, Canada. Yves-Marie Abraham teaches the sociology of economics and conducts research on the theme of Sustainable degrowth.**

South America **Patrícia Muniz de Medeiros, biologist; professor at the Federal University of Alagoas, Maceió, Brazil; doctorate in botany and plant biology. Patrícia Muniz de Medeiros' research into little-known wild edible fruit plants goes beyond the boundaries of ethnobotany. It incorporates other areas of knowledge, such as food psychology and consumer behaviour.**

Asia **Amita Baviskar, professor of Environmental Studies, Sociology and Anthropology, Ashoka University, Haryana, India. Her research and teaching focus on the cultural politics of the environment and development in both rural and urban India. Amita Baviskar is interested in the role of social inequalities and identities in conflicts over natural resources.**

**Ryota Nakajima, Ph.D. Biological Oceanography, University Soka, Tokyo, Japan. Ryota Nakajima worked for Soka University as teaching staff from 2009-2012. By becoming interested in the deep-sea, he moved to Japan Agency for Marine-Earth Science and Technology JAMSTEC with interests in the fate and impact of plastic debris in the deep-sea environment.**

Europe **Anne-Caroline Prévot, Director of Research at the CNRS, researcher at the Centre for Ecology and Conservation Sciences (CESCO), Muséum national d'histoire naturelle, Paris. An ecologist by training, Her research focuses on the interaction between biology and the psychology of conservation, i.e. the impact of the absence of nature on our behaviour.**

**Tobias Rausch, director and playwright Staatsschauspiels Dresden, Germany. Resident at the Research Institute for Sustainability - RIFS Potsdam, Germany. Tobias Rausch is regarded as a researcher among theatre creatives. From his preoccupation with the social and mental reality of our society, he has developed a specific form of research theatre, in which current themes and historical events are explored on the basis of in-depth research and numerous interviews.**

Oceania **Glenn A. Albrecht, environmental philosopher. Glenn A. Albrecht is a world expert in the study of emotions towards the Earth. He is interested in the relationship between the ecosystem and human health on both theoretical and applied levels. He is an innovator in the field of research into 'psychoterratic' mental health problems, i.e. those linked to the Earth. He lives in New South Wales in Australia, one of the regions most affected by the mega-fires that ravaged the country in 2019-2020.**

Arctic **Claire Houmard, archaeologist; doctorate in prehistory; professor at the University of Franche-Comté and Villa Albertine resident in the United States. Claire Houmard is taking part in the ANR Inter-Arctic and PaleoCet projects. Since 2022, she has been running the "Yup'ik" project supported by the Ministry for Europe and Foreign Affairs and the Villa Albertine. She was asked to write a text on the preservation and conservation of the tangible and intangible heritage of Arctic societies faced with climate change. The issue involves all cultures faced with rising temperatures, intense weather phenomena, rising sea, coastal erosion, etc.**

Conclusion **Céline Curiol Resident at the Villa Médicis 2023-2024. Céline Curiol (France) has developed an ambitious project the first part of which, carried out at Beauport Abbey, received funding from the government's New Worlds programme. She has collected more than 65 stories, entrusted to her by visitors of different ages, sexes, social backgrounds and origins but who had all agreed to respond to this incongruous proposal: tell a love story about a plant.**

# Texts

"When I set about choosing the authors who would take part in this project, I had in mind to represent all the continents, to give a voice to emerging voices as well as those already recognised, and to cover a very wide range of themes linked to sustainable development. My aim was to provide food for thought for those who, like me, want to gain a better understanding of the crucial issues facing us. I was also quietly hoping that I could inject a little optimism.
I have found this hope not only in the actions undertaken, but above all in the total commitment of each and every contributor. How can you lose faith when there are people driven by an ideal? To change our world for the better, respecting nature and all living beings.
Barbara Cassin's text, which opens this incredibly rich first edition, is a magnificent ode to harmony and balance, values we should all aspire to achieve."

Audrey Bazin

Artistic director,
Louis Roederer Foundation

## COSMOS, UNE ÉCOLOGIE GRECQUE ?

VO

L'écologie fait inventer beaucoup de mots, en plusieurs langues, parfois faciles à comprendre et à traduire, parfois non. A commencer par « écologie » : *Ökologie*, un mot allemand, assez jeune, inventé par un biologiste, Ernst Haeckel, en 1866, spécialiste des éponges et des méduses, parce que « biologie » lui semblait restrictif ; il était darwinien et pensait sans doute que la biologie seule risquait de produire un darwinisme trop étriqué.

*Oikos*, c'est la « maison », en grec. Là où l'on est chez soi. L'écologie, c'est donc la science de la maison. Aujourd'hui c'est évidemment une science politique. Mais, après tout, le « chez soi » a toujours été une question politique. Où commence et où finit le « chez soi » ? Comment, quand, à quelles conditions est-on « chez soi » ? Peut-on éviter d'y être comme un « idiot » ? *Idios*, en grec, sert à dire « le propre », le « privé », ce qui appartient à un seul, et s'oppose à *koinos*, « commun », ce que l'on partage, ce qui peut faire communauté, ce qui donc est vraiment politique, comme une *polis*, une « cité ».

Quel est donc le « chez soi » de l'écologie ? C'est au fond toute la question.

Notre modernité a pris pour guide l'évidence d'une phrase de Descartes, dans le *Discours de la méthode*, en oubliant ce à quoi elle s'opposait — la scolastique mourante : « Au lieu de cette philosophie spéculative qu'on enseigne dans les écoles, on en peut trouver une pratique, par laquelle, connaissant la force et les actions du feu, de l'eau, de l'air, des astres, des cieux, et de tous les autres corps qui nous environnent, aussi distinctement que nous connaissons les divers métiers de nos artisans, nous les pourrions employer en même façon à tous les usages auxquels ils sont propres… », et, surtout, en oubliant le *comme* : « … et ainsi nous rendre *comme* maîtres et possesseurs de la nature ». Depuis, la physique mathématique est la langue que parle le monde quand il nous est utile.

Or, l'écologie cherche à penser le monde au moins aussi dans un autre langage, et à nous re-penser dans le une autre « nature », au moyen d'autres « comme », liés à d'autres attendus.

Ecouter le grec, la langue grecque, n'est peut-être pas retomber comme à l'époque de Descartes dans la vieille Sorbonne de la « philosophie spéculative » - sans doute devenue trop difficile pour nous d'ailleurs… Le mot grec qui nous évite l'évidence de la maîtrise et de la propriété est celui de *kosmos*. D'étymologie obscure, nous dit Chantraine (« dérivé en *-mos* ou *-smos*, mais de quoi ? »), il exprime la notion d'ordre, de bon ordre, dans tous les sens, « matériel ou moral ». Il appartient aussi bien au vocabulaire de la « cosmologie » qu'à celui de la « cosmétique ». Le mot invite au voyage, on l'entend résonner dans Baudelaire : « ordre et beauté », qui ouvre à bon droit sur « luxe, calme et volupté »[1]. Il nomme l'ordonnance du monde pour un païen, quand non pas Dieu, mais les dieux, sont la doublure rêvée du réel. La première phrase du sophiste Gorgias, dans son *Éloge d'Hélène*, décrit l'ensemble de cette organisation :

« Ordre [*kosmos*] pour la cité est l'excellence de ses hommes pour le corps, la beauté, pour l'âme, la sagesse, pour la chose qu'on fait la valeur, pour le discours, la vérité. Leur contraire est désordre [*akosmia*][2]. ». Il existe des paysages, des chemins (j'en ai parcouru dans des îles grecques, en Corse) où le monde se réorganise à chaque tournant, en une perfection nouvelle, que l'existence du mot kosmos invite à percevoir.

Rien, pour moi, n'illustre mieux le kosmos que la « Coupe à l'oiseleur », qui s'épanouit comme un ornement dans le calme cosmique, courbe des rameaux, oiseaux dans la cage du monde, avec au centre le savoir-faire patient de l'oiseleur, tous les règnes conspirent, plante, animal, homme, pour faire ordre du monde : un chez soi sans propriétaire gagné par une même beauté qui les espace et les articule. Pourquoi ne se dit-on pas : cruel oiseleur qui capture d'innocents oiseaux pour les soumettre et en faire commerce ? Sans doute parce que l'immanence règne, tout est sur le même plan et chacun a trouvé sa place.

J'en conclurais ceci : peut-être faut-il que le chez soi soit empreint de beauté pour pouvoir être commun ?

1 *L'invitation au voyage*
2 82 B 11 DK (II, 288)

## DOES COSMOS REFER TO A GREEK ECOLOGY?

EN

Ecology has led to the invention of many new words in several languages, sometimes easy to understand and translate, sometimes not. Starting with "ecology": *Ökologie* is a fairly young German word coined by biologist Ernst Haeckel in 1866, who specialised in sponges and jellyfish, because he felt that "biology" was too restrictive; he was a Darwinian and no doubt thought that biology alone risked producing a Darwinism that was too narrow.

*Oikosis* Greek for house. Where you feel at home. Ecology is therefore the science of the home. Today it is obviously a political science. After all, "home" has always been a political issue. Where does "home" begin and end? How, when and under what conditions are we "at home"? Can we avoid feeling like an "idiot" at home? *Idios*, in Greek, means "one's own", "private", that which belongs to one person alone, and is opposed to *koinos*, "common", that which is shared, that which can form a community, that which is therefore truly political, like a *polis*, a "city".

So where is home for ecology? That's the whole point.

Our modern attitude follows the evidence of a sentence by Descartes, in the *Discourse on Method* but has forgotten what it opposed: dying scholasticism. "Instead of this speculative philosophy that is taught in schools, we can have a practical one. Knowing the force and actions of fire, water, air, the stars, the heavens, and all the other bodies that surround us, as distinctly as we know the various trades of our craftsmen, we could use them in the same way for all the uses to which they are suited…" most importantly forgetting the as *if*: "… and thus be as *if* masters and possessors of the natural world". Since then, mathematical physics has been the language the world speaks when it serves our purpose.

But ecology seeks to reflect on the world in a different language, and to rethink ourselves in a different "nature", using different "as ifs", linked to different expectations.

Listening to the Greek language is perhaps not to fall back into the old Sorbonne habit of "speculative philosophy" as Descartes did in his day - which has no doubt become too difficult for us… The Greek word that avoids the obvious trap of mastery and possession is *kosmos*. Of obscure etymological roots according to Chantraine ("derived from *-mos* or *-smos*, but from what?"), it expresses the notion of order, of good order, in every "material or moral" sense. It belongs just as well to the vocabulary of "cosmology" as it does to "cosmetics". The word is an invitation to travel; you can hear it in Baudelaire: "order and beauty" that rightly lead to "luxury, calm and pleasure"[1]. For a pagan, it is the order of the world, when not God but gods are the ideal reflection of reality. Sophist Gorgias's first sentence in his *Praise of Helen* describes the whole of this organisation:

"Order [*kosmos*] for the city represents excellence for the body of its men, beauty for the soul, wisdom for the things we make and value for speech and truth. Their opposite is disorder[*akosmia*][2]. "

There are landscapes and paths (I've walked some on the Greek islands and in Corsica) where the world reorganises itself at every turn into a new perfection that the existence of the word *kosmos* invites us to perceive.

I can think of no better illustration of the kosmos than the "Bird-catcher's Cup", which blooms like an ornament in the cosmic calm, curving branches, birds in the cage of the world, with the patient skill of the birdwatcher at the centre, all the kingdoms conspiring, plant, animal, human, to give order to the world: a home with no owner won over by the same beauty that generates space and movement. Why don't we say: cruel bird-catcher who captures innocent birds to subdue them and sell them? No doubt because immanence reigns, everything is on the same level and everything has its place.

My conclusion would be this: perhaps home has to be beautiful to be shared by all?

Coupe de l'oiseleur, vers -550, Musée du Louvre, © 1993 GrandPalaisRmn (musée du Louvre) / Hervé Lewandowski
Birder's Cup, circa 550 BC, Musée du Louvre, © 1993 GrandPalaisRmn (musée du Louvre) / Hervé Lewandowski

*1* *An invitation to a journey*
2 82 B 11 DK (II, 288)

Barbara Cassin of the Académie française *France*

# SUSTAINABILITY, SOLASTALGIA AND HEALTH IN THE SYMBIOCENE

## VO

To sustain something means to continue, uphold or maintain that thing so that it endures. The concept seems simple enough, yet there are hundreds, if not thousands of definitions of sustainability and sustainable development in the world of policy. These definitions range from the technical to the commonplace. Very quickly, problems are revealed, for everyone has a different opinion on what exactly should be sustained and over what time frame. Sustainability, like the condition of 'freedom' has no content unless you specify its context right from the start.

It is clear then, like many issues in human affairs, the definition of sustainability depends on who is doing the defining. If we go back to the start of modern environmentalism, Rachel Carson in *Silent Spring* (1962)[1] thought it wise to quote from the French scientist and philosopher, Jean Rostand, in her introduction to the book. Rostand famously stated that «The obligation to endure gives us the right to know» (Rostand 1960)[2]. He created this phrase in the context of the threat of nuclear technology to life on Earth, but as Carson knew, it also had huge relevance to her concerns about pesticide pollution, or what she called «the elixirs of death» on the planet.

Both issues are focussed on the future and the life-chances of our children. Both issues require knowing about the dangers of something complex, invisible and with implications for innocent, non-consenting future generations. Concern about the future entails a strong ethical stance, one that later definitions of sustainability included as 'equity within and between generations', including future generations of humans.

The focus mainly on humans in the early sustainability literature has also changed over the last few decades with 'equity' now including our relationships to non-human life forms (inter-species equity). The shift from the strictly anthropocentric has also seen a sustained critique of the Anthropocene or period of human dominance on this planet. In Australia, for example, the Anthropocene is exemplified by the black coal industry, its violent terraforming of the landscape, toxic regional pollution and global climate change impacts. Australia exports world-leading tonnages of black coal, but 'imports' hugely negative climate warming consequences manifest in extreme heat, drought, wildfires and storms.

In addition to these biophysical impacts, a negative result of large-scale coal mining has been the impact on human health and well-being. My own contribution to a better understanding of this relationship has been the concept of solastalgia (Albrecht 2005)[3]. While we already had a defined feeling of loss and mental anguish when absent from home in Hofer's 1688 concept of nostalgia, there was no concept in the English language for a similar distressing feeling while emplaced in a home environment that was being desolated.

Solastalgia was defined as a feeling of profound distress connected to a much-loved home environment that has changed for the worse by forces that seem impossible to prevent. Solastalgia is a feeling of melancholia or homesickness while still at home. It is the loss of solace that can be derived from a loved 'home' that is typical of solastalgia. Further, the 'algia' in solastalgia comes from the ancient Greek and it can mean pain, grief or sorrow. We will feel such emotions as our beloved home, the Earth, experiences even more endangerment, extinction and ecosystem ill-health. When ecosystem health begins to fail, so too does our mental health in the form of solastalgia and other negative psychoterratic (psyche-Earth) conditions.

Despite massive negative impacts on ecosystem health worldwide, in 2024 it seems humans are still confused about what to sustain. Ironically, we seem good at sustaining the very things that compromise our ability to endure on the Earth. The «right to know» about nuclear risks, ecosystem pollution, and now, the pollution of our climate has also been seriously confounded by «fake news» and conspiracy theories.

Climate chaos is impacting large island nations such as Australia. In addition, all over the Pacific, small island states are being regularly inundated due to the rising sea level. Ironically, the Marshall Islands and many other small island states in French Polynesia were also subject to the effects of over 300 atomic blasts[4] during so-called «testing» from 1946 to 1996.

The legacy of nuclear waste, nuclear radiation and sea level rise delivers chronic solastalgia to those who live near 'sacrifice zones' such as the 'Tomb' on Runit Island[5]. Now, «the right to know» applies to both climate warming and the nuclear legacy as they have unfortunately intersected in the Pacific. Beyond the experience of solastalgia, people on low-lying islands are being forced to re-locate to other countries.

Finally, in mid-March 2024, one of the largest coral reefs on Earth, the Great Barrier Reef, built by ancient symbiosis between polyps and algae, is undergoing yet another mass bleaching event due to record hot sea temperatures, causing the loss or death of the algae (zooxanthellae). In the whole Southern Hemisphere (Oceania), climate warming is breaking apart the unions that constitute coral reefs and the great diversity of life they harbour. This is a cause of solastalgia on a massive scale.

The antidote for solastalgia is to address its major determinant, the ecocidal aspects of the Anthropocene. To create the conditions where good ecosystem health and good human mental health prevail, we need to urgently exit the Anthropocene and move into the Symbiocene (Albrecht 2019)[6]. The Symbiocene[7] is a future state where our good Earth emotions can thrive and help rebuild a symbiotically connected world. The 'obligation to endure' is then understood as the right to 'know and grow' in symbiotic co-generation with all life forms on this wonderful home, the Earth.

1 Carson, Rachel. (1962). *Silent Spring*. Harmondsworth: Penguin Books.

2 Rostand, Jean. (May 20 1960). «Popularization of Science» in *Science*, May 20, 1960, New Series, Vol. 131, No. 3412 p. 1491.

3 Albrecht, Glenn. (2005). *Solastalgia: A New Concept in Human Health and Identity*. PAN (Philosophy, Activism, Nature), 3, pp. 41–55.

4 ICAN 2020: https://www.icanw.org/tuvalu_ratification (accessed 18/03/2024).

5 Sherriff, Lucy. (2023). «Endless fallout: the Pacific idyll still facing nuclear blight 77 years on». The Guardian, Fri 25 Aug 2023: https://www.theguardian.com/environment/2023/aug/25/endless-fallout-marshall-islands-pacific-idyll-still-facing-nuclear-blight-77-years-on?ref=mc.news (accessed 18/03/2024).

6 Albrecht, Glenn. (2019). *Earth Emotions*: *New Words for a New World*. Ithica, Cornell University Press.

7 Albrecht, Glenn. (Summer 2021) «Exiting the Anthropocene and Entering the Symbiocene,» *Minding Nature* 14, no. 2: https://www.humansandnature.org/exiting-the-anthropocene-and-entering-the-symbiocene-2021 (accessed 18/03/2024).

VO

*Hunger Games : La Révolte-partie 1*, troisième volet de la série. District 13, dans une forêt, avec des sons d'oiseaux et de rivières. Gale et Katniss sont sortis chasser ; c'est l'occupation de leur enfance qui les unit. Katniss met un cerf en joue mais ne l'abat pas, car ce ne serait 'pas juste' de le tuer.
*Hunger Games : La Révolte-partie 2*, ultime volet de la série, dernière scène, plusieurs années ont passé depuis la chute du capitole et la libération des districts. Une prairie fleurie, des sons d'oiseaux. Peeta joue dans l'herbe avec un jeune enfant. Katniss est assise près d'une nappe de pique-nique avec un bébé dans les bras.
Ces deux scènes, longues seulement d'une ou deux minutes chacune, sont deux exemples révélateurs des représentations de la nature dans un grand nombre d'œuvres culturelles populaires : une nature stéréotypée de carte postale, figée et immuable, présentée non pas pour elle-même mais comme symbole des états d'esprit des protagonistes humains ou d'un espace-lieu de sérénité hors du temps.
D'une façon générale, la nature présente dans nos imaginaires collectifs renvoie effectivement à des images figées, immuables et stéréotypées. Une grande partie d'entre nous a pourtant encore des souvenirs de jeux dehors, seul(e) ou à plusieurs, à déterrer des vers de terre, à attraper des grenouilles, à cueillir un bouquet de fleurs pour offrir, à grimper dans l'arbre du jardin de nos grands-parents… Dans ces souvenirs, la 'nature' est plurielle, variée, imprévisible, libre, ni méchante ni gentille, pleine d'inconnus et de découvertes possibles. Nous avons été en contact avec elle, nous nous sommes même souvent immergé(es) dans ce vivant. Nous savons au fond de nous que c'est cette nature et ces liens avec ce vivant qu'il s'agit de préserver, dans toute leur diversité, leur dynamique, et pas une maigre collection de clichés jaunis par le temps. Pourtant, nous n'en parlons pas, nous préférons les images de carte postale, cette nature vue de loin. Nous avons collectivement construit, dans les sociétés occidentales, ce que Serge Moscovici appelait une « société contre nature »[1], nos imaginaires collectifs ont progressivement séparé notre 'humanité' du reste du vivant ; ou plutôt ne mobilisent ce vivant, cette nature, que quand cela nous arrange - tel type de comportement humain n'est pas 'naturel', au contraire de tel autre - au gré des situations et des enjeux.
Nous avons progressivement et collectivement nié que nous, humains, sommes biologiquement vivants et en relation étroite avec le reste du vivant. Pourtant, nous mangeons des êtres vivants (plantes ou animaux), nous vivons en symbiose avec certains micro-organismes (microbiotes) et en combattons d'autres (certaines bactéries ou virus). Nous récupérons de l'énergie d'espèces vivantes passées (sources du charbon ou du pétrole) ou actuelles (bois), la qualité de notre eau et de notre air dépend du bon fonctionnement des cycles biologiques… La plateforme internationale pour la biodiversité et les services écosystémiques (IPBES) a formalisé l'importance de ces inter-relations dans son rapport de 2019, en synthétisant que la bonne qualité de vie des humains est directement dépendante d'un bon fonctionnement de la nature[2]. Celle que nous, enfants, avons entraperçue pendant nos jeux : un ensemble diversifié d'êtres vivants en interactions permanentes les uns avec les autres, très dynamique et variable dans l'espace et dans le temps, qui n'a pas besoin des humains pour exister et dont nous faisons partie. Un 'vivant écologique'.
Dépasser les images stéréotypées de la nature et renouer nos liens individuels et collectifs avec le vivant écologique, est une des conditions nécessaires pour sortir des crises en cours de nos sociétés humaines. Loin d'être simple et 'gentillette', cette proposition demande de bousculer fortement nos modes de pensée dominants, elle est d'une ambition folle ! Mais c'est ce que demandent l'IPBES et le GIEC : modifier profondément les modèles de fonctionnement des sociétés occidentales sur les plans économiques, politiques, sociaux et technologiques, y compris nos systèmes de croyance, nos valeurs et nos paradigmes.
Un peu de connaissance est nécessaire bien sûr, une culture générale de ce qu'est le vivant et de comment il fonctionne, espèce humaine comprise. Mais pour intégrer ce vivant dans ce qui fait collectivement sens pour nous, il est aussi nécessaire d'y porter attention au quotidien, dans nos vies indi-

1 See also Prévot A.C. 2021. *La nature à l'oeil nu*. CNRS publications

EN

*Hunger Games*, the third instalment in the blockbuster series, District 13: Gale and Katniss are allowed to leave the bunker to go hunting (it's what they did when they were kids, and it brings them together). In a forest, with the sounds of birds and a river. Katniss points a gun at a deer but doesn't shoot it, because it's not afraid of her and it wouldn't be 'fair' to kill it.
*Hunger Games*, the fourth and final instalment in the blockbuster series: The capitol is defeated, the people are liberated, and several years have passed. The last scene of the last of the four features: a meadow is in bloom, there is the sound of birdsong. Peeta is playing in the grass with a young child, Katniss is sitting on the ground next to a tablecloth with a baby in her arms - a symbol of serenity finally found. These two scenes, only one or two minutes long, are two revealing examples of the representations of nature in many popular cultural works: a stereotypical postcard nature, frozen and unchanging, presented not for its own sake but as a symbol of the states of mind of the human protagonists. Generally speaking, the nature of our collective imagination is indeed made up of fixed, unchanging and stereotyped images of spaces that we do not frequent on a daily basis, but which we model in our thoughts in relation to what we, humans, are[1].
Yet many of us still have memories of playing outside, alone or with others, digging up earthworms, catching frogs, picking wild flowers to give as a present, climbing the tree in our grandparents' garden… In these memories, 'nature' is plural, varied, unpredictable, free, neither nasty nor nice, full of the unknown and possible discoveries. We've been in contact with it, we've even immersed ourselves in it on many occasions. We know deep down that it is this nature and these links with living things that we need to preserve, in all their diversity and dynamism, and not a meagre collection of photographs yellowed by time. But we don't talk about it, we prefer postcard images, nature seen from afar. In Western societies, we have collectively built what S. Moscovici called an 'unnatural society'[2], our collective imaginations have gradually separated our 'humanity' from the rest of the living world; or rather, we mobilise this living world, this nature, only when it suits us - one type of human behaviour is not 'natural', while another is - depending on the situation and the issues at stake.
We have progressively and collectively denied that we humans are biologically alive and in close relationship with the rest of the living world. Yet we eat living things (plants or animals), live in symbiosis with certain micro-organisms (microbiota) and fight others (certain bacteria or viruses). We recover energy from living species past (sources of coal or oil) or present (wood), the quality of our water and air depends on the proper functioning of biological cycles… The international platform for biodiversity and ecosystem services (IPBES) formalised the importance of these inter-relationships in its 2019 report, summarising that a good quality of life for humans is directly dependent on the proper functioning of nature[3]. The nature we as children glimpsed during our games: a diverse group of beings in constant interaction with each other, highly dynamic and variable in space and time, which does not need humans to exist and of which we are a part. Un 'vivant écologique'. Overcoming stereotypical images of nature and renewing our individual and collective links with living ecology is one of the necessary conditions for overcoming the current crises in our human societies. Far from being simple and 'sweet', this proposal calls for a major shake-up of our dominant ways of thinking, and is wildly ambitious! But this is what IPBES and the IPCC are calling for: a profound change in the economic, political, social and technological operating models of Western societies, including our belief systems, values and paradigms.
A little knowledge is of course necessary, a general understanding of what living things are and how they work, including the human species. But if we are to integrate these living things into what makes sense for us collectively, we also need to pay attention to them on a daily basis, in our individual lives and in our social commitments. Give new meaning to

2 Moscovici S. 1972. *La société contre nature*. Union générale d'éditions, Paris.

2 Diaz, S., J. Settele, E. Brondizio, et et al. 2019 *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosysteme Services. Advanced unedited version* . IPBES, 2019.

3 Diaz, S., J. Settele, E. Brondizio, et al. 2019 *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Advanced unedited version*. IPBES, 2019.

viduelles et dans nos engagements sociaux. Redonner sens aux valeurs relationnelles[5] que nous lui portons : ce vivant est important pour qui nous sommes et fait partie de nous, en prendre soin participe de notre qualité de vie. Il est aussi nécessaire de mettre en histoire ce vivant écologique et la diversité des relations que nous avons avec lui. Car les sociétés se construisent en partie par les récits qui les composent, depuis leurs mythes fondateurs jusqu'aux fictions qui nous fournissent autant de mondes possibles dans lesquels nous projeter[4]. Alors, comment faire ? Toutes les idées sont bienvenues pour sortir de la situation funeste que nous avons collectivement construite. Une diversité d'idées est nécessaire, qui répondront à la diversité des éléments de nature, des collectifs et des individus humains. Une diversité d'idées, produites par une diversité de personnes et de socles culturels et sociaux. Les créations artistiques sont une des portes pour ouvrir ces voies nouvelles, vers plus de relations au vivant écologique et vers d'autres relations entre humains. Comme dans *Hunger Games*, les œuvres culturelles les plus populaires actuellement représentent la nature sans sortir du cadre de pensée dominant : peu présente, pauvre en espèces et en diversité, très contrôlée par les humains[5]... Certes, les œuvres d'art sont contingentes des normes et conditions sociales des lieux et époques de leurs créations. Mais l'art est aussi un lieu de transgression et d'imagination de nouveaux mondes ; c'est aussi un lieu de partage d'émotions, d'attentions, de relations ; un lieu de découverte de l'altérité. Les créations artistiques peuvent bousculer les personnes qui les reçoivent, augmenter leurs capacités d'empathie, de relations aux autres humains, de compréhension du monde[6]. Dans certaines conditions, l'art peut aussi ouvrir les spectateur. ices à l'altérité radicale, qui concerne les humains mais aussi le reste du vivant. Alors, au lieu de continuer à courir droit vers le mur de l'insoutenabilité sociale et écologique, tentons, chacun(e) à notre manière, de partir à la découverte de cette nature, de ce vivant si riche, si différent et pourtant si proche de nous. Parlons-en, chacun(e) avec nos moyens, partageons nos découvertes et nos souvenirs, inventons d'autres relations aux autres et imaginons ensemble des chemins de traverse vers des futurs soutenables ! Il en va de notre survie morale, sociale, puis biologique.

the relationship values[4] we attach to them: living things are important to who we are and are part of us, and taking care of them is part of our quality of life. We also need to tell the story of this ecological life and the diversity of the relationships we have with it. Societies only exist through the narratives they are made of, from their founding myths to the fictions that provide us with so many possible worlds in which to project ourselves[5].
So how do we go about it? All ideas are welcome to help us get out of the disastrous situation we have collectively built. A diversity of ideas is needed, which will respond to the diversity of natural elements, human collectives and individuals. A diversity of ideas, produced by a diversity of people and cultural and social backgrounds. Artistic creativity is one of the ways of opening up these new avenues, towards a better relationship with ecological life and towards other relationships with people.
As in *Hunger Games*, today's most popular cultural works depict nature without breaking out of the dominant frame of thought: sparsely present, poor in species and diversity, highly controlled by humans[6]... Of course, works of art are contingent on the social norms and conditions of the places and times in which they were created. But art is also a place for transgression and the imagination of new worlds; a place for sharing emotions, attentions and relationships; a place for discovering otherness. Artistic creations can shake people up, increasing their capacity for empathy, relating to other human beings and understanding the world[7]. Under certain conditions, art can also open people up to radical otherness, which concerns not only people but the rest of the living world. So, instead of continuing to run straight towards the wall of social and ecological unsustainability, let's try, each in our own way, to discover nature, this living world that is so rich, so different and yet so close to us. Let's talk about it, each in our own way, sharing our discoveries and memories, inventing new ways of relating to others and working together to imagine new paths towards a sustainable future! Our moral, social and biological survival depends on it.

3 Chan, K. M. A., et al. 2016 Why protect nature? Rethinking values and the environment. *Proceedings of National Academy of Sciences of USA* 113: 1462-65.

4 Voir par exemple Huston N. 2008. *L'espèce fabulatrice*. Actes Sud

5 Voir par exemple : Prévot-Julliard, A. C., R. Julliard, et S. Clayton 2015 Historical evidence for nature disconnection in a 70-year time series of Disney animated films. *Public Understanding of Science* 24: 672-80 / Kesebir, S., et P. Kesebir. 2017 A growing disconnection from nature is evident in cultural products. *Perspectives in Psychological Science* 12: 258-69 /Babb, Y.M., J. McBurnie, et K.K. Miller. 2018 Tracking the environment in Australian children's literature: the Children's book council of Australian picture book of the year awards 1955-2014 ». *Environmental Education Research* 24: 716-30.

6 Green, M.C. et T.C. Brock. 2000. The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology* 79: 701-21 / Bal, P.M., O.S. Butterman, et A.B. Bakker 2011. The influence of fictional narrative experience on work outcomes: a conceptual analysis and research model. *Review of General Psychology* 15: 361-70 / Kidd, D.C. et E. Castano. 2013. Reading literary fiction improves theory of mind. *Science* 342: 377-80. https://doi.org/10.1126/science.1239918.

4 Chan, K. M. A., et al. 2016 Why protect nature? Rethinking values and the environment. *Proceedings of National Academy of Sciences of USA* 113: 146265.

5 See for example Huston N. 2008. *L'espèce fabulatrice*. Actes Sud

6 See for example: Prévot-Julliard, A. C., R. Julliard, and S. Clayton 2015 Historical evidence for nature disconnection in a 70-year time series of Disney animated films. *Public Understanding of Science* 24: 67280 / Kesebir, S., and P. Kesebir. 2017 A growing disconnection from nature is evident in cultural products. *Perspectives in Psychological Science* 12: 25869 /Babb, Y.M., J. McBurnie, and K.K. Miller. 2018 Tracking the environment in Australian children's literature: the Children's book council of Australian picture book of the year awards 1955-2014.» *Environmental Education Research* 24: 71630.

7 Green, M.C. and T.C. Brock. 2000. The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology* 79: 70121 / Bal, P.M., O.S. Butterman, and A.B. Bakker 2011. The influence of fictional narrative experience on work outcomes: a conceptual analysis and research model. *Review of General Psychology* 15: 36170 / Kidd, D.C. and E. Castano. 2013. Reading literary fiction improves theory of mind. *Science* 342: 37780. https://doi.org/10.1126/science.1239918.

## A CLIMATE LAW STORY

**VO**

On a quiet weekday morning this past June I sat on a beach in New Jersey and watched my daughter and son, along with two of their cousins, all of them healthy and lively teens and tweens, as they stood ankle deep in the Atlantic, toying with the idea of diving in. The latest heat dome had settled on top of the northeastern United States, bringing with it the latest record-breaking temperatures. Here on the beach, though, the wind blew steadily in off frigid water, carrying a perceptible chill through the air. A swim felt more like a challenge to take on than a pleasure to enjoy – or than a necessity to stay alive. Back at home in New York City, people were crowding into cooling centers, sharing whatever outdoor shade could be found. I thought of video clips from China from a couple years ago, during an earlier record-setting heat wave, where people packed so tightly together into wave pools they could barely turn around. I thought of the opening chapter in Kim Stanley Robertson's *The Ministry of the Future*, where a heat wave in India causes people to seek refuge in a lake, only to find the water is too warm to provide their bodies with the needed relief, and so they die.

The surf was mild, the wind lifting up small waves that crowned and broke into a ticklish white foam. A boy, shirtless, maybe six years old, his torso bronzed and his brown hair tousled, traipsed after his older brother across the soft sand toward the ocean's edge. The older boy marched in, up to his waist, and turned to watch his sibling follow. But the younger one was scared. Not of the cold, which wouldn't affect him, but of the small waves and the white foam and the loud sound. He was worried, it seemed, of what the power of the water coming inland would do to him. I imagined what a predicted three feet of sea level rise in the next 75 years will do to our civilization and thought, *He has no idea how scared he should be*.

I'm not always like this. But oftentimes I am.

Just the week before my family beach day I sat in a large conference room with two dozen of America's leading environmental lawyers, discussing the state of play in the courts and legal strategies to address the climate crisis in the months and years ahead. As tends to happen in such contexts, the conversation shifted away from which claims to bring against which governments and corporations, away from statutes and legal doctrine and case law, to *story*. How to frame the narrative. How to move the audience. Whether to lean into the technical aspects of climate change law and policy—economics, engineering, ecology—or into its more human elements—individual characters, our lives and livelihoods, the communities in which we are placed in time and space. We wondered out loud whether it is more powerful to invoke fear, or to provide hope.

Climate apocalypse? Or sustainable utopia? What do people need to hear, see, feel, believe, understand, know, want, or imagine? Taking action on the climate crisis is not easy. Its causes are pervasive—they arise on every level, and everywhere—stemming from the carbonized core of the global enterprise. Its solutions are systemic, massive in scope and scale, reflecting profound reformations of our social and industrial infrastructures.

On an individual level, taking climate action often means sacrificing convenience, chancing the new, enduring significant change. It involves prioritizing the future over the present, weighing the indirect effects of things we do on people we don't know and places that are far away. These realities, distant in time and space, can feel essentially imaginary. Our brains are not hard-wired to take action for their benefit.

On the societal level, we are confronted with what sociologists have terms a "super-wicked problem," one with billions of stakeholders with competing priorities, no central authority to decide who gets what, no one right answer, and, even in the best of all possible worlds, no final resolution. Because once we do get things set up—once the bold vision for a just future is articulated, and the rules of the road are laid out, and the plans for kicking our fossil fuel addiction are in place, and the incentives for renewable energy are aligned, and the support systems for coping with heat waves and rising seas are operational—the crisis will not be over. The climate will continue to change for years to come. The problem will survive our best efforts to address it. Which only makes it more complex. More super wicked.

Back on the beach, I was talking with my sister and another of my nieces. I asked them what they needed to hear in order to be motivated: hope or fear.

"Hope," my sister said. She is 45 years old.

"You'd like me to show you a future in which all people are comfortable, all politics are progressive, economies are sustainable, and we live happily ever after?"

"Exactly." She smiled.

"Fear," my niece said. She is 17.

"You need me to show you heat domes and wildfires and floods and famine and mass migration and pandemics?"

"Yes." She did not smile. "*And* that other people are doing something, too."

One way or another, the lawyers in that conference room know that making progress on climate change through the courts is not only a matter of winning legal arguments but also of winning hearts and minds, and of leveraging those wins to shift power. United States Supreme Court Chief Justice John Roberts famously claimed that the role of a judge is analogous to a baseball umpire calling "balls and strikes" – they don't make the rules, they just apply them in a neutral, objective fashion. The statement was hopelessly blindered, perhaps even an intentional misdirection. Judges, after all, are people, too. They have their cognitive commitments. They belong to their epistemic tribes. They are pursuing their own personal and political agendas. They are ensconced in their milieus. (Consider recent U.S. Supreme Court decisions eliminating women's constitutional right to abortion and seeking to undermine the country's administrative and regulatory apparatus.) As a consequence, the law is not a fixed, immutable thing. It is not set in stone. It is alive, and breathing, and moves over time, and sometimes it does so in large jumps rather than small steps. The lawyer's job is to persuade the judge not only that logic and written rules require a specific outcome when applied to particular facts, but also to imagine the law moving in the desired direction.

For many years environmental law in the United States, as in some other places, has imagined a recovery of a lost past, a return to Eden, and sought to salvage what could be salvaged from the wreckage of our industrial economy and our extractive uses of the land. But the climate crisis calls for new understandings of the ways in which the law reflects our relationship to the natural world, and to each other. It demands that we think not of the past we want to return to, but the future we want. It asks us to ask, as Ayana Elizabeth Johnson does in a new anthology: *What if We Get It Right?*

Leaving the beach that day, making my way home from that legal strategy session, thinking about it now, I can start to see the contours of this new, climate-inflected law. It is rooted not in recovery and salvation but adaptation and sustainability. It envisions not a top-down, command-and-control regime but a diversity of individuals and communities operating independently and in relationship at multiple scales and along a variety of horizontal and vertical planes. It perpetuates a system of property, of what we own and call our own, as interconnected, not exclusive, and as something held for the benefit of others. For humans and nonhumans, those we know and those we don't, now and in the future.

# A SEASON UNSETTLED: THE MONSOON ON THE INDIAN SUBCONTINENT

**VO**

“Mausam, mausam, lovely mausam” sing the young lovers from a 1980s hit Hindi film as they prance and dance through misty green hills. Dark rainclouds gather behind them as they embrace on a swing suspended from a tree. “Chalo ghul jaayen mausam main hum.” Let us dissolve and become one with this mausam, this lovely mausam.

What is this mausam? Why does it bring forth this gush of romantic feeling? What’s so lovely about grey skies and swirling mist? To know this, to feel this, you have to understand the place of the monsoon on the Indian subcontinent.

Mausam is the Hindustani word for ‘weather’ or ‘season’, derived from the Arabic mawsim, or appropriate time. Since ancient times, sailors from West Asia used this term to denote the period when favourable winds would speed them across the Arabian Sea to the Indian subcontinent. In the 16th century, Dutch seafarers spoke of the monson, and the Portuguese of the monção. English explorers encountered these winds as they sailed east and called them Monsoon: seasonal rain-bearing winds that advance and retreat. As colonial science collected data from around the world, meteorologists found that regions in West Africa, Australia and the Americas also have monsoons. Yet it is in Asia—and especially on the Indian subcontinent—that the monsoon is a season above all others.

Imagine the months of scorching heat that make summer in the subcontinent a test of endurance. From late March to June, the land is baked brown and dry. Rivers shrivel and streams become a trickle. Plants, birds, and animals nurse their energy, barely stirring to stay alive, to find water and food. People shelter indoors, out of the fury of the sun and the dust-laden loo winds that scour the northern plains. Life slows to a standstill.

And then comes the Monsoon. From the month of June, winds that have gathered moisture from the Indian Ocean move north-eastwards. Masses of clouds make landfall in Kerala on the southern tip of the subcontinent, bringing summer to a sudden end. Over the next three months, they roll northeast, rumbling onwards in the sky like majestic herds of elephants, showering the land with longed-for rain. When this grey phalanx reaches the Himalayan mountain ranges, it turns west moving along their foothills towards my city of Delhi. As the rain sets in and the plants on my balcony burst out with tender green leaves, I sip ginger tea and dip hot potato and onion fritters into coriander chutney, and I hum to myself, “Mausam mausam, lovely mausam.”

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Amita Baviskar

*India*

The monsoon is a strange sort of season. A season suggests constancy, an established schedule of arrival and departure. Yet there is a whirl of contingency surrounding the monsoon that makes it hard to predict. Far-away phenomena such as the El Niño Southern Oscillation in the Pacific Ocean affect the monsoon. So do more proximate patterns such as the movement around the equator of the doldrums, the Intertropical Convergence Zone, caused by the spinning of the earth. Ocean currents and winds interact with the land. The temperature of the ocean relative to that of the continental mass, and the heating of the Tibetan plateau, are among the variables that shape South Asia’s yearly tryst with the monsoon. When the rains will come, how plentiful or meagre they will be, whether steady or scattered: on the monsoon’s annual caprice rests the fortunes of the subcontinent.

In South Asia, eighty per cent of all the rain in the year comes during the monsoon. It replenishes rivers, lakes, and aquifers. It moistens the soil and makes plants and animals thrive. In a region where agriculture sustains a majority of the population, the monsoon crop—kharif ki fasal—is the staple of the economy. Good rains mean that farmers are flush with funds; trade and industry surge and flourish. Not enough or too much rain brings hard times, hunger and disease, having to search for a living elsewhere. Even in areas with irrigation, people deal with this roll of the dice from year to year. They pray and perform rituals, implore the heavens, for they know that the monsoon is no mere meteorological phenomenon. It is the work of a larger divinity. Its power over life and death comes from gods who cannot be fathomed, from fates that one cannot outrun.

For centuries, the mystery of the monsoon has been attributed to the agency of gods or a Nature imperfectly understood. In more recent times, we have come to realise that a part of this variability is entirely manmade.

We live in the Anthropocene, a new geological epoch in which human actions have profoundly changed the earth, its ecosystems, and its climate. Much of the change in climate is caused by global warming, as greenhouse gases such as carbon dioxide, methane, nitrous oxide, and synthetic fluorinated gases accumulate in the atmosphere and trap heat. Since industrialization started, but most especially since the Great Acceleration of the 1950s, the increasing rate of burning coal, oil, petroleum, and natural gas, has made the planet hotter. Warmer air, oceans, and lands together create longer and hotter heat waves, more frequent droughts and wildfires, more powerful storms, and more erratic rainfall.

These severe forces of weather—The Elements: heat, wind, cold and rain—have always been with us. Over millennia, we have learned to live with their power and to endure their extreme agency. Global history recounts past catastrophic natural events like floods, droughts, fires, ice ages, and plagues that cascaded into human crises[1]. These extreme events reconfigured how people lived, worked, worshipped, and organised themselves. Taking this long view, the Anthropocene can be regarded as just another era of the earth unfolding, a cosmic blink of the eye. Yet what is unprecedented about this particular climate crisis is that it is anthropogenic. Not only has our capitalist system accelerated global warming by burning fossil fuels as if there were no tomorrow, it has shaped our ability to adapt to new conditions. Who among us survives and thrives in this strange new world and who suffers and dies is not accidental but ordained by the actuarial calculus of the Capitalocene.

This is the working of History on a planetary scale. The agency of the elements combines with and against our technologies, economic and political arrangements, and modes of thinking. Think of the Monsoon and ships sailing across the Arabian Sea carrying spices and silks, science and religion. Recall the European trade wars and territorial conquest of a land made fertile by the Monsoon. Imagine the imperial exercise of aiming to predict the Monsoon and improve revenues for Britain. Look at the gigantic dams—‘temples of modern India’—built by the Indian state to free the country from its dependence on the Monsoon[2]. Remember the people they displaced and dispossessed, the forests and fields they drowned. Listen to the chug-chugging of tubewells as they pump groundwater to irrigate crops, a guarantee underwriting the Green Revolution against the uncertain Monsoon[3]. I could go on and on, tracing these entangled threads but never managing to unravel them. So for the rest of this essay, let me focus on one little snarly knot in this vast web of life that is urban north India, especially the metropolis of Delhi where I live. Because it is the capital of India, Delhi’s 33 million people inhabit a city that gets the most government attention and money. Yet, despite this favoured status, most residents—and especially working-class migrants—live without decent housing, sanitation, and drinking water[4]. Everyone is not an equal citizen of the city; India’s enduring inequalities of caste, class, religious and ethnic differences are reflected in different standards of living and possibilities for the future. The injustice lies in plain sight. On Delhi’s streets, luxury SUVs honk impatiently at cycle-rickshaws to get out of their way. In its affluent tree-lined neighbourhoods, the gracious lives of the well-to-do would grind to a halt without the labour of domestic workers who dwell in makeshift shanty towns. During the ‘riots’ that break out regularly in Muslim-dominated areas, the police play a decidedly one-sided role.

1 Peter Frankopan. 2023. The Earth Transformed: An Untold History. London: Bloomsbury.

2 Amita Baviskar. 2019. “Nation’s Body, River’s Pulse: Narratives of Anti-dam Politics in India.” Thesis Eleven 150 (1): 26-41.

3 Kapil Subramanian. 2015. *Revisiting the Green Revolution: Irrigation and Food Production in Twentieth-Century India.* PhD dissertation: Kings College London.

4 Amita Baviskar. 2020. *Uncivil City: Ecology, Equity and the Commons in Delhi.* Delhi: Yoda Press and Sage Publications.

All these are facets of a fractured citizenry in an unequal country, united by a common striving to secure a better life for oneself and one's children.

Each place is particular. Great global forces may affect them all but always in ways that are distinctively local and conjunctural, situated in specific histories and geographies. My story of the Monsoon in Delhi is one among many. So I will not attempt to generalize. But I do hope that you may find evidence and arguments that resonate with other places and peoples.

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The Monsoon is not the same across South Asia. People in Kerala in south India, and those who live along the western coast, face the first full force of that cumulonimbus cloudburst as a thick velvet curtain that descends across the landscape in June, closing off everything except itself. For them, the monsoon is a total immersive experience. In the city of Mumbai on the western coast, caught between two wetnesses—torrential rains and a surging Arabian Sea—they scoff at us north Indians and the smaller showers that come our way in July. What do you know of the Monsoon, they say. But I have seen the worry in the eyes of farmers in central India as they look up to the skies, searching for those telltale hints of cloud, the first showers that will allow them to sow crops, grow food, fill the stomachs of their families[5]. The rains matter to them like nothing else. And for those of us in north India who have undergone the rigours of the dry, hot summer, far more intense than anything in the south or west, the rains are our reward. We deserve them, we have earned them through our tapasya, our period of sere austerity And that is why we celebrate them, more intensely, more joyfully.

North Indian poetry, music, and art are suffused our romance with the rains[6]. Waiting for the rains, revelling in them, is a metaphor of a larger emotional landscape of desire and longing. In Kalidas's Sanskrit poetry from the 5th century, the raincloud is a messenger from an exiled young man to his distant beloved. Just as the rain shall feed the 'fountain with new water, make the peacock dance, and awaken the flowers and creepers from the fatigue of summer heat', it shall quench the burning loneliness in the beloved's heart[7] .In the Prakrit verse of the Gathasaptashati from the same period, an older woman mocks her friend:

*Thunderclouds in the sky,*
*Paths overgrown, streams in flood,*
*And, you, innocent one, in the window,*
*Expecting him*[8].

Medieval miniature paintings from north India depict trysting lovers under cloudy skies, the Hindu god Krishna embracing Radha as they shelter from the rain, kings and queens enjoying the cool easterly breeze on the terrace of their garden pavilions. Folk song genres specific to saavan-bhadon, the season of the rains, tease out the themes of separation, yearning, and anticipation. In more contemporary Hindi cinema, rain-drenched bodies express shringar rasa, the savour of 'beauty, eroticism, voluptuousness, and the promise of approaching fulfilment'[9]. My memories of the monsoon are intertwined with classical Hindustani music, in particular the Malhar family of Raga, said to be so powerful that when properly sung, they can actually summon the rains. Mian Tansen, musician in the 16th-century court of the Mughal emperor Akbar, was a notable singer and composer of Malhar. For me, it is the Mian ki Malhar Raga sung by Pandit Bhimsen Joshi that is the most sublime music on earth: each note, each interval is suffused with a soul-drenching benediction. In these cultural forms, the Monsoon moves between sky and earth, body and soul, humans and god, the temporal and the spiritual. It is about simultaneously being in the moment and transcending it.

There is also the simple, almost primal pleasure of getting wet: I remember a June in my middle-class locality of Mukherjee Nagar, when the first gusts of wind and spatter of raindrops brought me out onto my balcony. And across the road, on the terrace of their house, my very respectable neighbours were out, dancing in the rain, their clothes soon plastered against their bodies. Who could have thought that this plump, staid Sardar-ji could let himself go like this, jumping and splashing with his wife and squealing children, as the rain came crashing down? That's what the first rain releases: dance, laughter, joy in life.

And the scents of the monsoon! That warm, musky scent of the first rain hitting dry earth. That smell, oh that incomparable never-to-be-forgotten fragrance. In the 1960s, scientists gave it an English name, petrichor, and traced it to microscopic Streptomyces bacteria in the soil that produce a compound called geosmin. Drops of water hitting the ground release geosmin into the air. In north India, we call that scent sondhi mitti. This short-lived—but all the more powerful for that—trigger of memory, has even been distilled into an ittr, a traditional perfume. I have been looking for it but haven't found it, and the smell itself, as it occurs in nature when rain hits hot earth, is becoming more elusive.

Then there is the charcoal-tinged sweetness of roasting bhutte, the first cobs of tender corn sold by roadside vendors in August. And the over-the-top ripeness of rotting nimboli fruit littering the ground, as much a part of the monsoon season as the dusty fragrance of neem flowers signifies early summer. As the rain washes away their flesh, the moist, warm soil incubates each kernel until it sends out a little green bud of folded leaves. Even in the city, surrounded by concrete and tarmac, plants leaf, flower, seed, sprout, and grow in step with seasonal rhythms, the life-giving power of the rains organizing their schedule. Visitors arrive, like the chatak or Jacobin Cuckoo from East Africa. In Indian mythology, the chatak flies with an open beak, catching raindrops to quench its thirst. Its arrival heralds the Monsoon. More prosaic explanations say that the bird takes advantage of the prevailing winds to fly to India, feasting on the clouds of larvae produced by mating insects in the rainy season. But what will happen to the annual migration of the chatak now when 'the year's clocks are off by a month or so, and entire ecosystems are unravelling'[10]? Without that fecund insect swarm, ready for the eating in June, the synchrony between prey and predator, how will the chatak survive?

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For the rains are different now. The usual variability in the monsoons has been amplified by global warming[11]. Erratic and reduced rainfall and delayed onset of the monsoons may now be the new normal. Tellingly, the India Meteorological Department is considering lowering its definition of 'normal rainfall' by 2 per cent and changing the expected date of onset. What we can expect is more drought across the region, as scattered showers are interspersed with prolonged dry spells. The river Yamuna which supplies most of Delhi's water will shrink to a trickle in summer as the glacier and snowmelt in the Himalaya that feed it remain unaugmented by Monsoon rain until late in the season. With a deeper crisis of drinking water, we will hear increasingly vociferous demands for building more upstream dams in the Himalayan ranges, further destabilizing a geologically active region already prone to landslides and floods. Delhi's troubles spill over to distant lands, leaving deep, devastating ecological footprints across the countryside.

Global warming is not the only human-made cause for the Monsoon's increased variability. Delhi's status as the most polluted capital city in the world also has a role to play. Part of the reason for the rain drying up is the cloud of particulate matter that hovers over Delhi, the result of accumulated emissions from vehicles, diesel generators, brick kilns, the construction of buildings and paving of roads. Soot or black carbon particles absorb heat. This floating layer of hot air means that the moisture in Monsoon clouds, instead of condensing as it encounters cooler air, simply re-evaporates. Instead of falling as rain, the clouds release their moisture back into the air. Instead of delivering the heat-quenching showers that delight the soul, Kalidas's cloud messengers wander away emptyhanded.

This aerosol of smoggy pollution also affects the formation of rainclouds in another way. Water vapour needs a surface on which to condense. Thanks to Delhi's air pollution and the increase in aerosol particles, there are many more surfaces for vapour to cling to and condense on. So there are many more droplets of water but they are smaller. They also reflect the light more and scatter it. Reflective clouds and the gases that make up these aerosols help to cool Delhi's summer. At the same time, smaller droplets take longer to coalesce into raindrops, leading to bigger pauses between spells of rain. And when the rain does fall, it does so in heavier downpours. In any case, globally, warmer air holds more water; more water vapour condenses into heavier rain. But it is the particularity of the interaction between global warming and Delhi's air pollution that creates a distinctive pattern. The global is localised in complex and contradictory ways that are hard to comprehend, let alone control. As I try to understand these changes in cloud micro-physics, words from an old Joni Mitchell song swim into my head:

*I've looked at clouds from both sides now*
*From up and down and still somehow*
*It's cloud illusions I recall*
*I really don't know clouds at all.*

***

Droughts and downpours: how do extreme rain events affect life in Delhi? When I asked people about what the Monsoon meant to them, the first thing that most of them mentioned was traffic jams. Not the poetry of romantic desire, not the exhilaration of dancing in the rain, not the celebration of lovely mausam, but traffic jams. One heavy shower is all it takes to create snarls on the road that take hours to untangle. As it rains, the unseen infrastructure of Delhi's drainage system rises to the surface, revealing its myriad pitfalls and faults. In principle, the city has been planned and engineered for rainwater to tidily flow into stormwater drains. Every summer, municipal workers clean the drains of silt and debris, leaving little heaps of muck to neatly punctuate the roadside. Collecting and disposing of the dirt is someone else's job. So one pre-monsoon shower is all it takes for the muck to go right back into the drain. The work was done, the contractor paid, so what if the drains are clogged again?

As a capital city, Delhi has an image to maintain, and an aspiration to be 'world-class'. So it is imperative that the main roads, the arteries of the city, must be clear. Water must not

5 Amita Baviskar. 1995. *In the Belly of the River: Tribal Conflicts over Development in the Narmada Valley*. Delhi: Oxford University Press.

6 Imke Rajamani, Margrit Pernau and Katherine Butler Schofield (eds). 2018. *Monsoon Feelings: A History of Emotions in the Rain*. Delhi: Niyogi Books.

7 Imke Rajamani. 2028. "Monsoon Feelings: Introduction." In Imke Rajamani, Margrit Pernau and Katherine Butler Schofield (eds). 2018. *Monsoon Feelings: A History of Emotions in the Rain. Delhi: Niyogi Books.*

8 Arvind Krishna Mehrotra. 1991. *The Absent Traveller: Prakrit Love Poetry from the Gathasaptasati of Satavahana Hala*. Delhi: Ravi Dayal Publisher. Page 57.

9 Juhi Saklani. 2017. "Every Silver Lining has a Cloud." *The Hindu* 26 August.

10 Richard Powers. 2018. *The Overstory*. New York: WW Norton and Company.

11 For an interactive map of the Monsoon in South Asia, see Henry Fountain and Saumya Khandelwal. 2022. "The Monsoon is Becoming More Extreme." *New York Times*. 4 October.

accumulate. World-class cities don't have waterlogging. But there is a contradiction here. Delhi depends on groundwater. Officially, ten per cent of all the drinking water supplied by the government comes from underground sources. Apart from that, millions of residents who don't get municipal water or don't get enough of it, collect or buy water from tanker trucks supplied by illegal borewells. And for that groundwater to be recharged, rain must slowly soak into the ground, not be efficiently channelled into drains and released into the river. Waterlogging is temporary, one just has to wait it out. But who has time to wait these days? A city must be a place of ceaseless, seamless mobility. Time is money. A traffic jam matters more than the unseen seep of rain into the ground.

Since Delhi's water-table has been severely depleted in recent years because of accelerated siphoning off, it is all the more important that this gradual percolation be allowed to happen. This requires land that is not built up, and where the soil allows water recharge. In Delhi's topography and geology, it is the floodplain of the River Yamuna that affords the most favourable conditions for recharge. But these low-lying areas are where working-class populations have been settled in great numbers: first in the mid-70s during the eviction drives of the Emergency when civil liberties were suspended, and then in the great wave of slum demolitions that occurred in the 2000s. At the turn of the millennium, as India adopted economic policies to convert the riverbanks into real estate and to commodify what had long been an urban commons, working-class people were forcibly shifted and squeezed into smaller, denser settlements on the floodplain while new, more prestigious projects were protected by embankments[12]. So a smaller part of the floodplain now performs the vital ecological function of groundwater recharge, and it is the inhabitants of this area that suffer the seasonal influx of rainwater mixed with sewage in their homes.

The spatial and social order of the city shapes the flow of water. Where rainwater collects and where it goes is not decided by geography alone but is socially engineered. Those who dwell in jhuggi-bastis, squatter-settlements, and 'unauthorised colonies' are forced to live with the floods so that the city's water-table is replenished. This spatial and social coincidence is not accidental; it is the product of postcolonial planning and the political ecology of a deeply unequal nation-state where environmental sustainability and social justice are steamrollered in the pursuit of a world-class dream for some.

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Mosquitoes are the other thing that residents of Delhi now associate with the Monsoon. The rains create conditions where insects thrive. Those of us who grew up in Delhi in the 1960s and '70s, recall monsoon nights where kamikaze beetles and moths blundered into the house, when frogs croaked and crickets creaked without end. They have now been replaced by the buzz of mosquitoes. Among them is the Aedes aegypti mosquito, the primary vector of malaria, dengue and chikungunya. In his essay, 'Can the Mosquito Speak?', Timothy Mitchell describes another mosquito, Anopheles gambiae, endemic to Sudan, entering Egypt during the second World War, hitching a ride with troops on trains and planes, spreading by taking advantage of the moist environment created by perennial irrigation from the Aswan dam[13]. Far more than the war, it was cerebral malaria carried by A. gambiae that killed people, already malnourished by the switch from food crops to sugarcane and cotton. Mitchell's virtuoso analysis of the techno-politics at work in mid-20th century Egypt has a bearing on how the mosquito is staging a comeback in Delhi. Aedes aegypti is well adapted to urban habitats. It happily breeds in discarded containers and used tyres, water tanks and desert coolers, on construction sites, in storm water drains and pools of stagnant water. Resistant to most insecticides, it thrives in densely populated areas. Anopheles stephensi is the vector species of urban malaria which, in 2017, was again detected in Delhi after a gap of ten years. These are now our companion species; our relationship is co-constitutive.

Dengue can kill. It causes severe internal bleeding and organ impairment. Malaria leaves its victims feverish, shivering and weak. Long after a bout of chikungunya, people complain of aching joints. Yet it is not only the risk of falling ill but also the irritation of whining, biting mosquitoes that prevent restful sleep that prompts anyone who can afford it to use pyrethroid-based mosquito repellents. They are relatively safe but more expensive. Poorer people use stronger pesticide-laced incense sticks and coils. For Reena, a labourer who lives in the Yamuna Khadar slum with her husband and two children, sleeping on a Monsoon night is a struggle against heat, humidity, and mosquitoes. The small electric fan in their small one-room dwelling barely stirs the heavy air. She lights a few incense sticks before going to sleep and hopes that the smoke will keep the mosquitoes away. Rainwater drips from a leak in the tin roof; sewage-laced water slops outside the door of their jhuggi. So much for the romance of the rains.

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Downpours and droughts: what happens when it doesn't rain? In his book Late Victorian Holocausts, Mike Davis described the rise of Western meteorological science and its discovery of global weather patterns[14]. At the turn of the 19th century, drought occurred simultaneously in north-east Brazil, Egypt, India and China, related to the El Niño Southern Oscillation. Davis argued that the occasional failure of rains was a natural phenomenon and people had devised ways of sharing food and other resources to deal with these times of dearth. Droughts turned into famines because of colonialism and its policy of conscripting cultivators into growing cash crops rather than food. Writing at the turn of the millennium, before global warming had begun to be widely discussed, Davis could still describe drought as a natural phenomenon. Twenty-five years later, we know that the incidence and character of drought has been forever altered by our actions. Drought and rain are now partly human-made phenomena, more uncertain than ever before. We have disrupted the Monsoon. And our capacity to deal with the consequences of this change—preventing droughts from spiralling into famines, stopping floods from sweeping away the lives and livelihoods of millions—is compromised by the same shortsighted pursuit of private gains that created the problem in the first place.

Are we destined to live out the rest of our lives in this dystopia? Or can we rescue ourselves and others from the worst of what lies before us? I don't know. But I do know whose side I am on: the activists working indefatigably to save the Yamuna floodplains from encroachment, those helping neighbourhoods recharge groundwater, those who campaign to keep pavements from being concretised so that the rain can soak in. Then there are those who strive tirelessly so that decent housing, food, wages, healthcare, and education are available to all. Only when the working classes have the rights and resources to live a fuller life can they be resilient in the face of whatever climate change throws our way. Global warming is a 'binding crisis'—one that affects everyone, irrespective of who they are. It ought to bring people together in concerted action[15]. Yet it is more likely to deepen the fissures between people. Just as the degree of culpability in causing the climate crisis varies widely across the world and within countries, so does the ability to weather its effects. Who gets to eat onion fritters and enjoy the rains from the security of their house, and who struggles to fix a leaky tarpaulin roof so that their meagre possessions stay dry—the Monsoon has always been different for different people. Only now, it will be all the more so. Perhaps, as that dissonance sharpens, it may precipitate a vision of ecological justice that gathers strength and grows into a river and an ocean of social change.

12 Baviskar, 2020. Chapter 6: The River, pp. 141-167.

13 Timothy Mitchell. 2002. *Rule of Experts: Egypt, Techno-Politics, Modernity.* Berkeley, CA: University of California Press. Chapter 1: Can the Mosquito Speak? pp. 19-53.

14 Mike Davis. 2000. *Late Victorian Holocausts: El Niño Famines and the Making of the Third World.* London: Verso.

15 In *The Great Derangement*, Amitav Ghosh argues that such collective action could come from organised religions since they provide the spiritual wellspring for a critique of capitalism. Amitav Ghosh. 2016.*The Great Derangement: Climate Change and the Unthinkable*. Delhi: Penguin Books.

## CONSTRUIRE LA VILLE DURABLE PAR NOUS-MÊME

## BUILDING A SUSTAINABLE CITY OURSELVES

**VO**

L'Afrique est aujourd'hui le continent qui connaît la plus grande poussée démographique avec une urbanisation grandissante. Selon les projections de l'OECD le continent africain accueillera, d'ici 2050, 950 millions de nouveaux citadins[1-2]. À l'heure où le monde a pris conscience du changement climatique, des limites des énergies fossiles et surtout de la nécessité de repenser nos modes de consommation et de production, les établissements humains en Afrique vont devenir le lieu où va se jouer la production du monde demain. Les villes africaines se sont construites par des politiques de planification coloniales et post-indépendance, qui répliquent des paradigmes urbains occidentaux et ont souvent échoué à accommoder les modes de vies uniques africains et aussi prévoir cet accroissement démographique. On le voit aux inondations répétées dans les capitales africaines ou dans la persistance de bidonvilles intra-urbains. Par nécessité et pragmatisme, les habitants ont développé une attitude d'adaptabilité, résilience et inventivité qui sont riches en enseignements pour construire la ville durable de demain. Ces formes d'architectures vernaculaires et de savoirs endogènes nous renseignent sur des principes d'économies, adaptabilité, résilience et empouvoirement puisés dans nos cultures traditionnelles et contemporaines.

1 *Africa's Urbanisation Dynamics* 2020 (2020) Published by OECD

2 Mae-ling Lokko, Frederick Wireko Manu, Nzinga Mboup, Mohamed Aly Etman, Marco Raugei, Ibrahim Niang, Kingdom Ametepe, Rosemary Sarfo-Mensah. *Comparing the whole life cycle carbon impact of conventional and biogenic building materials across major residential typologies in Ghana and Senegal*, Sustainable Cities and Society, Volume 106, 2024

**EN**

Today, Africa is the continent experiencing the greatest demographic growth, with increasing urbanisation. According to OECD projections, by 2050 the African continent will be home to 950 million new city dwellers[1-2]. At a time when the world has become aware of climate change, the limits of fossil fuels and above all the need to rethink our modes of consumption and production, human settlements in Africa will become the place where tomorrow's world production will be played out.

African cities were built by colonial and post-independence planning policies, which replicated Western urban paradigms and often failed to accommodate unique African lifestyles and anticipate demographic growth. This can be seen in the repeated flooding of African capitals and the persistence of intra-urban shanty towns. Out of necessity and pragmatism, the residents have developed an attitude of adaptability, resilience and inventiveness that is a rich source of lessons for building the sustainable city of tomorrow. These forms of vernacular architecture and endogenous knowledge tell us about the principles of saving, adaptability, resilience and empowerment drawn from our traditional and contemporary cultures.

1 *Africa's Urbanisation Dynamics* 2020 (2020) Published by OECD

2 Mae-ling Lokko, Frederick Wireko Manu, Nzinga Mboup, Mohamed Aly Etman, Marco Raugei, Ibrahim Niang, Kingdom Ametepe, Rosemary Sarfo-Mensah. *Comparing the whole life cycle carbon impact of conventional and biogenic building materials across major residential typologies in Ghana and Senegal*, Sustainable Cities and Society, Volume 106, 2024

# Nzinga Biegueng Mboup *Senegal*

### LE SEAU ET LA LUTTE CONTRE LE GASPILLAGE DE L'EAU.

La question de la gestion de l'eau est critique aussi bien dans un contexte de désertification et de sécheresse accrue ou de fortes pluies et inondations, que l'on observe de plus en plus. Plus de 300 millions de personnes n'ont pas accès à l'eau potable[3]. Les coupures d'eau font partie du quotidien de beaucoup d'Africains, y compris les capitales et métropoles. Cette réalité pousse les ménages africains à utiliser des seaux (ou bassines) comme objets essentiels de leur quotidien.
Cet outil est un instrument de mesure et de contrôle de la quantité d'eau utilisée. Une personne peut se doucher avec 7L d'eau, faire la vaisselle avec 6L d'eau, tirer la chasse d'eau avec un seau de 10L et laver le linge avec 20 à 30L d'eau. Avec 40-50L d'eau par jour (dont la moitié n'a pas besoin d'être potable), on peut largement subvenir à nos tâches quotidiennes. Comparé à une consommation moyenne d'eau de 450L par personne par jour aux États-Unis ou 150L par personne par jour en France[4], le citadin africain a déjà adopté les gestes qui permettraient d'atténuer le stress hydrique à échelle globale.
Il reste important de protéger les ressources en eau et d'adopter une politique anti-gaspillage dans les usages domestiques et personnels afin que nos ressources hydriques puissent être déployées dans des domaines plus critiques liés à la subsistance, tels que l'agriculture non-intensive, l'élevage ou le domaine médical.

### THE BUCKET AND THE FIGHT TO SAVE WATER

The issue of water management is critical, whether in a context of desertification and increased drought, or of heavy rainfall and flooding, which we are seeing more and more. More than 300 million people have no access to drinking water[3]. Water cuts are part of everyday life for many Africans, including capital cities and metropolises. As a result, African households use buckets (or basins) as essential items in their daily lives. This tool is used to measure and control the amount of water used. A person can shower with 7 litres of water, wash dishes with 6 litres of water, flush the toilet with a 10 litre bucket and wash clothes with 20 to 30 litres of water. With 40-50 litres of water a day (half of which doesn't need to be drinkable), we can more than cover our daily needs. Compared with the average water consumption of 450 litres per person per day in the United States or 150 litres per person per day in France[4], African city dwellers have already adopted measures that would help to reduce water stress on a global scale.

It remains important to protect water resources and adopt a no-waste policy for domestic and personal use, so that our water resources can be deployed in more critical areas linked to subsistence, such as non-intensive agriculture, livestock farming or the medical field.

*Le seau.* Photo par Katia Golovko. Dakar, 2022
*The bucket.* Photo by Katia Golovko. Dakar, 2022

### THE CARETAKER'S CHAIR AND THE CULTURE OF REPAIR

The culture of reuse, recycling and repair can be seen on a daily basis in African cities. With the culture of industrial manufacturing still in its infancy[5], many everyday accessories are imported. Given this context and the precarious economic situation, the culture of repair and reuse is a way of extending the life cycle of an object. This caretaker's chair (pictured below) shows how a simple plastic chair has been reinforced with wood to make it more robust for permanent use. There are many transformed and adapted objects that not only put us in a circular economy, they also demonstrate the ingenuity born in a context of scarce resources and optimisation of the existing.

This example leads us not only to question mass consumption, but also the dependence of African countries on imports of

3 Bazié, J. (2014*). Accès à l'eau : l'Afrique entre abondance et pénurie. Après-demain*, 31-32, NF, 28-29. https://doi.org/10.3917/apdem.031.0028

4 *Consommation domestique en eau potable* –Notre environnement. République Française https://www.notre-environnement.gouv.fr/themes/societe/le-mode-de-vie-des-menages-ressources/article/consommation-domestique-en-eau-potable

5 «Between 2011-2013, manufactured products accounted for just 18.5% of exports, while 62% of all imports were manufactured products». African Development Bank Group. https://www.afdb.org/fr/the-high-5/industrialize-africa

LA CHAISE DU GARDIEN ET LA CULTURE DE LA RÉPARATION.
La culture du réemploi, du recyclage et de la réparation sont visibles au quotidien dans les villes africaines. La culture de la fabrication industrielle étant encore émergente[5], beaucoup d'accessoires du quotidien sont importés. Face à cette donne et face à la précarité économique, la culture de la réparation et du réemploi est un moyen d'étendre le cycle de vie d'un objet. Cette chaise d'un gardien de résidence (photo ci-dessous) montre comment une simple chaise en plastique a été renforcée avec du bois pour la rendre plus robuste pour un usage permanent. On retrouve beaucoup d'objets transformés et adaptés, qui non seulement nous placent dans une économie circulaire, mais démontrent aussi l'ingéniosité née dans un contexte de rareté des ressources et d'optimisation de l'existant. Cet exemple nous amène à non seulement remettre en question la consommation de masse, mais aussi la dépendance des États africains envers les importations de produits venant de l'étranger. Au-delà de la production de biens matériels, la question de l'entretien pèse beaucoup sur le bilan carbone, ainsi la capacité à réparer ou transformer devrait devenir un critère central de nos modes de consommation pour ne pas tomber dans une importation de masse de produits à usage unique (certains types de plastiques) qui finiront dans des décharges, contribuant à la pollution et aux émissions de gaz à effet de serre. Cette frugalité créative doit également s'étendre au secteur de la construction, responsable de près de 42% des émissions de gaz à effet de serre à l'échelle mondiale[6]. L'urbanisation galopante des villes africaines, dominée par le béton, impose une réflexion autour de modes alternatifs de récupération de l'espace, plus respectueux de l'environnement tout en remettant l'humain au centre.

*Chaise de gardien.*
Photo par Nicolas Rondet.
Dakar, 2017
*Caretaker chair.*
Photo by Nicolas Rondet.
Dakar, 2017

products from abroad. Over and above the production of material goods, the issue of maintenance has a major impact on our carbon footprint, so the ability to repair or transform should become central in our consumption patterns to avoid the mass importation of single-use products (certain types of plastic) that will end up in landfill sites, contributing to pollution and greenhouse gas emissions.

This creative frugality must also extend to the construction sector, which is responsible for almost 42% of greenhouse gas emissions worldwide[6]. Dominated by concrete, the rampant urbanisation of African cities is forcing us to think about alternative ways of reclaiming space that are more respectful to the environment while putting people back at the centre.

LA CABANE EN BOIS : VERNACULAIRE URBAIN ET MULTITUDES DES RESSOURCES MATÉRIELLES DE LA VILLE
Les architectures vernaculaires du Sénégal telles que présentées dans l'ouvrage *L'habitat traditionnel au Sénégal : Etude de l'habitat rural*[7] démontrent une variété de typologies de logements traditionnels construits avec les matériaux de proximité tels que la paille, la pierre, la terre et du bois pour les éléments de structure (charpente, planchers). La cabane en bois ne figure pas dans les constructions traditionnelles (précoloniales) du Sénégal, pourtant elle apparaît au début du XXe siècle dans des anciennes capitales coloniales telles que Saint Louis et Dakar[8].

THE WOODEN HUT: URBAN VERNACULAR AND THE MULTITUDE OF MATERIAL RESOURCES IN THE CITY
The vernacular architecture of Senegal as presented in the book *L'habitat traditionnel au Sénégal: Etude de l'habitat rural*[7] shows a variety of traditional housing types built using local materials such as straw, stone, earth and wood for the structural elements (framework, floors). The wooden hut does not feature in Senegal's traditional (pre-colonial) buildings, although it did appear at the beginning of the 20th century in former colonial capitals such as Saint Louis and Dakar[8].

These wooden huts are a type of accommodation for Africans/indigenous people (in the Medina district of Dakar, for example) and for workers looking for work. They are made of wood from crates used in rail transport and roof tiling. The materiality of these huts echoes the traditional vernacular in its use of local materials, in this case salvaged materials to meet a specific demand for housing in an urban context. These houses were built by the residents and were even often physically moved during eviction policies.

5 « Entre 2011-2013, les produits manufacturés représentaient seulement 18,5 % des exportations, tandis que 62 % de l'ensemble des importations étaient des produits manufacturés ». Groupe de la Banque africaine de développement. https://www.afdb.org/fr/the-high-5/industrialize-africa

6 R. Crawford, *Life cycle assessment in the built environment*, Taylor & Francis (2011) https://www.architecture2030.org/why-the-built-environment/

7 Dujaric P, *L'habitat traditionnel au Sénégal : Etude de l'habitat rural*, Ecole d'Architecture et d'Urbanisme de Dakar, 1976

8 Saint Louis a été la capitale de l'Afrique occidentale française entre 1895 et 1902 et Dakar de 1902 jusqu'en 1960, année de l'Indépendance.

6 R. Crawford, *Life cycle assessment in the built environment*, Taylor & Francis (2011) https://www.architecture2030.org/why-the-built-environment/

7 Dujaric P, *L'habitat traditionnel au Sénégal : Etude de l'habitat rural*, Ecole d'Architecture et d'Urbanisme de Dakar, 1976

8 Saint Louis was the capital of French West Africa between 1895 and 1902, and Dakar from 1902 until 1960, the year of independence.

Ces cabanes en bois sont des typologies de logement pour les Africains/autochtones (dans le quartier de la Médina à Dakar, par exemple) et pour les travailleurs à la recherche de travail. Elles sont constituées de bois issus de caissons utilisés dans le transport ferroviaire et de toitures en tuiles. La matérialité de ces cabanes fait écho au vernaculaire traditionnel dans son usage des matériaux de proximité, en l'occurrence des matériaux de récupération pour répondre à une demande spécifique de logement dans un contexte urbain. Ces maisons étaient construites par les habitants et même souvent déplacées physiquement lors des politiques d'expulsion.

*Cabanes en bois.* Medina Dakar, 2022
*Wooden huts.* Medina Dakar, 2022

On voit toujours des cabanes voir le jour sur des parcelles vides, occupées par des populations défavorisées qui ont la possibilité de les ériger en un ou deux jours. Une cabane de 2.5m x 3m coûte entre 200 et 250 euros avec transport et assemblage.
Cette tendance à la récupération se manifeste aussi dans la démolition des bâtiments où les profilés des portes et fenêtres en aluminium sont récupérés et nourrissent une industrie de la fonte, qui les revalorise en marmites et ustensiles de cuisine. Il en est de même pour les ferraillages d'acier de béton armé ou la robinetterie en laiton, recyclés dans des unités de production nichées dans la ville de Dakar. La récupération et le recyclage créent de vraies économies citadines qui limitent la production des déchets et voient des opportunités dans les possibilités infinies de transformation de la matière. La ville est ainsi une mine perpétuelle où la ressource est changeante mais les dynamiques de transformation sont perpétuelles, inscrivant la construction dans des cycles de vie vertueux.

LA CONSTRUCTION EN TERRE : UNE TECHNIQUE ANCESTRALE POUR L'EMPOUVOIREMENT DES PERSONNES
Si l'analyse de cycle de vie dans la construction confère une grande vertu à la récupération et au recyclage, il n'en demeure pas moins que beaucoup de matériaux recyclés, tels que le plastique, l'aluminium et l'acier, ont une forte énergie grise et ne sont pas originellement produits au Sénégal ou dans d'autres pays africains de la sous-région. Pour créer de la résilience face aux changements climatiques, il est plus que pertinent de se pencher vers des matériaux de construction

Shacks are still springing up on empty plots of land, occupied by disadvantaged people who can erect them in a day or two. A 2.5m x 3m hut costs between €200 and €250, including transport and assembly.

This trend towards recycling can also be seen in the demolition of buildings, where aluminium window and door sections are recycled and fed into a cast-iron industry that turns them into cooking pots and utensils. The same applies to steel frameworks for reinforced concrete and brass pipework, recycled in production units in the city of Dakar. Recovering and recycling create real urban economies that reduce waste production and see opportunities in the infinite possibilities for transforming materials. In this way, the city is an infinite resource where supplies change but the dynamics of transformation are perpetual, making construction part of our virtuous life cycles.

EARTH CONSTRUCTION: AN ANCESTRAL TECHNIQUE FOR HOUSING PEOPLE
While life-cycle analysis in the construction industry gives great credit to recovery and recycling, the fact remains that many recycled materials, such as plastic, aluminium and steel, have a high grey energy content and are not originally produced in Senegal or other African countries in the sub-region. To be resilient when facing climate change, it makes more sense to look to biobased construction materials. In Senegal, as in many other African countries, it is rare to see earth-built buildings, and the perception of many is that this material is confined to the rural world or to the past. The cob technique, for example, involves making balls of

*Chantier d'une maison d'hôtes en bauge.*
Photo par Nzinga B. Mboup. Casamance, 2021
*Building site for a traditional cob guest house.*
Photo by Nzinga B. Mboup. Casamance, 2021

damp earth by hand and tamping them down according to a plan to make layers 40-50cm high which are dried in the sun for five days, waiting for the next weekend when an extra layer is added. After four weekends, the wall is 2 m high and the lintels for the doors and windows, with the rowan tree

biosourcés. Au Sénégal, comme dans beaucoup d'autres pays africains, il est rare de voir des constructions en terre, et la perception de beaucoup est que ce matériau est cantonné au monde rural ou au passé. La technique de la bauge, par exemple, consiste à faire des boules de terre humides à la main et de les tasser suivant un tracé de plan pour en faire des couches de 40-50cm de haut qui sont séchées au soleil pendant cinq jours, en attendant le prochain week-end où une couche supplémentaire est rajoutée. Au bout de quatre week-ends, le mur atteint 2m de haut et les linteaux de portes et fenêtres avec le rônier coupé sont posés. Une ou deux couches plus tard, la charpente de toit peut déjà être posée et la paille de riz est ensuite placée pour faire le toit de chaume. Loin de la ville, les traditions de construction en terre ont été préservées dans certaines localités du pays, et ont la capacité d'être adaptées à des typologies contemporaines. Loin de ressembler à la case à impluvium traditionnelle, ces constructions emploient une même technique ancestrale ; ainsi cette maison d'hôtes aux murs rectilinéaires est construite avec la matière et main d'œuvre trouvées sur place. Elle permet surtout à l'habitant de retrouver de l'auto-détermination en façonnant lui-même son habitat avec des matériaux naturels qui sont réutilisables et qui créent des bâtisses plus adaptées au climat tropical. En la construisant avec ses pairs, la transmission du savoir-faire s'opère, permettant non seulement la réplicabilité des techniques ancestrales tout en leur permettant d'entretenir leurs maisons.

*Test de cigares de terres argileuses.* Photo par Oumar Sanoko. Sénégal, 2024
*Testing clay cigars.* Photo by Oumar Sanoko. Senegal, 2024

LES ATELIERS DE CONSTRUCTION EN TERRE ARGILEUSE ET LA DÉMOCRATISATION DES SAVOIR-FAIRE

Au cours de ces dernières années, on assiste à un essor de la construction en terre crue où différents architectes contribuent à la production de bâtisses en terre crue et autres matériaux biosourcés au sein de la ville même. Bien que ceci contribue à déconstruire la perception que la terre n'est pas un matériau rural, ces bâtisses sont construites utilisant des techniques qui ne sont pas à la portée de tout le monde. La BTC (brique de terre comprimée), qui est la technique la plus utilisée dans ces exemples, exige d'avoir une presse bien calibrée. Cette année, nous avons travaillé pour mettre sur pied des ateliers d'apprentissage de la terre argileuse afin de contribuer à la dissémination des compétences techniques liées à la conception et exécution de bâtiments faisant recours à des matériaux géo (terre) et biosourcés (fibres végétales). Lors des ateliers, les participants sont exposés à la diversité de terres en termes de couleurs, granulométrie, plasticité. On leur présente les différents tests qui permettent de caractériser ces différentes terres avant de déterminer leurs usages, qui varient de la confection de briques adobes à la mise en œuvre d'enduits pour la construction. Les terres argileuses ont été sourcées à moins de 60km de Dakar, notamment dans la commune de Sébikhotane. Il en est de même pour le typha, cette plante aquatique invasive qui sert d'isolant thermique, sourcée dans les lacs à la sortie de la capitale. Ces ateliers mettent en œuvre un apprentissage de la terre axé sur l'observation de la matière en engageant tous les sens tels que la vue, l'odorat et le toucher pour déterminer les propriétés des terres argileuses. L'analyse de ces terres en fonction de leur plasticité et degré d'humidité, détermine leurs mises en œuvre dans la construction et permet une grande adaptabilité selon le besoin et l'argile disponible. Par exemple, si on perçoit des fissures sur un enduit fait avec une terre trop argileuse, on peut facilement le corriger en ajoutant au mélange de la fibre ou du sable. Avant d'obtenir le bon dosage, on se prête à un processus itératif qui fait appel à notre intuition, empirisme, et, à terme, nourrit des réflexes de bonne pratique.

La technique de l'adobe et les enduits en terre ne demandent pas de machines spécifiques, juste des outils usuels tels que seaux, truelles et moules. La terre argileuse des briques n'est pas stabilisée (contrairement à la BTC) et peut être réutilisée autant qu'on le souhaite. Ces techniques, également appelées 'low-tech', portent en elles un vrai potentiel de démocratisation.

CONCLUSION

Comment construire la ville africaine de demain pour qu'elle soit adaptée aux réalités des habitants sans compromettre le bien-être des générations futures ? Ce défi nous pousse à employer des modes de vie qui ne gaspillent pas les ressources que nous avons, et à puiser l'inspiration dans nos histoires urbaines et rurales, riches en exemples d'inventivité et d'utilisation de la matière locale, et moins polluante. La transmission des savoirs ancestraux peut s'opérer dans le cadre urbain et il est de notre ressort, en tant qu'architectes et citoyens africains, de réfléchir à des modèles de construction vertueux et démocratiques afin que les habitants puissent s'approprier la ville et l'entretenir. Pour ceci, les modèles doivent se nourrir de l'intelligence collective qui a produit des solutions déjà manifeste dans notre quotidien. La culture de résilience, d'adaptabilité et de créativité du continent le plus jeune, centrée sur l'humain comme agent de son environnement, sont les meilleurs outils pour œuvrer pour un développement durable.

cut to size, are installed. One or two layers later, the roof framework can be laid and the rice straw is then put on top for the thatched roof.

Far from the cities, earth building traditions have been preserved in some parts of the country, and can be adapted to modern typologies. Far from resembling the traditional impluvium hut, these constructions use the same ancestral technique; this guest house with its rectilinear walls is built with materials and labour found on site. Above all, it allows residents to regain their self-determination by shaping their own homes using natural materials that can be reused, creating buildings that are better suited to the tropical climate. By building it with their peers, the expertise is passed on, enabling them not only to replicate ancestral techniques but also to maintain their homes.

CLAY CONSTRUCTION WORKSHOPS AND THE DEMOCRATISATION OF SKILLS

In recent years, there has been a boom in raw earth construction, with various architects contributing to the production of buildings in raw earth and other bio-sourced materials within the city itself. Although this helps breakdown the perception that earth is not a rural material, these buildings are constructed using techniques that are not available to everyone. Making compressed earth blocks (CEB), the technique most commonly used in these examples, requires a well-calibrated press.

This year, we have been working to set up clay apprenticeship workshops to help teach the technical skills for designing and constructing buildings using geo (earth) and biosourced (plant fibre) materials. During the workshops, participants are exposed to the diversity of soils in terms of colour, grain size and plasticity. They are shown the various tests used to characterise these different types of earth before determining their uses, which range from making adobe bricks to applying plaster for construction. The clay soils were sourced less than 60km from Dakar, notably in the town of Sébikhotane. The same applies to typha, an invasive aquatic bulrush that acts as a thermal insulator, sourced from lakes just outside the capital. These workshops focus on learning about clay by observing the material and using all the senses - sight, smell and touch - to determine the properties of clay. The analysis of these clays according to their plasticity and degree of humidity determines their use in construction and allows great adaptability, depending on need and availability. For example, if you notice cracks in a rendering made with clay that is too rich, you can easily correct them by adding fibre or sand to the mixture. Before we get the right balance, we go through an iterative process that calls on our intuition and empiricism, and ultimately nurtures reflexes of good practice. The adobe technique and earth plasters do not require any specific machinery, just the usual tools such as buckets, trowels and moulds. The clay in the bricks is not stabilised (unlike CEB) and can be reused as often as required. These low-tech techniques have real potential for democratisation.

*Fabrication d'adobes.* Photo par Oumar Sanoko. Sénégal, 2024
*Adobe production.* Photo by Oumar Sanoko. Senegal, 2024

CONCLUSION

How can we build the African city of tomorrow so that it is adapted to the realities of its inhabitants without compromising the well-being of future generations?

This challenge urges us to adopt lifestyles that do not waste the resources we have, and to draw inspiration from our urban and rural histories, which are rich in examples of inventiveness and use of local, less polluting materials. Ancestral knowledge can be passed on in the urban context, and it is up to us, as architects and African citizens, to think about virtuous and democratic construction models so that the inhabitants can take ownership of the city and maintain it. To achieve this, the models must draw on the collective intelligence that has produced solutions that are already evident in our daily lives. The youngest continent's culture of resilience, adaptability and creativity, centred on people as agents of their environment, are the best tools for working towards sustainable development.

Maison en terre à Dakar, conçue par Worofila.
Photo par Sylvain Cherkaoui. Sénégal, 2023
*Earth house in Dakar, designed by Worofila*
Photo by Sylvain Cherkaoui. Senegal, 2023

## COMMENT SOIGNER NOTRE ÉCO-ANXIÉTÉ ?

VO

Face au flot quotidien de mauvaises nouvelles concernant l'état de la planète, comment ne pas éprouver de l'anxiété, de la peur ou de l'angoisse ? Et que faire alors contre de tels malaises ? Si l'on se fie aux travaux sur le stress menés par le neurobiologiste Henri Laborit, il semble en tout cas essentiel de ne pas laisser perdurer la situation. Au terme de diverses expériences menées sur le sujet, Laborit aboutissait en effet à deux constats clairs, magistralement mis en images d'ailleurs par Alain Resnais dans *Mon oncle d'Amérique* (1980). Premièrement, le stress répété est potentiellement très dangereux pour l'animal, y compris pour l'être humain bien sûr. Une telle situation finit par perturber son système immunitaire et son système cardio-vasculaire. Deuxièmement, pour ne pas risquer de développer des pathologies plus ou moins graves en pareil cas, le meilleur des remèdes, assurait Laborit, est la fuite. Il faut tout simplement s'éloigner autant que faire se peut de la source de stress en question[1]. Mais, comment échapper à la catastrophe écologique en cours et à ses diverses manifestations ? Il n'y a actuellement aucun endroit sur Terre où l'on peut se considérer véritablement à l'abri de cette catastrophe[2]. Même si c'est avec des intensités variables selon les endroits, le dérèglement climatique affectera l'ensemble du globe et des êtres vivants qui l'habitent. Par ailleurs, certaines pollutions sont déjà présentes tout autour de la planète. C'est le cas en particulier des microplastiques que l'on retrouve aussi bien dans les glaces de l'Antarctique que dans nos intestins. Même chose pour un certain nombre de particules chimiques, qui saturent nos milieux de vie et viennent déjà perturber gravement un autre système régulateur de nos corps : le système endocrinien. Plusieurs « maladies de civilisation » qui affectent un nombre grandissant d'entre nous et fragilisent aujourd'hui nos systèmes de santé y trouvent l'une de leurs causes[3].

Toutefois, à la différence des rats sur lesquels Laborit a mené ses expériences, les humains ont à leur disposition une autre stratégie de fuite face à une situation stressante : celle qui consiste à s'en échapper mentalement. A défaut de modifier le monde dans lequel nous nous trouvons plongés, il reste toujours possible de modifier la conscience que nous avons de ce monde. Et nous avons développé toutes sortes de moyens d'y parvenir. Outre les drogues légales et illégales dont la consommation peut nous aider à mieux supporter le stress de la vie quotidienne, nous pouvons aussi nous discipliner de diverses manières pour envisager de façon moins anxiogène notre monde, en pratiquant la pensée positive ou certaines formes de méditation. Autre option encore : s'échapper dans des mondes imaginaires. L'art nous en offre à foison. Mais, le cyberespace également. Enfin, il est possible de ne prêter l'oreille qu'à des « histoires » rassurantes, c'est-à-dire à des lectures de la réalité qui viennent atténuer le caractère anxiogène des nouvelles que nous recevons sur l'état de notre planète. C'est le cas des discours qui promeuvent le « développement durable », la « croissance verte », la « transition énergétique », l'« économie circulaire » ou la « redirection écologique ». Tout en reconnaissant le péril écologique, ces histoires nous assurent que le pire pourra être évité, sans pour autant remettre en question notre civilisation. Comme les contes pour enfants, elles aident à dormir. D'où leur succès considérable.

La fuite intérieure présente deux avantages indéniables. Elle est relativement facile à pratiquer et s'avère plutôt efficace pour demeurer soi-même en bonne santé, si l'on en croit Laborit toujours. Le problème est que pendant que nous fuyons de la sorte dans l'imaginaire, la catastrophe reste bien réelle, et se poursuit d'autant plus facilement que nous ne lui opposons aucune résistance, puisque nous sommes en quelque sorte ailleurs. Par conséquent, elle risque bien de finir par nous rattraper et nous sortir brutalement de l'espèce de torpeur dans laquelle nous nous maintenons. Que faire alors, si aucune sorte de fuite n'est possible ? Il est essentiel, soutenait Laborit, de ne pas sombrer dans « l'inhibition de l'action », cette sorte de paralysie imposée par la conviction qu'il n'y a plus rien à faire contre les maux qui nous accablent. C'est dans cet état en effet que se développent certaines

1 Henri Laborit, *Éloge de la fuite*, Paris, Folio, 1976.

2 Voir notamment la série d'études sur les limites planétaires réalisées au sein du Stockholm Resilience Centre, dont les principaux résultats sont vulgarisés dans : Aurélien Boutaud, Natacha Gondran, *Les limites planétaires*, Paris, La découverte (Repères), 2020.

3 André Cicolella, *Toxique planète*, Paris, Seuil, 2013.

## HOW CAN WE TREAT OUR ECO-ANXIETY?

EN

Faced with the daily flood of bad news about the state of the planet, how can we not feel concerned, afraid or anxious? What can be done about this anxiety? If the work on stress carried out by the neurobiologist Henri Laborit is anything to go by, it is essential not to let the situation continue. After various experiments on the subject, Laborit came to two clear conclusions, masterfully illustrated by Alain Resnais in My American Uncle (1980). Firstly, repeated stress is potentially very dangerous for animals, including humans of course. A stressful situation ultimately disrupts the immune and cardiovascular systems. Secondly, to avoid the risk of developing more or less serious pathologies in such cases, according to Laborit, the best remedy is flight. You simply need to get as far away as possible from the source of the stress in question[1].

But how can we escape the current ecological disaster and its various manifestations? There is currently no place on Earth where we can consider ourselves truly safe from this catastrophe[2]. Even if the intensity varies from place to place, climate disruption will affect the entire globe and the living beings that inhabit it. Furthermore, some forms of pollution are already present all around the world. This is particularly true of microplastics, which can be found both in the Antarctic ice and in our intestines. The same applies to a number of chemical particles, which saturate our living environments and are already seriously disrupting another of our bodies' regulatory systems: the endocrine system. Many of the lifestyle diseases that affect a growing number of us and are undermining our healthcare systems today have one of their causes in this area[3].

However, unlike the rats on which Laborit conducted his experiments, humans have another escape strategy when faced with a stressful situation: mental escape. If we cannot change the world in which we find ourselves, we can always change our awareness of it. And we have developed all sorts of ways of achieving this. As well as legal and illegal drugs, which can help us cope better with the stresses of everyday life, we can also discipline ourselves in various ways to take a less anxiety-inducing approach to our world, by practising positive thinking or certain forms of meditation. Another option is to escape into imaginary worlds. Art is full of them. And cyberspace too. Finally, we can focus only on reassuring 'stories', realities that reduce the anxiety-inducing nature of the news we receive about the state of our planet. This is the case with information promoting "sustainable development", "green growth", "energy transition", the "circular economy" or "ecological redirection". While acknowledging the ecological dangers we face, these stories reassure us that the worst can be avoided, without calling our civilisation into question. Like children's stories, they help you sleep. Hence their considerable success.

Internal flight offers two undeniable advantages. It's relatively easy to practise and, if Laborit is to be believed, it's a pretty effective way of keeping yourself in good health. The problem is that while we are escaping into our imaginary world, the catastrophe remains very real, and continues all the more easily because we are not putting up any resistance to it, since we are in some way elsewhere. As a result, it may well end up catching up with us and jolting us out of the torpor in which we keep ourselves. So what can you do if fleeing is not possible? Laborit argued that it was essential not to fall into "inhibition of action", a kind of paralysis imposed by the conviction that there was nothing we could do about the ills that overwhelm us. It is in this state that certain diseases develop, such as high blood pressure, cancer, depression and many others. So how can we avoid somatisation?

### FIGHT YES, BUT FIGHT WHAT?

The experiments carried out by the author of In praise of flight suggest a possible solution. They reveal that two rats subjected to small electric shocks in the same cage will tend to fight each other. Of course, this fight does not eliminate the cause of their torment but it does seem to prevent them

1 Henri Laborit, *In praise of flight*, Paris, Folio, 1976.

2 See in particular the series of studies on planetary limits carried out by the Stockholm Resilience Centre, the main results of which are presented in: Aurélien Boutaud, Natacha Gondran, *Les limites planétaires*, Paris, La découverte (Repères), 2020.

3 André Cicollela, *Toxique planète*, Paris, Seuil, 2013.

pathologies telles que l'hypertension artérielle, le cancer, la dépression et bien d'autres encore. Comment donc éviter la somatisation ?

SE BATTRE, MAIS CONTRE QUOI ?
Les expériences menées par l'auteur d'*Éloge de la fuite* suggèrent une piste de solution. Elles révèlent en effet que deux rats soumis à de petits chocs électriques dans une même cage vont avoir tendance à se battre l'un contre l'autre. Cette lutte, évidemment, ne fait pas disparaître la cause de leurs tourments, mais semble leur permettre de ne pas développer de pathologie, contrairement aux rats qui subissent seuls la même situation. Pour ne pas somatiser, il faudrait donc se battre. Contre l'éco-anxiété, soyons d'abord « éco-furieux », comme nous y invite Frédéric Lordon, ce qui devrait au moins nous éviter de tomber malade. Reste à savoir contre qui se battre. C'est là sans doute qu'un autre danger nous guette, celui de se tromper de cible. Parmi les erreurs courantes en la matière, il y a celle qui consiste, en Occident, à attribuer par exemple l'origine de nos horreurs écologiques aux « Chinois », dont l'industrie est présumée trop polluante, tout en oubliant que nous sommes les premiers consommateurs des produits de celle-ci. Plus grave encore peut-être, il y a aussi ce discours omniprésent, en Occident toujours, qui dénonce l'humanité elle-même, et soutient que la meilleure manière d'affronter le péril écologique serait de ne plus avoir d'enfants ou d'en faire moins…

Notons d'abord que cette dernière proposition a quelque chose de paradoxal. La lutte écologique n'a pas pour objectif de « sauver la planète ». Celle-ci n'est pas en danger. L'enjeu est de protéger le monde vivant, et en particulier l'humanité. N'est-ce pas contradictoire alors de prétendre assurer l'avenir de notre espèce en nous invitant à cesser de nous reproduire ? Mais, il s'agit surtout d'une fausse piste. L'analyse historique met clairement en évidence que la cause de la catastrophe écologique n'est pas démographique - pas d'abord démographique, en tout cas. Depuis deux siècles, le nombre d'humains peuplant la Terre a effectivement augmenté de manière considérable, passant d'environ 800 millions d'individus en 1800 à quelque 8 milliards actuellement. Toutefois, les quantités d'énergie et de matière mobilisées par ces mêmes humains au cours de cette période ont cru à un rythme bien plus rapide, de même que les quantités de capitaux accumulés et de déchets produits[4]. Ces données suggèrent qu'une autre force que celle du nombre est en cause dans ce grand bouleversement écologique. De quoi s'agit-il ?

Cette force porte le nom de « croissance économique ». Elle consiste, pour une population humaine donnée, à produire et à vendre, d'année en année, toujours plus de marchandises. Elle semble s'être emparée des nations européennes à partir de la fin de l'époque médiévale, avant d'étendre sa domination sur la presque totalité des sociétés humaines aujourd'hui. Son action est généralement considérée comme une condition nécessaire de l'amélioration du bien-être des humains. Toutefois, produire toujours plus de marchandises implique de consommer toujours plus de matière et d'énergie, et de générer toujours plus de déchets, ce qui finit par dégrader les conditions d'habitabilité de la Terre, au point même de menacer l'avenir de notre espèce. Les promesses de « croissance verte » ou « propre » n'ont jusqu'à ce jour jamais été tenues et semblent bien loin de pouvoir être tenues dans un avenir proche[5]. Il serait prudent par conséquent de vouloir y mettre un frein. S'il faut se battre pour guérir de notre éco-anxiété ou de notre éco-angoisse, c'est donc contre cette course à la croissance qu'il conviendrait de se lever, d'autant qu'elle pose bien d'autres problèmes, notamment sur le plan social et politique. Tel est le sens de l'appel lancé dans l'espace public, il y a maintenant un peu de plus de vingt ans, en faveur d'une « décroissance soutenable » ou « conviviale »[6].

D'OÙ VIENT LE PROBLÈME ?
Comment mener cette bataille ? Pour espérer la gagner, il importe d'identifier d'où vient cette force ou ce qui la fonde. L'explication la plus fréquente, que vient cautionner la science économique orthodoxe, consiste à loger l'origine de la croissance économique dans la nature des êtres humains. Confrontés au problème de la rareté, ceux-ci n'auraient d'autre solution pour y faire face que de tenter de produire toujours plus de moyens de satisfaire toujours plus de besoins[7]. Dans cette perspective, la croissance économique ne serait jamais que l'effet composé des efforts de chacune et chacun pour améliorer son sort. Cette explication repose sur un postulat anthropologique fort : l'être humain serait animé de besoins illimités, excédant donc toujours les moyens disponibles pour les satisfaire. Or, l'histoire, l'archéologie et l'anthropologie permettent de découvrir des humains dont le comportement ne vient pas conforter ce postulat. En tout cas, force est de constater que la croissance est somme toute un phénomène très récent et, au départ, très circonscrit sur le plan géographique[8]. Difficile donc d'y voir l'expression d'une quelconque nature humaine.

Une autre explication commune concernant ce phénomène en situe le fondement dans une certaine vision du monde, une idéologie. La course à la croissance serait le fruit d'une passion mauvaise, qui se serait emparée de nos esprits, au point de constituer une sorte de dogme[9]. Il est indéniable que la quête

from developing pathologies, unlike rats which have to endure the same situation on their own. To avoid somatisation, you have to fight. To combat eco-anxiety, we should first of all be "eco-furious", as Frédéric Lordon invites us to be, which should at least prevent us from falling ill. The question is who to fight. This is undoubtedly where another danger lurks, that of hitting the wrong target. One of the most common mistakes made in the West is to blame the Chinese for our ecological horrors. China's industry is presumed to be too polluting but we forget that we are the main consumers of their products. Perhaps even more seriously, there is also the omnipresent idea, once again in the West, which denounces humanity itself, and maintains that the best way to face our ecological dangers would be to have no more or fewer children…

First of all, this last proposal is something of a paradox. The ecological struggle is not about "saving the planet". It is not in danger. The challenge is to protect the living world, humanity in particular. Isn't it contradictory, then, to claim to be ensuring the future of our species while inviting us to stop reproducing? But most importantly, it's on the wrong track. Historical analysis clearly shows that the cause of the ecological catastrophe is not demographic - or not primarily demographic, in any case. Over the last two centuries, the number of people living on Earth has risen dramatically, from around 800 million in 1800 to around 8 billion today. However, the quantities of energy and materials mobilised by these same humans over this period have grown at a much faster rate, as have the quantities of capital accumulated and waste produced[4]. This data suggests that a force other than numbers is at work in this great ecological upheaval. What is it?

This force is known as "economic growth". For a given human population, it represents producing and selling more and more goods year after year. It seems to have taken hold of European nations from the late medieval period onwards, before extending its domination over almost all human societies today. Its action is generally considered to be a necessary condition for improving human well-being. However, producing more and more goods means consuming more and more materials and energy, and generating more and more waste, which ultimately degrades the Earth's habitability, even to the point of threatening the future of our species. Promises of "green" or "clean" growth have never been kept and look far from being kept in the near future[5]. It would therefore be prudent to try and put a stop to it. If we have to fight to cure our eco-anxiety, then it is against this race for growth that we should be fighting, especially as it poses many other problems, particularly on a social and political level. This is the thrust of the call made in the public arena just over twenty years ago for sustainable or convivial "degrowth"[6].

WHAT IS THE PROBLEM?
How do we fight this battle? To win, it is important to identify where this force comes from or what underpins it. The most common explanation, supported by orthodox economics, is that the origin of economic growth lies in the nature of human beings. Faced with the problem of scarcity, they would have no other solution than to try to produce ever more resources to satisfy ever more needs[7]. From this point of view, economic growth would never be anything more than the composite effect of everyone's efforts to improve their lot. This explanation is based on a strong anthropological assumption: that human beings are driven by unlimited needs, and therefore always exceed the resources available to satisfy them. Yet history, archaeology and anthropology have uncovered human behaviour that does not support this assumption. In any case, it has to be said that growth is, after all, a very recent phenomenon, and initially very limited in geographical terms[8]. Therefore it is hard to see it as an expression of human nature.

Another common explanation for this phenomenon is that it is based on a certain vision of the world, an ideology. The race for growth is said to be the result of an evil passion that has taken hold of our minds to the point of becoming a kind of dogma[9]. It is undeniable that the quest for growth is partly based on shared beliefs. As mentioned above, it is generally seen as the sine qua non of human progress, whether you are on the political left or right. There are disagreements about how to generate this growth and how to redistribute the benefits. But there is almost unanimous support for it. And it has to be said that this is a relatively well-founded belief. Admittedly, economic growth does not necessarily translate into an improvement in our individual or collective lot, as many studies now attest[10]. But when it slows down or stops, things go wrong. People lose their jobs and therefore their livelihoods, the public purse is emptied and the State's capacity to act is reduced. The political climate is certain to deteriorate and instability increase. The imperative of the race for growth does not only originate in our heads and our representations of the world. It is part of the nature of our societies.

These societies are determined by a fundamental social phenomenon which took hold in Europe at the end of the

4 Christophe Bonneuil et Jean-Baptiste Fressoz, *L'événement Anthropocène*, Paris, Le Seuil, 2013.

5 Timothée Parrique, *Ralentir ou périr. L'économie de la post-croissance*, Paris, Le Seuil, 2022.

6 Yves-Marie Abraham, *Guérir du mal de l'infini. Produire moins, partager plus, décider ensemble*, Montréal, Écosociété, 2019.

7 Paul A. Samuelson, William D. Nordhaus, *Économie*, Paris, Economica, 2005.

8 Angus Maddison, *L'économie mondiale : une perspective millénaire*, Paris, OCDE, 2001.

9 Dominique Méda, *La mystique de la croissance : comment s'en libérer*, Paris, Flammarion, 2013.

10 Richard Wilkinson et Kate Pickett, *L'égalité c'est mieux. Pourquoi les écarts de richesse ruinent nos sociétés*, Montreal, Écosociété, 2013.

de croissance repose en partie sur des croyances partagées. On l'a dit plus haut, elle est généralement envisagée comme la condition *sine qua non* du progrès de l'humanité, que l'on soit de « gauche » ou de « droite ». Des désaccords existent quant à la manière de générer cette croissance et d'en redistribuer les fruits. Mais, il y a quasi-unanimité en ce qui concerne le fait de la favoriser. Et force est d'admettre qu'il s'agit d'une croyance relativement bien fondée. Certes, la croissance économique ne se traduit pas nécessairement par une amélioration de notre sort individuel ou collectif, comme en attestent désormais de nombreux travaux[10]. Mais, quand elle ralentit ou s'arrête, les choses tournent mal. Des humains perdent leur emploi et donc leurs moyens de vivre, le Trésor public se vide et l'État voit donc se réduire sa capacité d'agir, le climat social ne peut alors que se dégrader et l'instabilité augmenter. L'impératif de la course à la croissance ne trouve pas seulement son origine dans nos têtes et nos représentations du monde. Il est inscrit dans la nature de nos sociétés.

Ces dernières sont déterminées par un phénomène social fondamental qui s'est imposé en en Europe à la fin de l'époque médiévale et que Marx a résumé en une formule très simple : A – M – A'. De l'argent accumulé (A) est utilisé pour produire des marchandises (M), non pas dans le but d'assouvir un quelconque besoin, mais d'abord pour tenter de réaliser un profit (A') en revendant ces marchandises. Autrement dit, nos sociétés sont capitalistes, au sens où leur devenir dépend de la capacité de leurs membres à favoriser, individuellement et collectivement, l'accumulation du capital. Et la stratégie privilégiée pour ce faire consiste à produire et à vendre toujours plus de marchandises, c'est-à-dire à générer de la croissance économique[11]. Par conséquent, si l'on souhaite arrêter la catastrophe écologique en cours, et mettre ainsi un terme à l'éco-anxiété ou l'éco-angoisse que nous subissons, il faut arrêter la circulation capitaliste de l'argent. Bref, il convient de sortir du capitalisme, ce qui n'est évidemment pas une mince affaire. Il semble bien que ce soit cependant la seule solution pour en finir avec le désastre actuel, n'en déplaise à celles et ceux qui entretiennent l'espoir de voir émerger un jour prochain un « capitalisme vert »[12]. Tout montre qu'il s'agit là d'un oxymore.

ABOLIR L'ENTREPRISE, REDÉCOUVRIR LES COMMUNS
Quelles cibles concrètes se donner pour enrayer la dynamique capitaliste ? Il faut stopper son principal « moteur », à savoir l'entreprise « libre », dont la raison d'être est d'accumuler du capital en produisant et en vendant toujours plus de marchandises. Et pour ce faire, il faut remettre en question le rapport social sur lequel elle est fondée, c'est-à-dire le salariat. Comme l'histoire et l'ethnologie en attestent, s'ils en ont le choix, les humains ne vont jamais s'efforcer de produire sans limites. Pour qu'ils le fassent, ils doivent y être forcés[13]. C'est ce que permet le rapport salarial, qui place le propriétaire des moyens de production, donc des moyens de vivre, dans une position de force par rapport à ceux qui n'ont d'autre choix pour rester en vie que de lui vendre leur force de travail. Il peut de la sorte obtenir de ceux qu'il emploie davantage de travail que ce qui est nécessaire à leur reproduction. Telle est l'une des principales conditions de possibilité de la croissance économique[14].

Pour en finir avec le salariat, la solution n'est pas de transférer les moyens de production sous contrôle étatique. Les révolutions socialistes du XX$^{e}$ siècle ont assez bien montré que cette forme de collectivisation n'a accouché que d'une sorte de capitalisme d'État, visant surtout à rattraper les économies occidentales, et qui s'est avéré finalement pas moins productiviste que le capitalisme libéral. La solution est de garantir à toutes et tous l'accès aux moyens de vivre, selon ce principe socialiste qui n'a rien perdu de sa pertinence : de chacun selon ses moyens, à chacun selon ses besoins. Cela n'exclut pas une forme de propriété privée, mais limitée à l'usage de ce qu'il faut pour vivre, d'une part, et excluant le droit d'abusus, notamment le droit de détruire les biens possédés, d'autre part. En réalité, il s'agit moins de s'approprier les moyens de production que d'en devenir les co-responsables, dans un souci de soutenabilité et de justice. Le but : assurer notre subsistance, et non plus produire (ou coproduire) des marchandises dans l'espoir de réaliser un profit. Enfin, lorsque les moyens de production en question sont pris en charge par plusieurs personnes, les décisions les concernant doivent être démocratiques et la collaboration entre ces personnes doit reposer sur l'entraide, à l'opposé des principes de l'entreprise capitaliste[15].

Ces principes sont constitutifs de ce que l'on appelle des « communs », qui seraient donc la forme de vie sociale à privilégier pour envisager une sortie du capitalisme et permettre, par conséquent, un vrai ralentissement de la catastrophe écologique en cours[16]. Évidemment, une telle « communalisation » générale apparaît comme un objectif très lointain, alors que c'est plutôt l' « entreprisation » du monde qui semble se poursuivre de plus belle aujourd'hui[17]. Il reste que les « communs » fleurissent un peu partout en Occident actuellement.

10 Richard Wilkinson et Kate Pickett, *L'égalité c'est mieux. Pourquoi les écarts de richesse ruinent nos sociétés*, Montréal, Écosociété, 2013.

11 Anselm Jappe, *Crédit à mort : la décomposition du capitalisme et ses critiques*, Paris, Éditions Lignes, 2011.

12 Éric Pineault, *A social ecology of Capital*. London, Pluto Press, 2023.

13 Marshall Sahlins, *Age de pierre, âge d'abondance : l'économie des sociétés primitives*, Paris, Gallimard, 1976.

14 André Gorz, « L'écologie politique entre expertocratie et autolimitation. », *Actuel Marx*, 12, 1992, p. 15-29.

15 Yves-Marie Abraham, Ambre Fourrier, « Mais vous êtes donc communiste? Complément d'enquête sur les communs », *Recherches sociographiques*, LXIV, 1, 2023, p. 201-227.

16 Pierre Dardot, Christian Laval, *Commun. Essai sur la révolution au XXIème siècle*, Paris, La Découverte, 2014; Silvia Federici, *Réenchanter le monde. Féminisme et politique des communs*, Genève/Paris, Entremonde, 2022.

17 Andreu Solé, « Prolégomènes à une histoire des peurs humaines », in Jérôme Méric, Yvon Pesqueux, Andreu Solé (éd.), *La « Société du risque ». Analyse et critique*, Economica, 2009, pp. 45-57.

medieval period and which Marx summed up in a very simple formula: M - C - M'. Accumulated money (M) is used to produce commodities (C), not to satisfy any need, but primarily to try to make more money (M') by reselling these commodities. In other words, our societies are capitalist in the sense that their future depends on the ability of their members to promote, individually and collectively, the accumulation of capital. And the preferred strategy for achieving this is to produce and sell ever more goods, to generate economic growth[11]. If we want to stop the ecological disaster that is underway and put an end to the eco-anxiety we are experiencing, we need to stop the capitalist circulation of money. In short, we need to get out of capitalism, which is obviously no easy task. However, it seems that this is the only way to put an end to the current disaster, despite the hopes of those who believe that "green capitalism" will emerge one day soon[12]. All the evidence suggests that this is an oxymoron.

ABOLISH ENTERPRISE, REDISCOVER JOINT OWNERSHIP
What concrete targets can we set ourselves to curb the capitalist dynamic? We need to stop its main driver, namely "free" enterprise, whose purpose is to accumulate capital by producing and selling ever more goods. And to do that, we need to call into question the social relationship on which it is based, i.e. the wage system. As history and ethnology show, if given the choice, humans will never strive to produce without limits. For them to do so, they must be forced to[13]. This is made possible by the wage relationship, which places the owner of production resources, and therefore life resources, in a position of strength over those who have no choice but to sell their labour in order to survive. In this way, the business owner can get more work from those he employs than is necessary for their reproduction. This is one of the main conditions for economic growth[14].

The solution to ending wage-labour is not to transfer the production resources to state control. The socialist revolutions of the twentieth century showed quite clearly that this form of collectivisation only produced a kind of state capitalism, aimed above all at catching up with Western economies, and which ultimately proved to be no less production-driven than free capitalism. The solution is to ensure that everyone has access to life resources, according to the socialist principle that is still incredibly relevant: from each person according to their means, to each person according to their needs. This does not exclude a form of private property. However, it reduces it to what is necessary to live and excludes the right of "abusus", notably the right to destroy possessed goods. In reality, it is less a question of appropriating the production resources than becoming co-responsible for them, with a view to sustainability and justice. The aim is to ensure our subsistence rather than produce (or co-produce) commodities in the hope of making a profit. Finally, when the production resources in question are managed by several people, the decisions concerning them must be democratic and the collaboration between these people must be based on mutual support, as opposed to the principles of capitalist enterprise[15].

These principles make up what we call the "commons", which would therefore be the preferred form of social life if we were to envisage a way out of capitalism and, consequently, a real slowing down of the ecological disaster underway[16]. Obviously, such a general sharing approach seems a very distant goal and the enterprise economics of the world are what seem to be continuing apace today[17]. The fact remains that "commons" are flourishing just about everywhere in the West at the moment. Not only is it not necessary to overthrow the existing order to introduce them, but they are a way of living together that tends to emerge spontaneously in times of crisis. It should be emphasised that "commons" are not an invention of our time, but a social form that has been omnipresent throughout human history, as the seminal work of Elinor Ostrom reminds us[18]. Their virtual disappearance from industrial civilisation may therefore have been no more than a brief eclipse. However, there will be no real sharing approach without political efforts to support it. And it is these efforts, which may involve drawing up a coherent political project, developing commons or exerting pressure on the authorities in place, that seem to me to be the best way of curing our eco-anxiety[19].

11 Anselm Jappe, *Crédit à mort: la décomposition du capitalisme et ses critiques*, Paris, Éditions Lignes, 2011.

12 Éric Pineault, *A social Ecology of Capital*. London, Pluto Press, 2023.

13 Marshall Sahlins, *Age de pierre, âge d'abondance : l'économie des sociétés primitives*, Paris, Gallimard, 1976.

14 André Gorz, "L'écologie politique entre expertocratie et autolimitation." *Actuel Marx*, 12, 1992, pp. 15-29.

15 Yves-Marie Abraham, Ambre Fourrier, "Mais vous êtes donc communiste? Complément d'enquête sur les communs", *Recherches sociographiques*, LXIV, 1, 2023, p. 201-227.

16 Pierre Dardot, Christian Laval, *Commun. Essai sur la révolution au XXIème siècle*, Paris, La Découverte, 2014; Silvia Federici, *Réenchanter le monde. Féminisme et politique des communs*, Genève/Paris, Entremonde, 2022.

17 Andreu Solé, «Prolégomènes à une histoire des peurs humaines», Jérôme Méric, Yvon Pesqueux, Andreu Solé (eds.), *La "Société du risque". Analyse et critique*, Economica, 2009, pp. 45-57.

18 Elinor Ostrom, *Gouvernance des biens communs*, Paris, De Boeck, 2010.

19 Michel Lepesant, *Politique(s) de la décroissance. Propositions pour penser et faire la transition*, Paris, Utopia, 2013.

Non seulement, il n'est pas nécessaire de renverser l'ordre en place pour les instaurer, mais ils constituent une manière de vivre ensemble qui tend à émerger spontanément en temps de crises. Car, il faut le souligner, les communs ne sont pas une invention propre à notre époque, mais une forme sociale omniprésente dans l'histoire de l'humanité, comme l'ont rappelé les travaux séminaux d'Élinor Ostrom[18]. Leur quasi-disparition au sein de la civilisation industrielle pourrait donc n'avoir été qu'une courte éclipse. Toutefois, il n'y aura pas de réelle communalisation sans un travail politique pour la soutenir. Et c'est ce travail, qui peut consister aussi bien à élaborer un projet politique cohérent, à développer des communs ou à exercer des pressions en leur faveur sur les autorités en place, qui me semble constituer la meilleure manière de soigner notre éco-anxiété[19].

18 Elinor Ostrom, *Gouvernance des biens communs*, Paris, De Boeck, 2010.

19 Michel Lepesant, *Politique(s) de la décroissance. Propositions pour penser et faire la transition*, Paris, Utopia, 2013.

# DA FLORESTA PARA A MESA: BENEFÍCIOS DO CONSUMO SUSTENTÁVEL DE FRUTAS SILVESTRES E CONTRIBUIÇÕES CIENTÍFICAS PARA SUA POPULARIZAÇÃO

# FROM THE FOREST TO YOUR PLATE: THE BENEFITS OF SUSTAINABLE WILD FRUIT CONSUMPTION AND SCIENTIFIC CONTRIBUTIONS TO ITS POPULARISATION

VO

EN

Em vários locais do mundo, especialmente em áreas urbanas, as pessoas têm consumido uma variedade cada vez menor de plantas alimentícias. É preocupante, por exemplo, que 51% do alimento de origem vegetal consumido globalmente provenha de apenas três plantas – milho, trigo e arroz[1]. Esse predomínio de poucos elementos nas dietas humanas possui evidentes desvantagens. Primeiro, uma baixa diversidade alimentar está muitas vezes associada a práticas agrícolas pouco sustentáveis, baseadas, por exemplo, em monoculturas (cultivos de uma única planta em vastas extensões territoriais) e na supressão de áreas de vegetação natural, como as florestas nativas. Além disso, quando os sistemas agrícolas focam em poucas plantas, eventos climáticos extremos, como uma seca prolongada, podem levar a perdas de produção muito maiores do que em casos nos quais a agricultura se baseia em uma maior diversidade de plantas. Finalmente, dietas pouco diversas costumam ser deficientes em nutrientes, o que pode trazer consequências à saúde.

Cientistas de diversas áreas do conhecimento vêm pensando em soluções para diversificar a alimentação das sociedades humanas. Desse modo, os alimentos negligenciados e subutilizados vêm crescendo em interesse. Entre estes estão uma série de frutas silvestres. No contexto brasileiro, o aumento no consumo de frutas silvestres também beneficia populações vulneráveis de agricultores e extrativistas que, muitas vezes, têm no comércio desses produtos sua principal fonte de renda.

Diante desse cenário, minhas pesquisas vêm sendo pensadas para auxiliar na popularização de frutas silvestres. Para isso, meu grupo e eu trabalhamos com abordagens interdisciplinares, integrando áreas como etnobiologia, ecologia, ciências do consumidor e psicologia ambiental. Recentemente, temos trabalhado em comunidades extrativistas no município de Piaçabuçu, sul do estado de Alagoas (nordeste do Brasil). Buscamos tratar do consumo e comércio destas plantas de forma abrangente, estudando desde a base da cadeia produtiva (agricultores e extrativistas) até o topo (consumidores e potenciais consumidores).

Nossos estudos com os agricultores e extrativistas identificaram as plantas que, segundo eles, têm maior potencial para popularização[2], considerando elementos como o sabor, a disponibilidade, o valor nutricional e a velocidade de deterioração. Algumas destas frutas de alto potencial são o cambuí, conhecido pela ciência como *Myrciaria floribunda* (H.West ex Willd.) O.Berg, o araçá (*Psidium guineense* Sw.) e a aroeira (*Schinus Terebinthifolia* Raddi.).

Tendo em vista que a parte de interesse alimentício destas plantas é o fruto, elas possuem alto potencial para extrativismo sustentável, de maneira a conciliar o consumo com a manutenção das espécies em seus ecossistemas naturais. Neste sentido, temos realizado estudos ecológicos e etnobiológicos com as plantas de maior potencial para entender se o extrativismo de frutos pode ser mantido ou ampliado de forma sustentável. Nossos estudos ecológicos com cambuí[3], por exemplo, mostraram que um eventual aumento na retirada de frutos pode comprometer a espécie na região, de maneira que, para agricultores e extrativistas, a melhor forma de ampliar sua renda com o comércio do cambuí seria a partir do beneficiamento e agregação de valor, em contraste com o aumento na coleta.

Ao avaliar as plantas com potencial, assim como a sustentabilidade do extrativismo, preparamos a base da cadeia produtiva para uma eventual popularização destes produtos. No entanto, não é possível pensar em aumento do interesse em frutas silvestres sem dirigir o olhar ao consumidor e potencial consumidor. Muitas frutas silvestres possuem pouca procura. Nosso grupo de pesquisa entrevistou consumidores e potenciais consumidores de alimentos negligenciados e subutilizados na capital do estado de Alagoas (Maceió)[4]. Observamos que as principais barreiras que dificultam o

In many parts of the world, especially in urban areas, people are consuming an increasingly smaller variety of food plants. It is also worrying, for instance, that just three plants – maize, wheat and rice[1] – account for 51% of global plant-based food consumption, and there are clear drawbacks related to this predominance of so few food elements in human diets. Firstly, low dietary diversity is often associated with unsustainable agricultural practices, based, for example, on monoculture (cultivation of a single crop on vast tracts of land) and the shrinking of areas of natural vegetation, such as native forests. Furthermore, when agricultural systems focus on just a few plants, extreme weather events such as a prolonged drought can lead to much greater production losses than in cases where agriculture is based on a greater diversity of plants. It must also be noted that low-diversity diets are often deficient in nutrients, which may result in health consequences.

Scientists from various fields of expertise have been thinking of solutions to diversify the diet of human societies. This has led to growing interest in neglected and underused foods, including a number of wild fruits. In Brazil, vulnerable populations of farmers and extractivists have also benefited from the increase in wild fruit consumption, whose main source of income is derived from trading these products.

My research has therefore been carried out with a view to popularising wild fruits, and with this in mind, my team and I have been using interdisciplinary approaches, integrating domains such as ethnobiology, ecology, consumer science and environmental psychology. We have recently been working in extractivist communities in the municipality of Piaçabuçu, in the south of the state of Alagoas (North-east Brazil). We have tried to take a comprehensive approach towards the consumption and trade of these plants, studying everything from the start (farmers and extractivists) to the end (consumers and potential consumers) of the production chain.

Our research with farmers and extractivists identified the plants that, according to them, have the greatest potential for popularisation[2], taking into account elements such as taste, availability, nutritional value and speed of deterioration. Some of these high-potential fruits are the cambuí, known in scientific circles as *Myrciaria floribunda* (H.West ex Willd.) O.Berg; araçá *(Psidium guineense* Sw.); and aroeira *(Schinus Terebinthifolia* Raddi.).

Given that the edible part of these plants is their fruit, they have a high potential for sustainable harvesting in terms of reconciling consumption with maintaining these plant species in their natural ecosystems. To this end, we have carried out ecological and ethnobiological studies on the plants with the greatest potential, in order to understand whether fruit extraction can be maintained or expanded sustainably. Our ecological studies on cambuí[3], for example, have shown that any potential increase in fruit extraction could jeopardise the species in the region. This means that the best way for farmers and extractivists to increase their income from the cambuí trade would be through processing and adding value, as opposed to increasing extraction.

By assessing the plants with potential, as well as the sustainability of extractivism, we have prepared the base of the production chain for the potential popularisation of these products. However, we cannot consider the increasing interest in wild fruits without focusing on the consumer and potential consumer, and it should also be noted that wild fruits are in low demand. Our research team interviewed consumers and potential consumers of neglected and underused foods in the state capital of Alagoas, Maceió[4], where we found that the main barriers to the consumption of these foods are the

1 FAO (2019) Voluntary Guidelines for the Conservation and Sustainable Use of Farmers' Varieties/Landraces. Food and Agriculture Organization of the United Nations, Rome.

1 FAO (2019) Voluntary Guidelines for the Conservation and Sustainable Use of Farmers' Varieties/Landraces. Food and Agriculture Organisation of the United Nations, Rome.

2 Gomes, D.L.; Ferreira, R.P.S.; Santos, E.M.C.; Silva, R.R.V.; Medeiros, P.M. (2020). Local criteria for the selection of wild food plants for consumption and sale in Alagoas, Brazil. Ethnobiol. Conserv. 9.

3 Santos, E.M.C.; Conservação biocultural de Myrciaria floribunda (H. West ex Willd.) O. Berg: contribuições ecológicas, socioeconômicas e comportamentais. Tese (doutorado), Universidade Federal de Alagoas.

4 Santos, G.M.C., Barbosa, D.M.; Santos, E.M.C.; Gomes, D.L.; Silva, R.R.V.; Medeiros, P.M. (2020). Experiências de popularização de plantas alimentícias não convencionais no estado de Alagoas, Brasil. Ethnoscientia 5.

2 Gomes, D.L.; Ferreira, R.P.S.; Santos, E.M.C.; Silva, R.R.V.; Medeiros, P.M. (2020). Local criteria for the selection of wild food plants for consumption and sale in Alagoas, Brazil. Ethnobiol. Conserv. 9.

3 Santos, E.M.C.; Conservação biocultural de Myrciaria floribunda [Biocultural conservation of Myrciaria floribunda] (H. West ex Willd.) O. Berg: contribuições ecológicas, socioeconômicas e comportamentais. [ecological, socio-economic and behavioural contributions] Thesis (PhD), Federal University of Alagoas.

4 Santos, G.M.C., Barbosa, D.M.; Santos, E.M.C.; Gomes, D.L.; Silva, R.R.V.; Medeiros, P.M. (2020). Experiências de popularização de plantas alimentícias não convencionais no estado de Alagoas, Brasil. [Experiences of popularising unconventional food plants in the state of Alagoas, Brazil]. Ethnoscientia 5.

consumo destes alimentos são a dificuldade em encontrá-los nas feiras e mercados, assim como a falta de informações, especialmente nutricionais e gastronômicas, sobre eles.

Assim, estratégias de divulgação são essenciais para ampliar o interesse das pessoas. No entanto, sabemos que este interesse pode variar de acordo com o perfil do consumidor. Nosso grupo observou, por exemplo, a partir de entrevistas em feiras de Alagoas[4], que pessoas mais velhas e frequentadores de feiras orgânicas são o público com maiores chances de consumir esses produtos. Em termos de estratégias publicitárias, um estudo recente, ainda não publicado pelo nosso grupo, observou que anúncios focados nos benefícios sociais do consumo de frutas silvestres (por exemplo, geração de renda para comunidades vulneráveis), são mais efetivos do que anúncios que focam nos benefícios nutricionais ou ambientais do seu consumo.

Nossos estudos também revelaram que associar frutas silvestres com outras frutas mais conhecidas pode ser uma forma eficiente para estimular as pessoas a consumi-las[3]. Vimos, por exemplo, que, ao misturar sucos de cambuí e araçá com frutas como acerola e goiaba, bastante consumidas no Brasil, há uma menor resistência e maior aceitação dos produtos. Embora seja uma estratégia menos efetiva, para alguns públicos, atribuir à fruta silvestre um nome que remeta a uma fruta popular (por exemplo, acerola-jasmim, em vez de cambuí), também pode reduzir a resistência do consumidor em aceitar um produto por ele desconhecido[3]. Mas essa estratégia precisa ser considerada com cautela, pois a manutenção dos nomes populares das plantas é muito importante, especialmente no sentido de valorizar as culturas que originalmente consomem e comercializam esses produtos. Assim, a complementação (por exemplo, *"cambuí: a acerola-jasmim"*) seria mais bem vinda do que a substituição.

Esperamos, com esses estudos, fornecer informações relevantes para aliar geração de renda no campo, conservação da natureza e diversificação alimentar. Esses esforços estão alinhados com a ideia de que precisamos mudar a lógica dos nossos sistemas alimentares, de modo a pensar em uma agricultura plural, sustentável e socialmente justa.

difficulty in finding them at fairs and markets, as well as the lack of information available about them, especially in nutritional and culinary terms.

This means that publicity strategies are essential to widen people's interest; however, we know that this interest can vary according to the profile of the consumer. After conducting interviews at fairs in Alagoas[4], our team also found, for example, that older people and those who frequent organic product fairs are the most likely to consume these products. In terms of advertising strategies, it was found, in a recent study not yet published by our team, that adverts focusing on the social benefits of wild fruit consumption (such as generating income for vulnerable communities) are more effective than those centred on the nutritional or environmental benefits of their consumption.

In addition, our studies have revealed that pairing wild fruits with other better-known fruits can be an effective way of encouraging people to consume them[5]. We have also seen, for example, that by mixing cambuí and araçá juices with fruits such as acerola and guava, which are widely consumed in Brazil, there is less resistance and greater acceptance of these products. Likewise, although this is a less effective strategy for some audiences, giving the wild fruit a name that alludes to a popular fruit (for example, *acerola-jasmim* instead of *cambuí*) can also reduce consumer resistance to accepting an unfamiliar product[5]. However, such a strategy must be considered with caution, since it is extremely important to maintain the popular names of plants, especially with regard to preserving and promoting the crops from which these products are derived for trade and consumption. Complementing the names of these wild fruits by adding those of other fruits alongside them (for example, *"cambuí: a acerola-jasmim"*) would be a more suitable solution than replacing their names entirely.

With these studies, we hope to provide relevant information to bring together income generation in the countryside, nature conservation and food diversification. These efforts are aligned with the idea that we need to change the logic behind our food systems in order to contemplate diverse, sustainable and socially beneficial agriculture.

# 海洋プラスチック□深海に溜まる永遠に消えないごみ

# MARINE PLASTIC—THE EVERLASTING LITTER ACCUMULATING IN THE DEEP SEA

**VO**

安価で耐久性に優れたプラスチック製品は私たちの生活を向上させてきたが、同時に海洋へと流出する膨大な量のプラスチックごみが深刻な環境問題を引き起こしている。ほとんどのプラスチックは微生物に分解されず、海に永遠に残り続けるため、海洋は次第にプラスチックで溢れていく。世界で最も深いマリアナ海溝や北極海、南極海でもプラスチックの痕跡が見つかり、プラスチックのない海洋はもはや存在しないと言える。この記事では、私が所属する国立研究開発法人海洋研究開発機構（JAMSTEC）の研究チームが進めてきた研究成果を交えながら、海洋プラスチックごみ問題の現在とこれからについて述べる。

■大量生産と大量廃棄

世界中で年間約4億トンのプラスチックが生産されており、これは全人類の体重とほぼ同等だ。プラスチックの大量生産は1950年に始まり、2017年までの合計生産量は約92億トンになる。廃棄されたプラスチックは70億トンを超え、そのうち10%がリサイクルされ、14%が焼却され、残りの大部分は埋め立てられたり環境中に放出されたりした[1]。リサイクルされたプラスチックが再びリサイクルされる率は約10%に過ぎず、現在のリサイクルプロセスは持続可能ではない。

■世界の6割以上のプラスチックごみがアジアから流出

海洋で見つかるプラスチックごみのうち、大部分の80%は陸上に由来し、主に日常生活で使用される使い捨てプラスチックが排水や風によって海に運ばれる。残りの20%は漁業等の海洋活動から発生するプラスチックである[2]。

年間に陸上から海へと流出するプラスチックごみ量の推定値には幅があり、50万トンから最大で1000万トンとされている[3-4-5]。プラスチックが完全に回収・処理されれば海洋への流出は防げるが、問題は適切に管理されていないプラスチックごみである。これには野ざらしのごみや、ごみ箱から溢れたごみ、不法な埋立地のごみなどが含まれる。これらの「管理不十分なプラスチックごみ」の一部が結果的に海へと流出する。世界全体で発生する管理不十分プラスチックごみは年間6000万〜9900万トンもあるが、そのうち60%以上がアジアから発生している[6]。

陸上から海へのプラスチックの流出は、大雨の後や台風やハリケーンの通過後に特に顕著である。日本の相模湾で、台風通過直後にプラスチックの観察した際、河川を通じて湾内に流れ込んだプラスチックや木屑が海面全体を覆っていた。海面に浮かぶマイクロプラスチックの量を調べると、台風通過前と比較して1300倍に増加していた[7]。しかし、湾内に流出した大量のプラスチックごみは、海流にのって速やかに広い外洋へと運ばれてしまう(Fig.1.)。

■行方不明プラスチックの謎

海洋に流出したプラスチックの総量についてはさまざまな推測があり、2500万トンから1億トン以上とされる[8]。しかしながら、海表面に実際に浮いているプラスチックは、全体の約10%に相当する数十万から数百万ト

**EN**

Inexpensive and durable plastic products have improved our lives, but at the same time, the enormous amount of plastic litter flowing into the oceans is causing a serious environmental problem. Most plastics are not decomposed by microbes and remain in the ocean indefinitely, gradually filling the marine environment with plastic. Traces of plastic have been found in the deepest parts of the world, such as the Mariana Trench, as well as in the Arctic and Antarctic Oceans, leading to the conclusion that no ocean is free from plastic anymore. This article discusses the current and future state of marine plastic debris issues, incorporating the research results from the study team at the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), to which I belong.

MASS PRODUCTION AND DISPOSAL

Approximately 400 million tons of plastic are produced worldwide each year, which is nearly equivalent to the total weight of humanity. Plastic mass production began in 1950, and the cumulative production amount by 2017 was approximately 9.2 billion tons. Over 7 billion tons of discarded plastics exceed, of which 10% has been recycled and 14% has been incinerated, while the majority of the remainder has been landfilled or released into the environment[1]. The rate at which recycled plastics are recycled again is only about 10%, indicating that the current recycling processes are not sustainable.

OVER 60% OF THE WORLD'S PLASTIC DEBRIS COMES FROM ASIA

Of the plastic debris found in the oceans, the vast majority, 80%, originates from land-based sources, mainly everyday disposable plastics that are carried to the sea by drainage and wind. The remaining 20% comes from marine activities such as fishing[2]. The estimated amount of plastic debris flowing from land to sea annually ranges from 500,000 tons to as much as 10 million tons[5]. If plastics were completely collected and processed, marine outflow could be prevented, but the problem lies with improperly managed plastic debris. This includes garbage left exposed, overflow from trash bins, and debris from illegal landfill sites. A portion of this "miss-managed plastic waste" eventually ends up in the sea. Every year, 60 to 99 million tons of such waste is generated worldwide, with more than 60% of it originating from Asia[4]. The outflow of plastics from land to sea is particularly noticeable after heavy rainfalls or the passage of typhoons or hurricanes. In Japan's Sagami Bay, when plastics were observed immediately after a typhoon, plastics and wood debris that had flowed into the bay through rivers covered the entire sea surface. The amount of microplastics floating on the surface increased by 1,300 times compared to before the typhoon[5]. However, the large amount of plastic debris that flowed into the bay was quickly carried by ocean currents to the vast open ocean (Fig. 1).

THE MYSTERY OF MISSING PLASTICS

Various estimates exist for the total amount of plastics that have flowed into the ocean, ranging from 25 million to over 100 million tons[6]. However, the actual amount of plastic

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1 R. Geyer, J. R. Jambeck, K. L. Law, Production, use, and fate of all plastics ever made. Science advances 3, e1700782 (2017).

2 C. Morales-Caselles, J. Viejo, E. Martí, D. González-Fernández, H. Pragnell-Raasch, J. I. González-Gordillo, E. Montero, G. M. Arroyo, G. Hanke, V. S. Salvo, An inshore–offshore sorting system revealed from global classification of ocean litter. Nature Sustainability 4, 484-493 (2021).

3 J. R. Jambeck, R. Geyer, C. Wilcox, T. R. Siegler, M. Perryman, A. Andrady, R. Narayan, K. L. Law, Plastic waste inputs from land into the ocean. science 347, 768-771 (2015).

4 L. J. Meijer, T. Van Emmerik, R. Van Der Ent, C. Schmidt, L. Lebreton, More than 1000 rivers account for 80% of global riverine plastic emissions into the ocean. Science advances 7, eaaz5803 (2021).

5 M. L. Kaandorp, D. Lobelle, C. Kehl, H. A. Dijkstra, E. van Sebille, Global mass of buoyant marine plastics dominated by large long-lived debris. Nature Geoscience 16, 689-694 (2023).

6 L. Lebreton, A. Andrady, Future scenarios of global plastic waste generation and disposal. Palgrave Communications 5, 1-11 (2019).

7 R. Nakajima, T. Miyama, T. Kitahashi, N. Isobe, Y. Nagano, T. Ikuta, K. Oguri, M. Tsuchiya, T. Yoshida, K. Aoki, Plastic after an extreme storm: The typhoon-induced response of micro-and mesoplastics in coastal waters. Plastic Pollution in the Bay Areas, (2022).

8 A. Isobe, S. Iwasaki, The fate of missing ocean plastics: Are they just a marine environmental problem? Science of the Total Environment 825, 153935 (2022).

1 R. Geyer, J. R. Jambeck, K. L. Law, Production, use, and fate of all plastics ever made. *Science advances* 3, e1700782 (2017).

2 C. Morales-Caselles, J. Viejo, E. Martí, D. González-Fernández, H. Pragnell-Raasch, J. I. González-Gordillo, E. Montero, G. M. Arroyo, G. Hanke, V. S. Salvo, An inshore–offshore sorting system revealed from global classification of ocean litter. *Nature Sustainability* 4, 484-493 (2021).

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- L. J. Meijer, T. Van Emmerik, R. Van Der Ent, C. Schmidt, L. Lebreton, More than 1000 rivers account for 80% of global riverine plastic emissions into the ocean. *Science advances* 7, eaaz5803 (2021).
- M. L. Kaandorp, D. Lobelle, C. Kehl, H. A. Dijkstra, E. van Sebille, Global mass of buoyant marine plastics dominated by large long-lived debris. *Nature Geoscience* 16, 689-694 (2023).

4 L. Lebreton, A. Andrady, Future scenarios of global plastic debris generation and disposal. *Palgrave Communications* 5, 1-11 (2019).

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6 A. Isobe, S. Iwasaki, The fate of missing ocean plastics: Are they just a marine environmental problem? *Science of the Total Environment* 825, 153935 (2022).

ン程度である[9]。残り90%のプラスチックの行方が分かっておらず「行方不明プラスチック」と呼ばれるが、おそらく大部分は深海に沈んでいる。

多くの人がプラスチックごみは海面を浮かぶイメージを持っているかもしれないが、藻類やフジツボなどの生物付着や粒状有機物との凝集などによって重くなり、最終的には沈んでしまう。例えば、食品包装用の袋の多くは最初は水に浮いているが、生物付着等によってやがて沈む。実際に深海に行くと、場所によっては多くの食品包装が見られる(Fig. 2)。

まだ行方不明プラスチックを説明できるほど大量のプラスチックは海底から見つかってはいないが、日本近海の深海底が最も怪しいプラスチックごみ集積地のひとつである。その理由を以下に述べる。

■日本は海洋プラスチックのホットスポット

日本周辺の海域は、日本海を北上する「対馬暖流」と太平洋を北上する「黒潮」という二つの主要な海流の影響を受けている。これらの海流は東アジアや東南アジアからの大量のプラスチックごみを運んでくるため、日本の近海ではマイクロプラスチックの濃度が高い。過去の研究によると、日本周辺海域のマイクロプラスチック濃度は世界平均の27倍もあり、日本の海がプラスチック汚染の集中地であることが示されている[10]。同様のことが深海底でも観察される可能性が高い。

日本近海には、巨大な深海ごみの集積場所が少なくとも2か所存在すると予想されている。1つ目は四国沖の「黒潮・再循環域」の海底であり、2つ目は房総半島沖の「黒潮続流・再循環域」の海底である(Fig.3)。「黒潮・再循環域」と「黒潮続流・再循環域」では、表層の海流が強く渦を巻きながら循環しており、この海流により日本や東アジア、東南アジアから運ばれてくるプラスチックごみが海流の渦に巻き込まれて集積している。そのため渦によって集積したごみが沈降することで海底に大量のごみを輸送し、巨大なごみの堆積が深海底に形成されていると考えた。

■日本の深海に溜まるプラスチック

我々の研究チームは、まず「黒潮続流・再循環域」の海底調査を実施した。この海域は、陸から500 kmも離れており、水深は5000 mを超える。有人潜水調査船「しんかい6500」を使って、水深5700 mから5800 mの海底を調査したところ、多くの使い捨てプラスチックが見つかった(Figs. 4 and 5)。1平方キロメートルあたり約5000個のマクロプラスチックごみ(直径25 mm以上のプラスチック)が発見された[11]。これは、かつての認識を覆すほど多い数である。深海底のプラスチックごみの数は陸から離れるほど少なくなることが常識であったが、今回の結果はそれを否定する結果となった。また、北太平洋の他の海域から同様の水深帯の深海底で調べられたマクロプラスチックごみの数に比べて2桁も多かった。

さらに「黒潮続流・再循環域」の深海底の堆積物に含まれるマイクロプラスチック濃度を調べたところ、堆積物1グラムあたりに約600粒のマイクロプラスチックが確認された[12]。これは陸に近い深海底の値よりも一桁高く、また地中海や北大西洋の堆積物中のマイクロプラスチック濃度と比べて数倍から数千倍も多い。

JAMSTECのスーパーコンピュータ「地球シミュレータ」を用いた流れ場のシミュレーションによると、この地域の深海底に見られるプラスチックごみは遠くの海底から水平方向に運ばれてきたものではなく、この地域の海表面に集まったプラスチックごみが上層から直接沈んできたものであることがわかった[11]。これらの研究も含め、日本周辺の深海底のプラスチック濃度が他の海域に比べて非常に高いことが明らかになりつつある。

深海底で発見されるごみの大部分は、ポリ袋や食品包装などの使い捨てプラスチック製品ある。「黒潮続流・再循環域」の深海底からは、1984年製造と記された(回収時で)35年以上前の食品包装がほとんど無傷かつ印刷も鮮明なまま見つかった(Fig. 6)。深海は水温が低く、また紫外線が届かないため、プラスチックを劣化させる要素がない。その後の調査で、1973年や1984年に製造された食品包装など、半世紀前に捨てられたごみが見つかっている。深海に堆積したプラスチックは「消えないごみ」として海底に残り続ける。

■中深層に蓄積する微小マイクロプラスチック

先ほどは深海底の話しをしたが、海底だけでなく、中深層の海中でもプラスチックが溜まる層があることが最近の研究から見えてきた。北太平洋におけるマイクロプラスチックの研究から、水深2000 mの中深層にマイクロプラスチックが多量に存在することが明らかになったのだ[13]。特に、直径が数十$\mu$m程度の非常に小さなマイクロプラスチックがこの中深層に蓄積していることがわかった。

海面に存在するマイクロプラスチックは、生物付着等によって次第に深海へ沈んでいくが、沈降する過程でその表面の有機物が微生物によって消費され、プラスチックを沈める因子が失われてしまう。これにより、一見すると再び浮上しそうに思うが、これらの極小粒子は簡単には浮上せず、さらに分解しにくい有機物がプラスチック表面に残るため、浮かび上がることも沈むこともない状態が続く。結果として、海の中深層にマイクロプラスチックが層を成して蓄積されている実態が見えてき

floating on the ocean surface is only about 10% of the total, which amounts to several hundred thousand to a few million tons[7]. The whereabouts of the remaining 90% of the plastic, referred to as "missing plastics," are unknown, but most likely a large portion has sunk to the deep sea. Many people may imagine that plastic debris floats on the ocean surface, but it becomes heavier due to biological attachments like algae and barnacles and aggregation with particulate organic matters, ultimately sinking. For example, many bags used for food packaging initially float on water but eventually sink due to biological attachments. In the deep sea, depending on the location, a lot of food packaging can be seen (Fig. 2). Although a significant amount of plastic has not yet been found on the seabed to explain the missing plastics, the seabed near Japan's coast is one of the most suspicious areas for plastic debris accumulation. The reasons for this are explained below.

JAPAN AS A HOTSPOT FOR MARINE PLASTIC

The waters around Japan are influenced by two major ocean currents: the Tsushima Warm Current, which flows northward through the Sea of Japan, and the Kuroshio Current, which flows northward through the Pacific Ocean. These currents bring a large amount of plastic debris from East Asia and Southeast Asia, making the concentration of microplastics in the waters near Japan high. Previous research indicates that the concentration of microplastics in the waters around Japan is 27 times the global average, suggesting that Japan's seas are a focal point for plastic pollution[8]. A similar situation is likely observed in the deep sea.

It is anticipated that there are at least two significant deep-sea garbage accumulation sites near Japan's coast. The first is located on the seabed in the "Kuroshio Recirculation gyre" off the coast of Shikoku, and the second is in the "Kuroshio Extension Recirculation gyre" off the Boso Peninsula (Fig. 3). In the "Kuroshio Recirculation gyre" and the "Kuroshio Extension Recirculation gyre", the surface currents are strong and swirl, causing the plastics brought from Japan, East Asia, and Southeast Asia to be caught in the gyres and accumulate. It is believed that the debris accumulated by the gyres is transported to the seabed, forming large deposits of debris on the deep seabed.

PLASTICS ACCUMULATING IN JAPAN'S DEEP SEA

Our research team first conducted a seabed survey in the "Kuroshio Extension Recirculation gyre". This area is located 500 km away from the land, with depths exceeding 5,000 m. Using the manned submersible "Shinkai 6500," we surveyed the seabed at depths of 5,700 to 5,800 m and found many single-use plastics (Figs. 4 and 5). Approximately 5,000 macro plastic debris (plastics with a diameter of 25 mm or more) were discovered per square kilometer[9]. This number is significantly higher than previously recognized. Although it was common knowledge that the number of plastic debris on the deep sea floor decreases the farther away from land, our findings contradict this notion. Moreover, the number of macro plastic debris found at similar depths in other areas of the North Pacific was two orders of magnitude higher.

Furthermore, when we examined the concentration of microplastics in the sediment on the deep seabed of the "Kuroshio Extension Recirculation gyre", about 600 particles of microplastics per gram of sediment were confirmed[10]. This value is an order of magnitude higher than values near coastal deep seabeds and several times to thousands of times higher than the microplastic concentrations in the sediments of the Mediterranean and North Atlantic.

Simulations of flow fields using JAMSTEC's supercomputer "Earth Simulator" revealed that the plastic debris seen on this region's deep seabed did not come from far-off seabeds horizontally but directly sank from the plastic debris accumulated on the surface of this region[11].

These studies, among others, are increasingly clarifying that the concentration of plastics on the deep seabed around Japan is very high compared to other marine areas. Most of the debris found on the deep seabed consists of single-use plastic products, such as plastic bags and food packaging. From the deep seabed of the "Kuroshio Extension Recirculation gyre", food packaging manufactured in 1984, more than 35 years old at the time of collection, was found almost intact and with clear printing (Fig. 6). The deep sea has low temperatures and no ultraviolet light penetration, which are factors that prevent the degradation of plastics. Subsequent surveys have found debris such as food packaging manufactured in 1973 and 1984, and debris discarded half a century ago. Plastic that has settled in the deep sea continues to remain as "indestructible debris" on the seabed.

9 E. Van Sebille, C. Wilcox, L. Lebreton, N. Maximenko, B. D. Hardesty, J. A. Van Franeker, M. Eriksen, D. Siegel, F. Galgani, K. L. Law, A global inventory of small floating plastic debris. Environmental Research Letters 10, 124006 (2015).

10 A. Isobe, K. Uchida, T. Tokai, S. Iwasaki, East Asian seas: a hot spot of pelagic microplastics. Marine pollution bulletin 101, 618-623 (2015).

11 R. Nakajima, M. Tsuchiya, A. Yabuki, S. Masuda, T. Kitahashi, Y. Nagano, T. Ikuta, N. Isobe, H. Nakata, H. Ritchie, Massive occurrence of benthic plastic debris at the abyssal seafloor beneath the Kuroshio Extension, the North West Pacific. Marine Pollution Bulletin 166, 112188 (2021).

12 M. Tsuchiya, T. Kitahashi, R. Nakajima, K. Oguri, K. Kawamura, A. Nakamura, K. Nakano, Y. Maeda, M. Murayama, S. Chiba, Distribution of microplastics in bathyal-to hadal-depth sediments and transport process along the deep-sea canyon and the Kuroshio Extension in the Northwest Pacific. Marine Pollution Bulletin 199, 115466 (2024).

13 S. Zhao, T. J. Mincer, L. Lebreton, M. Egger, Pelagic microplastics in the North Pacific Subtropical Gyre: A prevalent anthropogenic component of the particulate organic carbon pool. PNAS nexus 2, pgad070 (2023).

7 - M. L. Kaandorp, D. Lobelle, C. Kehl, H. A. Dijkstra, E. van Sebille, Global mass of buoyant marine plastic dominated by large long-lived debris. *Nature Geoscience* 16, 689-694 (2023).
- E. Van Sebille, C. Wilcox, L. Lebreton, N. Maximenko, B. D. Hardesty, J. A. Van Franeker, M.Eriksen, D. Siegel, F. Galgani, K. L. Law, A global inventory of small floating plastic debris. *Environmental Research Letters* 10, 124006 (2015).

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た。海洋プラスチックの約80%は炭素で構成されるが、海中のプラスチック濃度は指数関数的に増え続けているため、このような「溜まり場」ではプラスチックの炭素量が生物系の有機炭素量に匹敵する可能性があり、そうなった時の生態系や物質循環への影響が懸念されている[14]。

■プラスチックがもたらす問題

海洋へ流出するプラスチックは、多様な影響を生態系や生物に及ぼすことが分かっている。プラスチックがもたらす問題はいくつもあるが、ここではプラスチックの誤食について述べる。人間は意図的にプラスチックを食べることはないし、もし誤って小さなプラスチック片を摂取しても、消化されずに体外に排出される。しかし、多くの海洋生物はプラスチックを誤って餌と認識し摂取してしまう。プラスチックに餌の匂いがつくことが要因のひとつである[15]。一部の海鳥はプラスチックを餌と勘違いし、それを雛に与える。これにより、雛の胃にプラスチックが蓄積され、消化管の閉塞や栄養不足による死に至る。大きなプラスチック片を摂取した場合、消化管が物理的に傷つくこともある。魚類においても、調査された約500種類の中で60%以上が体内にマイクロプラスチックを保持していることが確認された[16]。イワシなどの小魚は、海中のプランクトンを丸呑みする際にマイクロプラスチックも一緒に摂取してしまう。海水中のマイクロプラスチック濃度が高くなれば、マイクロプラスチックの摂取を避けることはできなくなる。すでに700種を超える海洋生物がプラスチックを誤食しているが[17]、海洋のプラスチック濃度は年々増加しており、生物に取り込まれる量も増えていくだろう。

日本の研究チームによれば、海中のマイクロプラスチック濃度が1立方メートルあたり1グラムを超えると、海洋生物に顕著な悪影響が出ると指摘されている[18]。特に北太平洋の表層では、2060年代にその濃度を超える可能性があると予測されているが、海底ではプラスチック量がより多いためさらに早く悪影響が現れるかもしれない。また、プラスチックに含まれる添加剤による有害化学物質の影響も考慮する必要がある。以下に述べる通り、これらの化学物質は長期にわたって環境に残り続け、広範囲にわたり影響を及ぼす可能性がある。

■プラスチックの添加剤に毒性が

マイクロプラスチックは、そのサイズが小さければ消化されずに便として体外に排出されるため、現在のマイクロプラスチック濃度では特に生物に直接的な問題はないと考えられている。しかし、問題はプラスチック自体の毒性ではなく、プラスチックに含まれる有害な化学物質（添加剤）である。これらの添加剤には、生物に有害な影響を及ぼすものが含まれる場合がある。例えば、プラスチックの難燃性を高めるために使われてきたPBDEs（ポリ臭化ジフェニルエーテル）は、かつて電化製品や家具に広く使用されていた。しかし、その環境への持続性や生物への蓄積性、長距離移動性、生殖に対する毒性が問題視され、PBDEsはストックホルム条約で残留性有機汚染物質(POPs)に指定され、使用や製造が禁止されている。同様に、プラスチックの紫外線耐性を高めるBZT-UVs（ベンゾトリアゾール系紫外線吸収剤）のUV-328、ヘキサブロモシクロドデカン(HBCD)や一部の有機フッ素化合物(PFOA)などのプラスチック関連化学物質が最近POPsに指定された。

これらの添加剤はプラスチックから抜け出しやすく、生物がプラスチックを摂取すると消化液で抽出されて体内に移動し、脂肪に蓄積される。生物が有害化学物質を含むプラスチックを直接あるいは間接的に摂取することにより、これらの有害化学物質が体内に蓄積されることがある。我々が日本の深海に生息するサメの肝臓に含まれるプラスチック添加剤の調査を行ったところ、捕獲された8種の全ての深海サメから高濃度のPBDEsが検出された[19]。このような有害物質は生物濃縮により、食物連鎖の上位に位置する生物に特に多く見られる。同様に、水深9000mを超える超深海の海底で採取されたカイコウオオソコエビという甲殻類からは、BZT-UVsのUV-328が検出された[20]。これらの結果は、深海の隅々までプラスチック由来の化学物質汚染が及んでいることを示す(Fig.7)。

■プラスチックとの正しい付き合い方

日々大量のプラスチックが陸から海に流れ出ており、一度海に入ると回収はほぼ不可能である。浜辺や河川から漂着ごみを回収することは可能だが、これは海に流入するごみのごく一部に過ぎない。既に海に入ってしまったプラスチックごみは回収が難しいため、新たなプラスチックの流出を防ぐことが重要である。このためには、海洋で最も多い「使い捨てプラスチック」への対策が必要となる。

積極的にリサイクルすれば解決すると安易に考える人は多い。現在の世界のプラスチックリサイクル率は約10%であるが、リサイクルされたプラスチックが再びリサイクルされる割合もまた約10%であり、永続的にリサイクルされる訳ではない。リサイクルは抜本的な解決策ではなく、プラスチックの使用量を減らし、生産を削減することが重要である。特に「使い捨てプラスチック」の削減が必要で、持続可能な未来に向けてプラスチック以外の代替材料への転換が求められている。

生分解性プラスチックは水と二酸化炭素に分解される特性があり、海洋でも分解する生分解性プラスチック

## MICROPLASTICS ACCUMULATING IN THE MID-DEEP LAYERS

While the previous discussion was about the deep seabed, recent research has revealed that there are layers in the mid-deep sea where plastics accumulate. Studies on microplastics in the North Pacific have shown that a large amount of microplastics exists at a depth of 2,000 m in the mid-deep layers[12]. It has been found that particularly small microplastics, with diameters of several tens of micrometers, are accumulating in these mid-deep layers.

Microplastics existing on the sea surface gradually sink to the deep sea due to biological attachments, etc. However, during the sinking process, the organic material on their surface is consumed by microbes, and the factors that cause the plastics to sink are lost. At first glance, it might seem that these tiny particles would resurface, but they do not easily float back up, and more indigestible organic material remains on the surface of the plastics, continuing the state of neither floating nor sinking. As a result, layers of microplastics have been observed accumulating in the mid-deep layers of the sea. Since about 80% of marine plastics are composed of carbon, and the concentration of plastics in the sea continues to increase exponentially, such “accumulation zones” could potentially have a plastic carbon amount comparable to the organic carbon amount of biological systems, raising concerns about the impact on ecosystems and material cycles[13].

## PROBLEMS CAUSED BY PLASTICS

The plastic flowing into the oceans has various impacts on ecosystems and marine life. There are several problems caused by plastics, but here, the issue of plastic ingestion will be discussed. Humans do not intentionally eat plastic, and if they accidentally ingest small pieces of plastic, it is not digested and is excreted from the body. However, many marine organisms mistakenly ingest plastic as food. One factor is the smell of food attached to the plastic[14]. Some seabirds mistake plastic for food and feed it to their chicks. This results in plastic accumulating in the chicks’ stomachs, leading to intestinal blockage and death from malnutrition. In cases where large pieces of plastic are ingested, the digestive tract can also be physically damaged. In fish, it has been confirmed that over 60% of approximately 500 species examined retain microplastics in their bodies[15]. Small fish, such as sardines, swallow microplastics along with plankton when they engulf them. As the concentration of microplastics in seawater increases, it becomes impossible to avoid ingesting microplastics. Over 700 species of marine life have been found to ingest plastic[16], and as the concentration of plastics in the ocean increases each year, the amount ingested by marine life is also expected to increase.

According to research teams in Japan, when the concentration of microplastics in the sea exceeds 1 gram per cubic meter, it has a significant adverse effect on marine life[17]. Especially in the surface layer of the North Pacific, it is predicted that this concentration could be exceeded in the 2060s, but the effects may appear even sooner on the seabed where the amount of plastic is greater. Additionally, the effects of toxic chemicals contained in plastics, such as additives, must also be considered. As described below, these chemicals can remain in the environment for a long time and have a wide-ranging impact.

## TOXICITY OF PLASTIC ADDITIVES

Microplastics, due to their small size, are not digested and are excreted as feces, so the current concentration of microplastics does not pose a direct problem to organisms. However, the issue is not the toxicity of the plastic itself, but the harmful chemicals (additives) contained in the plastic. Some of these additives can have harmful effects on organisms. For example, polybrominated diphenyl ethers (PBDEs), which have been used to enhance the flame retardancy of plastics, were once widely used in electrical appliances and furniture. However, due to their persistence in the environment, bioaccumulation in organisms, long-distance mobility, and reproductive toxicity, PBDEs have been designated as Persistent Organic Pollutants (POPs) under the Stockholm Convention, and their use and manufacture have been banned. Similarly, plastic-related chemicals such as the UV-328 of benzotriazole UV stabilizers (BZT-UVs), hexabromocyclododecane (HBCD), and some perfluorinated compounds (PFOA) have recently been designated as POPs. These additives easily leach out of plastics, and when organisms ingest plastics, the digestive fluids extract the chemicals, which then move into the body and accumulate in fat. Organisms can accumulate these harmful chemicals in their bodies by directly or indirectly ingesting plastics containing them. In our study of plastic additives in the liver of deep-sea sharks living in Japan’s deep sea, high concentrations of PBDEs were detected in all eight species of deep-sea sharks captured[18]. Such harmful substances are particularly prevalent in organisms at the top of the food

14 A. Stubbins, K. L. Law, S. E. Muñoz, T. S. Bianchi, L. Zhu, Plastics in the Earth system. Science 373, 51-55 (2021).

15 M. S. Savoca, M. E. Wohlfeil, S. E. Ebeler, G. A. Nevitt, Marine plastic debris emits a keystone infochemical for olfactory foraging seabirds. Science advances 2, e1600395 (2016).

16 A. Markic, J.-C. Gaertner, N. Gaertner-Mazouni, A. A. Koelmans, Plastic ingestion by marine fish in the wild. Critical Reviews in Environmental Science and Technology 50, 657-697 (2020).

17 S. Kühn, J. A. Van Franeker, Quantitative overview of marine debris ingested by marine megafauna. Marine pollution bulletin 151, 110858 (2020).

18 A. Isobe, S. Iwasaki, K. Uchida, T. Tokai, Abundance of non-conservative microplastics in the upper ocean from 1957 to 2066. Nature communications 10, 417 (2019).

12 S. Zhao, T. J. Mincer, L. Lebreton, M. Egger, Pelagic microplastics in the North Pacific Subtropical Gyre: A prevalent anthropogenic component of the particulate organic carbon pool. *PNAS nexus* 2, pgad070 (2023).

13 A. Stubbins, K. L. Law, S. E. Muñoz, T. S. Bianchi, L. Zhu, Plastics in the Earth system. *Science* 373, 51-55 (2021).

14 M. S. Savoca, M. E. Wohlfeil, S. E. Ebeler, G. A. Nevitt, Marine plastic debris emits a keystone infochemical for olfactory foraging seabirds. *Science advances* 2, e1600395 (2016).

15 A. Markic, J.-C. Gaertner, N. Gaertner-Mazouni, A. A. Koelmans, Plastic ingestion by marine fish in the wild. *Critical Reviews in Environmental Science and Technology* 50, 657-697 (2020).

19 R. Nakajima, M. Kawato, Y. Fujiwara, S. Tsuchida, H. Ritchie, K. Fujikura, Occurrence and levels of polybrominated diphenyl ethers (PBDEs) in deep-sea sharks from Suruga Bay, Japan. Marine Pollution Bulletin 176, 113427 (2022).

20 R. Nakajima, T. Ikuta, K. Oguri, H. Ritchie, Occurrence of polybrominated diphenyl ethers and benzotriazole UV stabilizers in the hadal amphipod Hirondellea gigas. iScience 26, (2023)

16 S. Kühn, J. A. Van Franeker, Quantitative overview of marine debris ingested by marine megafauna. *Marine pollution bulletin* 151, 110858 (2020).

17 A. Isobe, S. Iwasaki, K. Uchida, T. Tokai, Abundance of non-conservative microplastics in the upper ocean from 1957 to 2066. *Nature communications* 10, 417 (2019).

18 R. Nakajima, M. Kawato, Y. Fujiwara, S. Tsuchida, H. Ritchie, K. Fujikura, Occurrence and levels of polybrominated diphenyl ethers (PBDEs) in deep-sea sharks from Suruga Bay, Japan. *Marine Pollution Bulletin* 176, 113427 (2022).

の開発が進められている[21]。しかし、海洋生分解性プラスチックも、すぐに分解されるわけではなく、長期的には通常のプラスチックと同様の環境問題を引き起こす可能性がある。そのため、海洋生分解性プラスチックの使用は特定のリスクを伴う用途に限定されるべきだろう。

プラスチック汚染への対策意識は世界的に高まっており、2022年3月の国連環境会議では、2025年までにプラスチック問題の解決に向けた国際条約を作成する準備を始めることで、175カ国・地域が合意した。プラスチックの生産と使用に良い意味で大きな変化が起きることに期待したい。

参考文献

chain due to biomagnification. Similarly, a crustacean called the *Hirondellea gigas* isopod, collected from the hadal seabed more than 9,000 m deep, was found to contain the UV-328 of BZT-UVs[19] (Fig. 7). These results indicate that chemical pollution from plastics extends to every corner of the deep sea.

## PROPER HANDLING OF PLASTICS

Every day, a large amount of plastic flows from land to sea, and once it enters the ocean, recovery is nearly impossible. It is possible to collect drift debris from beaches and rivers, but this represents only a small part of the debris that flows into the sea. Since it is difficult to recover plastic debris that has already entered the sea, it is important to prevent new outflows of plastic. To achieve this, measures against "single-use plastics", which are the most common in the ocean, are necessary. Many people think that active recycling can solve the problem. However, the current global plastic recycling rate is about 10%, and the rate at which recycled plastics are recycled again is also about 10%, meaning they are not perpetually recycled. Recycling is not a fundamental solution; reducing the amount of plastic used and cutting production is important. Especially, reducing "single-use plastics" is necessary, and a transition to alternative materials other than plastic is required for a sustainable future.

Biodegradable plastics, which decompose into water and carbon dioxide, are being developed to decompose in the ocean as well[20]. However, marine biodegradable plastics do not decompose immediately and could cause environmental problems similar to regular plastics in the long term. Therefore, the use of marine biodegradable plastics should be limited to specific applications with associated risks.

Awareness of measures against plastic pollution is increasing globally, and at the United Nations Environment Conference in March 2022, 175 countries and regions agreed to start preparing an international treaty aimed at resolving the plastic issue by 2025. I hope for significant positive changes in plastic production and use.


21 T. Omura, N. Isobe, T. Miura, S. i. Ishii, M. Mori, Y. Ishitani, S. Kimura, K. Hidaka, K. Komiyama, M. Suzuki, Microbial decomposition of biodegradable plastics on the deep-sea floor. Nature Communications 15, 568 (2024)

19 R. Nakajima, T. Ikuta, K. Oguri, H. Ritchie, Occurrence of polybrominated diphenyl ethers and benzotriazole UV stabilizers in the hadal amphipod *Hirondellea gigas*. *iScience* 26, (2023).

20 T. Omura, N. Isobe, T. Miura, S. i. Ishii, M. Mori, Y. Ishitani, S. Kimura, K. Hidaka, K. Komiyama, M. Suzuki, Microbial decomposition of biodegradable plastics on the deep-sea floor. *Nature Communications* 15, 568 (2024).




Fig. 1.
ニューストンネットで採取されたマイクロプラスチック。大きさが5mm以下のプラスチック片をマイクロプラスチックと呼ぶ。現在、世界の海表面には170兆個を超えるマイクロプラスチックが漂う。
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Fig. 1
Microplastics collected with a neuston net in the sea around Japan. Plastic pieces smaller than 5 mm are referred to as microplastics. Currently, there are more than 170 trillion microplastics floating on the world's ocean surface. ©JAMSTEC

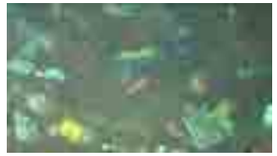

Fig. 2.
日本の東北沖の海底に堆積するプラスチックごみ（水深660m）。軽いプラスチックも、藻類などの生物が付着したりして、重くなって沈む。
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Fig. 2
Plastic litter accumulating on the seabed off the coast of Northeast Japan (at a depth of 660m). Buoyant plastics sink after becoming heavy due to the attachment of algae and other organisms. ©JAMSTEC

Fig. 3.
日本近海で海洋ごみが集積すると予測された黒潮再循環域（Kuroshio Recirculation gyre）と黒潮続流再循環域（Kuroshio Extension Recirculation gyre）。
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Fig. 3
Predicted areas of marine debris accumulation in the Kuroshio Recirculation Gyre and the Kuroshio Extension Recirculation Gyre near Japan. ©JAMSTEC

Fig. 4.
房総半島沖の海底で見つかったポリ袋（水深5814m）。深海底では袋などの包装ごみが最も多い。
©JAMSTEC

Fig. 4
A plastic bag found on the seabed off the Boso Peninsula, Japan (at a depth of 5814m). Packaging litter such as bags is most common on the deep seabed. ©JAMSTEC

Fig. 4.
水深5813 mの海底で見つかった風船ごみ。風船ごみとしては世界最深記録である。
©JAMSTEC

Fig. 5
Balloon litter found on the seabed at a depth of 5813m. This is the deepest record for balloon litter in the world. ©JAMSTEC

Fig. 6.
房総半島沖の海底から採取された食品包装（水深5707m）。1984年に製造された印字が読める（回収時で35年前のごみ）。プラスチックは生物によって分解されず、完全に崩壊してなくなるまでに数百年から千年以上かかると考えられている。
©JAMSTEC

Fig. 6
Food packaging collected from the seabed off the Boso Peninsula (at a depth of 5707m). The print, manufactured in 1984, is still readable (litter from 35 years ago). Plastics are not decomposed by organisms, and it is believed to take hundreds to over a thousand years to completely disintegrate. ©JAMSTEC

Fig. 7.
房総半島沖の水深9200mの海底から採取された甲殻類、カイコウオオソコエビ。その体内からはプラスチックに使われる有害な化学物質（紫外線吸収剤UV-328）が検出された。
©JAMSTEC

Fig. 7
A crustacean, the Hirondellea gigas isopod, collected from the seabed at a depth of 9200m off the Boso Peninsula. Harmful chemicals used in plastics (UV-328) were detected inside its body. ©JAMSTEC

## VIVRE EN ALASKA DANS UNE COMMUNAUTÉ YUP'IK : QUELLES SOLUTIONS DURABLES ?

## LIFE IN A YUP'IK COMMUNITY IN ALASKA. WHAT SUSTAINABLE SOLUTIONS ARE AVAILABLE?

**VO**

Au sud-ouest de l'Alaska, dans le delta des rivières Yukon et Kuskokwim, vit actuellement la communauté native la plus importante des États-Unis d'Amérique : les Yupiit (Yup'ik au singulier) peuple apparenté aux Inuit, dont ils se distinguent par leur langue et certaines de leurs traditions. Dans les deux cas, ces sociétés se considèrent comme les « Hommes » (*Inuit*), les personnes (*Yuk*) « vraies » (*-piit*).

Pour les Yupiit, peuple au mode de vie saisonnier, le littoral de la mer de Béring et sa toundra humide, recouverte de neige en hiver, sont le principal habitat. Les activités tournent autour des campements de pêche au printemps et en été, dédiés en particulier à l'exploitation des différentes espèces de saumon, alors que les Yupiit sont plus communautaires et sédentaires en hiver, s'affairant à des activités plus artisanales (vannerie, travail du bois, de l'os par exemple) et cérémonielles. Ces occupations hivernales sont menées dans le *qasqiq* (« maison des hommes »), un véritable lieu de vie, diurne comme nocturne, pour les hommes et les enfants. Les femmes habitent traditionnellement la maison voisine *ena*. Avant l'aménagement des constructions préfabriquées modernes, l'abondance de bois de flottage, charrié par les rivières depuis l'intérieur des terres plus tempérées, leur a permis de développer une architecture et une culture matérielle particulièrement riche dont témoignent les vestiges de Nunalleq, « le vieux village », abandonné il y a environ 350 ans, actuellement en bord de mer (probablement à une trentaine ou cinquantaine de mètres à l'intérieur des terres au moment de l'occupation du site). Les habitations en bois flotté sont reliées par des tunnels et des chemins de planches pour isoler de l'humidité dans ses environnements de toundra marécageuse. Elles sont recouvertes de tourbe pour se protéger du froid l'hiver, mais semblent aussi être occupées à d'autres moments de l'année, avec deux entrées distinctes selon la saison. Ce site ancestral, désormais archéologique, a vu se succéder au moins trois générations durant le petit âge glaciaire (1350-1850)[1]. Les conditions tragiques de son abandon sont encore fidèlement relatées dans la tradition orale du village de Quinhagak[2] à quelques kilomètres au nord, à l'embouchure de la rivière Qanirtuuq, où se sont déplacés les derniers survivants de l'attaque qui a touché « ce vieux village » autour de 1675 de notre ère.

Ce Petit âge glaciaire, période climatique froide principalement localisée de part et d'autre de l'Océan Atlantique Nord, a eu un impact différent selon les régions. Jusqu'à la première moitié du XIX$^{e}$ siècle, des vagues de froid ont été enregistrées, en particulier l'été, qui ont provoqué d'importants dégâts. Quatre minimas ont été enregistrés (~1350, 1640, 1820 et 1850), le second correspondant à une période de conflits intenses dans la région du delta Yukon-Kuskokwim où étaient installées de nombreuses communautés yupiit. Bien que parfois perçu comme un avantage pour les sociétés arctiques, les périodes de refroidissement enregistrées pendant le Petit âge glaciaire semblent corrélées à des périodes de conflits plus intenses. Les impacts climatiques et environnementaux sur les populations animales, et sur les saumons en particulier, ressource alimentaire principale des Yupiit, au côté de mammifères marins et de cervidés, méritent d'être clarifiés. C'est l'un des objectifs fixés par le projet archéologique YUP'IK[3], qui vise à appréhender les modalités d'adaptation aux variations climatiques et environnementales des sociétés yupiit passées, mais aussi à intégrer les données enregistrées et les résultats obtenus à une réflexion plus générale sur les notions de développement durable dans ces contrées reculées d'Alaska. Actuellement, le village de Quinhagak, ainsi que de nombreux autres villages yupiit côtiers, font face à une hausse du niveau de la mer qui atteint déjà par endroits plus de 6 mètres d'après le CReSIS[4] Les inondations plus fréquentes liées à la montée inéluctable du niveau marin, provoquent une très forte érosion côtière qui est aggravée par des tempêtes

1 Ledger P.M., Forbes V., Masson-MacKean E., Hillerdal C., Hamilton W.D., McManus-Fry E., Jorge A., Britton K. et R.A. Knecht, 2018, Three Generations Under One Roof? Bayesian Modeling of Radiocarbon Data from Nunalleq, Yukon-Kuskokwim Delta, Alaska, *American Antiquity*, vol. 83, no. 3, pp. 505-524.

2 Riordan A. et A. Fienup-Riordan, 2013, Erinaput Unguvaniartut. So Our Voice Will Live. Quinhagak History and Oral Traditions, Yupik Languages Edition, Alaska Native Language Center, 413 p.

3 Ce projet a le soutien du Ministère de l'Europe et des Affaires Etrangères, ainsi que de l'Ambassade de France aux Etats-Unis par l'intermédiaire de la Villa Albertine, associée à la Fondation ENGIE sur ce programme pour la période 2023-2025.

4 Center for Remote Sensing and Integrated Systems https://cresis.ku.edu/research/data/sea_level_rise/index.html

**EN**

In south-west Alaska, in the delta of the Yukon and Kuskokwim rivers, lives the largest native community in the United States: the Yupiit (Yup'ik in the singular), a people related to the Inuit, from whom they differ in their language and some of their traditions. In both cases, these societies see themselves as the «People" (*Inuit*), the «real" (*-piit*) people *(Yuk*).

For the Yupiit, a people with a seasonal lifestyle, the Bering Sea coastline and its wet tundra covered in snow in winter are their main habitat. Activities revolve around fishing camps in spring and summer, dedicated in particular to harvesting the various species of salmon, while the Yupiit are more communal and sedentary in winter, engaging in more craft (basketry, woodwork and bonework, for example) and ceremonial activities. These winter occupations are carried out in the *qasqiq* («men's house»), a veritable living space, day and night, for men and children. The women traditionally live in the neighbouring *ena* house. Before the development of modern prefabricated buildings, the abundance of driftwood, carried by rivers from the more temperate inland areas, allowed them to develop a particularly rich architecture and material culture, as evidenced by the remains of Nunalleq, «the old village», abandoned around 350 years ago, now right on the shore (probably some thirty or fifty metres inland at the time the site was occupied). The driftwood dwellings are linked by tunnels and plank paths to insulate them from the dampness of the swampy tundra environment. They are covered in peat to protect them from the cold in winter, but also appear to be occupied at other times of the year, with two separate entrances depending on the season. This ancestral site, which is now archaeological, was home to at least three generations during the Little Ice Age (1350-1850)[1]. The tragic conditions of its abandonment are still faithfully recounted in the oral tradition of the village of Quinhagak[2], a few kilometres to the north, at the mouth of the Qanirtuuq River, where the last survivors of the attack on «this old village» around 1675 AD moved to.

This Little Ice Age, a cold climatic period mainly located on either side of the North Atlantic Ocean, had a different impact depending on the region. Until the first half of the 19$^{th}$ century, there were cold spells, particularly in summer, which caused major damage. Four lows have been recorded (~1350, 1640, 1820 and 1850), the second corresponding to a period of intense conflict in the Yukon-Kuskokwim delta region where many Yupiit communities were settled. Although sometimes seen as an advantage for Arctic societies, the cooling periods recorded during the Little Ice Age seem to be correlated with periods of more intense conflict. The climatic and environmental impacts on animal populations, salmon in particular, the Yupiit's main food resource alongside marine mammals and deer, need to be clarified. This is one of the objectives set by the YUP'IK archaeological project (C. Houmard dir.)[3]. The aim of this project is to understand the ways in which Yupiit societies have adapted to climatic and environmental variations in the past, and also to integrate the data recorded and the results obtained into a more general reflection on the notions of sustainable development in these remote Alaskan regions. The village of Quinhagak, along with many other coastal Yupiit villages, is currently facing a rise in sea level, which in some places is already more than 6 metres, according to CReSIS[4]. More frequent flooding linked to the inevitable rise in sea levels is causing severe coastal erosion, which is exacerbated by increasingly severe and frequent autumn and winter storms. The ground, for its part, is also warming and freezing later, accentuating the effects of erosion on coastlines previously protected by pack ice. The Yupiit people, disarmed and unable to fight the devastating effects of global warming on their own, are wondering about their future. In Quinhagak, in particular, where legend has

1 Ledger P.M., Forbes V., Masson-MacKean E., Hillerdal C., Hamilton W.D., McManus-Fry E., Jorge A., Britton K. and R.A. Knecht, 2018, Three Generations Under One Roof? Bayesian Modeling of Radiocarbon Data from Nunalleq, Yukon-Kuskokwim Delta, Alaska, *American Antiquity*, vol. 83, no. 3, pp. 505-524.

2 Riordan A. and A. Fienup-Riordan, 2013, Erinaput Unguvaniartut. So Our Voice Will Live. Quinhagak History and Oral Traditions, Yupik Languages Edition, Alaska Native Language Center, 413 p.

3 The project has the support of the French Ministry of Europe and Foreign Affairs, as well as the French Embassy in the United States via the Villa Albertine, which is associated with the ENGIE Foundation on this programme for the period 2023-2025

4 Center for Remote Sensing and Integrated Systems(https://cresis.ku.edu/research/data/sea_level_rise/index.html

automnales et hivernales de plus en plus fortes et rapprochées. Le sol, de son côté, se réchauffe aussi et gèle plus tardivement, accentuant les effets de l'érosion des littoraux auparavant protégés par la banquise. Les populations yupiit, désarmées et peu à même de lutter seules contre les effets dévastateurs du réchauffement climatique, s'interrogent sur leur devenir. A Quinhagak, en particulier, dont la légende voudrait que les habitants déménagent cinq fois dans leur existence, se prépare d'ores et déjà l'installation d'un nouveau village, avec toutes les questions que ce déménagement soulève, en premier lieu sur sa localisation. Il leur faut pour cela un endroit « au sec », bien drainé, plus enfoncé à l'intérieur des terres, dans un méandre de rivière suffisamment grand et stable pour pouvoir accueillir un petit millier de personnes, un aéroport et un port afin d'être ravitaillé par la barge qui approvisionne le village deux fois par an aux très grandes marées (mars et septembre). L'avion est un moyen de transport plus rapide mais il est beaucoup plus onéreux et limité en volumes transportés. Le nouveau lieu d'implantation doit aussi avoir un sens pour cette communauté de Quinhagak, être situé sur leur territoire et proche des traditionnels lieux de pêche et de chasse. A l'heure actuelle, les habitants ne s'accordent pas sur le choix d'un nouvel emplacement, malgré l'imminence des bouleversements à venir.

Face à ces menaces de plus en plus pressantes, l'archéologie a un rôle à jouer, non seulement pour récupérer et préserver un maximum de vestiges détériorés par l'érosion et la fonte du pergélisol, mais aussi pour documenter plus précisément le patrimoine matériel et immatériel de cette communauté yup'ik. Les fouilles archéologiques entreprises ces dernières années, et les restitutions faites aux résidents après chaque campagne, ont eu des effets particulièrement bénéfiques sur la communauté de Quinhagak. Les savoirs ancestraux sont retrouvés par l'étude de la culture matérielle et des modes de vie, tant grâce à l'archéologie qu'aux témoignages des aînés. Alors que la jeunesse avait tendance à délaisser son passé, au grand dam des aînés, le projet archéologique initié par Rick Knecht en 2009 a permis à certains jeunes d'assumer fièrement leur identité et a stimulé leur volonté de renouer avec les traditions ancestrales, notamment par le biais des chants et de la danse[5]. Co-construit par la communauté yup'ik et l'Université d'Aberdeen, ce projet est progressivement devenu international, regroupant des scientifiques européens (Ecosse, Estonie, Allemagne, France) et américains (Canada, Etats-Unis). Un jeune du village a ainsi eu l'idée de créer une application pour traduire les mots yupiit (de la langue yugtun) en anglais, ravivant ainsi l'usage des dialectes locaux. Par ailleurs, le développement des analyses génétiques (paléogénétique et génomique) aide également à retracer l'origine des populations humaines, végétales et animales, les mouvements migratoires ainsi qu'à préciser l'évolution des paysages, notamment en termes de diffusion/rétraction de la faune et de la flore disponibles et exploitées aux différentes périodes.

it that the inhabitants move five times in their lifetime, preparations are already underway for the installation of a new village, with all the questions that this move raises, first and foremost about its location. To do this, they need a 'dry', well-drained location, further inland, in a river bend that is large enough and stable enough to accommodate a few thousand people, an airport and a harbour so that they can be supplied by the barge that supplies the village twice a year during the very high tides (March and September). The plane is a faster means of transport, but it is much more expensive and limited in terms of volumes transported. The new site must also be meaningful to the Quinhagak community, located on their territory and close to traditional fishing and hunting grounds. At present, residents are unable to agree on a new location, despite the imminent upheaval ahead.

In the face of these increasingly pressing threats, archaeology has a role to play, not only in recovering and preserving as many remains as possible that have been damaged by erosion and melting permafrost, but also in documenting more accurately the tangible and intangible heritage of this Yup'ik community. The archaeological digs undertaken in recent years, and the returns made to residents after each campaign, have had a particularly beneficial impact on the community of Quinhagak. Ancestral knowledge is rediscovered through the study of material culture and ways of life, both through archaeology and through the testimony of elders. At a time when young people were tending to abandon their past, much to the chagrin of their elders, the archaeological project initiated by Rick Knecht in 2009 enabled some young people to proudly assume their identity and stimulated their desire to reconnect with ancestral traditions, particularly through song and dance[5]. Co-constructed by the Yup'ik community and the University of Aberdeen, this project has gradually become international, bringing together European (Scotland, Estonia, Germany, France) and American (Canada, USA) scientists. A young man from the village came up with the idea of creating an application to translate Yupiit words (from the Yugtun language) into English, thus reviving the use of local dialects. The development of genetic analyses (palaeogenetics and genomics) is also helping to trace the origins of human, plant and animal populations, migratory movements and the evolution of landscapes, particularly in terms of the spread/reduction of the flora and fauna available and exploited at different periods. The results to come could provide a wealth of information on current issues, particularly on the question of berries collected for consumption, the abundance (and sometimes simply the presence) of which appears to be highly dependent on the vagaries of the weather. A better characterisation of the ways in which the environment has been adapted

5 Knecht R. et W. Jones, 2019, « The Old Village": Yup'ik Precontact Archaeology and Community-Based Research at the Nunalleq Site, Quinhagak, Alaska, *Etudes/Inuit/Studies*, vol. 43, no. 1-2, pp. 25-52.

5 Knecht R. and W. Jones, 2019, 'The Old Village: Yup'ik Precontact Archaeology and Community-Based Research at the Nunalleq Site, Quinhagak, Alaska, *Etudes/Inuit/Studies*, vol. 43, no. 1-2, pp. 25-52.

Les résultats à venir peuvent être riches d'enseignement en écho à des problématiques actuelles, notamment sur la question des baies collectées pour être consommées, dont l'abondance (et parfois simplement la présence) semble très dépendante des aléas climatiques. Mieux caractériser les modalités d'adaptation et exploitation de l'environnement dans le passé[6] peut en conséquence informer sur les choix à opérer dans le futur. Le développement durable implique bien sûr de bonnes pratiques sur les plans cynégétique (lié à la pêche et à la chasse), sanitaire et social, à une échelle locale comme régionale et internationale. La population yup'ik en a toujours été consciente, mais toutes les décisions ne leur reviennent pas, certaines dépendant des gouvernances provinciales et fédérales, tel l'octroi ou non de licences de pêche, cruciales pour le modèle économique de ces villages reculés. Par le prisme de l'archéologie, nous souhaitons ainsi contribuer, à une prise de conscience collective à l'échelle internationale, de la fragilité de ces populations littorales, en Alaska et ailleurs.

and exploited in the past[6]can therefore inform the choices to be made in the future. Sustainable development naturally implies best practices in terms of hunting and fishing, health and social issues, on a local, regional and international scale. The Yup'ik people have always been aware of this, but not all decisions are theirs to make. Some depend on provincial and federal governments, such as whether or not to grant fishing licences, which are crucial to the economic model of these remote villages. Through the prism of archaeology, we hope to contribute to a collective international awareness of the fragility of these coastal populations, in Alaska and elsewhere.

6 Masson-MacLean E., Houmard C., Knecht R., Sidéra I., Dobney I. et K. Britton, 2020, Pre-Contact adaptations to the Little Ice Age in Southwest Alaska: New evidence from the Nunalleq site, *Quaternary International*, vol. 549, pp. 130-141.

6 Masson-MacLean E., Houmard C., Knecht R., Sidéra I., Dobney I. and K. Britton, 2020, Pre-Contact adaptations to the Little Ice Age in Southwest Alaska: New evidence from the Nunalleq site, *Quaternary International*, vol. 549, pp. 130-141.

# ERZKISTEN, SHAMPOOFLASCHEN UND INTELLIGENTE PILZE

# ORE CRATES, SHAMPOO BOTTLES AND INTELLIGENT MUSHROOMS

## VO

Zum Frühstücken hat er sich auf die Erzkiste gesetzt – auf die Kiste mit dem Uran, so wie es alle Kumpel unter Tage gemacht haben. Am nächsten Tag war der ganze Unterleib geschwollen und alles tat weh. Trotzdem fuhr er weiter in den Schacht ein. Dreißig Jahre später kam die Leukämie, dann der Lymphknotenkrebs und schließlich der Darmkrebs. Von 1947 – 1990 wurde im Erzgebirge Uran für das sowjetische Kernwaffenprogramm gefördert. Ohne Rücksicht auf die Bevölkerung und die Umwelt wurde gebohrt und gefördert. Innerhalb weniger Jahre wurden verschlafene Dörfer zu staubigen Mondlandschaften aus Abraumhalden, Schachtanlagen und Aufbereitungsfabriken. Jahrzehnte später haben sich die ehemaligen Abbaugebiete in Parklandschaften oder normale Gewerbegebiete verwandelt. Dass hier einstmals das weltgrößte Unternehmen für Uranbergbau förderte, ist fast unvorstellbar.

Was können wir uns vorstellen? Wir leben in einer Krise der Imagination. In der Inszenierung TAUSEND SONNEN (Premiere: 28.11.2022, Staatsschauspiel Dresden) brachten wir sechs ehemalige Bergleute und Anwohner des Uranbergbaus auf die Bühne und erforschten mit ihnen die Narrative, die ihr Leben und die Erinnerung an die Zeit unter Tage bestimmen. Im Probenprozess zeigte sich immer wieder, wie ungreifbar die unsichtbaren, geruchlosen und zunächst unmerklichen Folgen der Radioaktivität für die Beteiligten geblieben sind. Und auch heute scheint bei den meisten der Eindruck vorzuherrschen, dass mit dem Abbau der Fördertürme das Problem verschwunden sei. Zwar wusste und weiß man um die Gefahren, die unter der Erde und in den Körperzellen schlummern, aber sie schienen und scheinen immer nur die anderen zu betreffen. Stattdessen sind viele Lebenserzählungen vom Stolz auf die eigene Leistung bestimmt und davon, zu einer besonders privilegierten Bevölkerungsgruppe in der DDR gehört zu haben. Vielleicht steht der erzählerische Umgang mit Radioaktivität paradigmatisch für ein Problem, das wir heute in der Auseinandersetzung mit den ökologischen Krisen unseres Planeten haben.

Der indische Romancier Amitav Ghosh vertritt in seinem Essay „Die große Verblendung“ die These, dass die westlich geprägte Literatur zu einer Krise der Imagination beigetragen habe. Mit der Fokussierung auf menschliche Protagonisten zur Zeit der Aufklärung klammerte sie die Natur als Akteur von Geschichten aus und degradierte sie zur reinen Kulisse menschlicher Konflikte. Sie wurde zur Ressource, die man ausbeuten konnte, zur Erholungslandschaft oder zur „schönen Natur“, die der Erbauung diente. Darin liegt eine kolonialistische Geste, mit der die Welt jenseits der europäischen Metropolen (mit ihrer kulturellen Definitionsmacht und wirtschaftlich-militärischen Potenz) zum reinen Hinterland ohne eigene Geschichte reduziert wurde. Weil wir es aber verlernt haben, nicht-menschliche Akteure (wie radioaktiv strahlendes Erz oder ein Unwetter) als Protagonisten unserer Geschichten zu begreifen, fällt es uns heute auch so schwer, die Klimakrise, die Zerstörung von Lebensräumen oder das Artensterben auf eine Art und Weise zu erzählen, dass es uns affektiv ergreift.

In der Inszenierung TORNADO (Premiere: 12.09.2020, Theaterdiscounter Berlin) haben wir uns mit der Frage beschäftigt, warum wir es nicht schaffen, angemessene Maßnahmen zur Bekämpfung der Klimakrise zu ergreifen. In einer Szene, die auf dem Interview mit einer Klimawissenschaftlerin beruht, reflektiert die Figur ihre Erschütterung, wenn sie nach einer mehrmonatigen Expedition im sibirischen Polarmeer im Drogeriemarkt vor einem Regal mit Shampooflaschen steht. Auf dem Schiff hat sie die Klimakrise hautnah erlebt, wie gigantische Flächen, die früher eine Landschaft aus Packeis und glasklarem Himmel bildeten, heute aus einer trüben Suppe aus Eisklümpchen und grauem Nebel besteht. Dann kehrt sie zurück, der Alltag geht einfach weiter, mit unzähligen Shampoo-Marken im Supermarkt, die mit Pflegeölen aus Erdöl produziert sind, aromatisiert und duftend und in Plastikflaschen verpackt, und sie fühlt sich unfähig, die Drastik ihrer Erfahrung den Zuhausegebliebenen zu vermitteln. Ihre Forschungsergebnisse sind so komplex, oft nur mit mathematischen Modellen zu durchdringen und von Hochleistungsrechnern erstellt, dass sie in eine kommunikative Resignation verfällt: das kann sich niemand vorstellen. Sie beschreibt damit ein Grundproblem unseres modernen Naturzugangs, der uns auch in unserem fünfjährigen botanischen Langzeittheater DIE WELT OHNE UNS (2009 – 2014, Staatstheater Hannover) immer wieder begegnete. In dieser Produktion haben wir versucht, Pflanzen zu Protagonisten eines Theaterstücks zu machen. In ins-

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He sat down on the ore crate for breakfast - on the crate with the uranium, just like all the miners did underground. The next day his whole abdomen was swollen and everything hurt. But that didn’t stop him from going further into the shaft. Thirty years later came leukaemia, then lymph node cancer and finally bowel cancer. From 1947 to 1990, uranium was mined in the Ore Mountains for the Soviet nuclear weapons programme. Drilling and extraction were carried out without any regard for the local population or the environment. Over the course of just a few years, sleepy villages were transformed into dusty moonscapes of spoil tips, mine shafts and processing factories. Decades later, these former mining areas have been transformed into parkland or normal industrial estates. It is almost unimaginable that the world’s largest uranium mining company was once active her.

So what can we imagine? We are living in a crisis of the imagination. In the production TAUSEND SONNEN (Premiere: 28.11.2022, Staatsschauspiel Dresden), we brought six former miners and residents of the uranium mining area on stage and explored the narratives that define their lives with them and the memory of their time underground. During the rehearsal process, it became clear time and again how intangible the invisible, odourless and initially imperceptible consequences of radioactivity remained for those involved. And even today, most people seem to be under the impression that the problem has disappeared with the dismantling of the winding towers.

Whilst people knew and still know about the dangers that lie dormant underground and in the body’s cells, these dangers always seemed and still seem to only affect others. Instead, many life stories from the era are characterised by pride in their own achievements and the fact that they belonged to a particularly privileged population group in the GDR. Perhaps the narrative approach to radioactivity is paradigmatic of a problem we have today in dealing with the ecological crises of our planet.

In his essay «The Great Derangement», the Indian novelist Amitav Ghosh argues that Western-influenced literature has contributed to a crisis of the imagination. By focussing on human protagonists at the time of the Enlightenment, it excluded nature as an actor in stories and degraded it to a mere backdrop for human conflicts. It became a resource that could be exploited, a recreational landscape or «beautiful nature» for edification. There was also a colonial aspect to this view, in which the world beyond the European metropolises (with their cultural defining power and economic-military potency) was reduced to a mere hinterland without its own history. And now that we have forgotten how to recognise non-human actors (such as radioactive ore or a storm) as the protagonists of our stories, today we find it very difficult to talk about the climate crisis, the destruction of habitats or the extinction of species in a way that affects us.

In the production TORNADO (première: 12.09.2020, Theaterdiscounter Berlin), we addressed the question of why we are failing to take appropriate measures to combat the climate crisis. In a scene based on an interview with a climate scientist, the character reflects on her shock when she stands in front of a shelf of shampoo bottles in a chemist’s after an expedition lasting several months in the Siberian Arctic Ocean. On the ship, she experienced the climate crisis at first hand, saw with her own eyes how gigantic areas that used to form a landscape of pack ice and crystal-clear skies are now a murky soup of lumps of ice and grey fog. Then she returns, everyday life just goes on, with countless brands of shampoo in the supermarket made with petroleum-based oils, flavoured and scented and packaged in plastic bottles, and she feels unable to convey the drastic nature of her experience to those at home. Her research results are so complex, often only penetrable with mathematical models and generated by powerful computers, that she falls victim to a sense of communicative resignation: nobody can imagine it.

She thereby describes a fundamental problem of our modern approach to nature, which we also encountered again and again in our five-year botanical long-term theatre project DIE WELT OHNE UNS (THE WORLD WITHOUT US) (2009 - 2014, Staatstheater Hannover). In this production, we tried to make plants the protagonists of a theatre play. In a total of nine episodes, we set up a public container with a glass pane on a former barracks site and created a garden that has artificially gone wild over the years. The idea behind the project of learning to see plants as individuals with a specific history, which we explored in various performance and theatrical arrangements, repeatedly stumbled over the challenge that human and plant scales of size and time are far apart.

gesamt neun Folgen haben wir auf einem ehemaligen Kasernengelände einen Publikumscontainer mit Glasscheibe aufgestellt und einen Garten angelegt, der im Laufe der Jahre künstlich verwilderte. Die Idee des Projekts, Pflanzen als Individuen mit einer spezifischen Geschichte sehen zu lernen, die wir in unterschiedlichen performativen und theatralen Anordnungen erforschten, stolperte immer wieder über die Herausforderung, dass menschliche und pflanzliche Größen- und Zeitskalen weit auseinanderklaffen. Prozesse von Kommunikation, Verteidigung und Fortpflanzung geschehen über chemische, innerpflanzliche und unterirdische Wege, die unserer unmittelbaren Wahrnehmung verschlossen sind. So bleibt vermeintlich nur der Zugang über die wissenschaftliche Aufbereitung, die das einzelne Individuum zum Vertreter einer Art und Gattung macht, Zufall und Schicksal über statistische Quantifizierung herausmittelt und ihre Geschichte zur Episode eines Evolutionsprozesses reduziert. Oder wir fangen an zu anthropomorphsieren, der Pflanze eine menschliche Stimme zu verleihen und vom Gespräch der Bäume und der Intelligenz der Pilze zu raunen. Die Natur verwandelt sich zum Puppentheater, das durch unsere menschlichen Vorstellungen von Geschichten animiert wird. So aber können wir die Pflanze *als Pflanze* in ihrem Eigensinn gerade eben nicht wahrnehmen.

Wir sehen also, wie hoch die historisch gewachsenen Hürden sind, wie sehr unsere Wahrnehmung und unsere ästhetischen Sprachen durch die Marginalisierung von Natur geprägt sind. Die Krise der Imagination führt unmittelbar zur Frage, wie wir uns als Menschen selbst verstehen und unsere Stellung im Kosmos verorten.

Im zweiten Teil von TORNADO betritt das Publikum eine Halle, in der eine Installation aus Ventilatoren aufgebaut ist. Zu einer Collage aus Sound, Musik und Stimmenfragmenten setzen sich die Ventilatoren nach und nach in Bewegung, bilden mit der Rotation ihrer Propeller und der Pendelbewegung ihrer Köpfe im Raum flüchtige synchrone oder gegenläufige Muster, treten in Dialog miteinander, kämpfen gegen die Schwerkraft oder rempeln sich gegenseitig an. Die Luft im Raum wird durch die Ventilatoren aufgewirbelt und in Bewegung versetzt; sie bildet Kaskaden, Strömungsmuster und Turbulenzen. Irgendwann, zu einem unvorhersehbaren Augenblick, entwickelt sich mitten im Raum ein spiralförmiger Strudel, der sich allmählich verdichtet und immer höher aufbaut. Mehr und mehr Luftteile werden in die Rotationsbewegung mit hineingerissen, und dann, plötzlich, reckt sich ein schlauchförmiger Rüssel zur Decke der Halle empor. Vor dem Angesicht des Publikums hat sich ein etwa 4-5 Meter hoher echter, künstlicher Tornado gebildet. Er tanzt hin und her, kippt mal in die eine Richtung, dann in die andere Richtung. Sein Schlauch ist zeitweise breit und kräftig, dann wieder zerbrechlich und dünn, dann fällt er in sich zusammen und scheint verschwunden, um im nächsten Moment spukhaft wieder aufzutauchen.

In seinem Essay schreibt Amitav Ghosh von einem Wirbelsturm in seiner Heimatstadt Delhi, dem er „Auge in Auge" gegenübersteht. Er meinte zu spüren, dass der Wirbelsturm ihn angeschaut habe. Als sei dieser ein Wesen, das ihn erkennt. Es sind also nicht wir, die wir die Natur subjektivieren müssen, um sie als Gegenüber zu erkennen. Es ist die Natur, die uns in den Blick nimmt, indem sie vor unseren Augen Gestalt gewinnt und uns gegenübertritt. Damit beschreibt Ghosh ziemlich präzise, was im Theater geschehen kann, wenn wir zulassen, dass nicht wir Menschen mehr die Protagonisten sind, die mit ihren Intentionen die Handlung bestimmen. Vielleicht sind dies nur momenthafte Erfahrungen, in denen hinter der Krise der Imagination doch ein Zipfel von Vorstellung aufflackert. Möglicherweise entsprechen diese nicht dem menschlichen Muster einer Geschichte, kennen keinen Unterschied zwischen Handlung und Hintergrund und folgen nicht dem linearen Modell von Zeit, das unseren eigenen narrativen Raum strukturiert. Sie sind fragil, temporär, sprunghaft, nicht-determinierbar und verweigern sich unserer Verfügbarkeit. Doch sie erzählen von der Möglichkeit des Theaters, Unvollstellbares erfahrbar zu machen und von dieser Erfahrung affektiv ergriffen zu werden, selbst wenn sie sich unseren tradierten Vorstellungen von Theater entzieht.

Communication, defence and reproduction processes take place via chemical, intra-plant and subterranean pathways that we are unable to perceive directly. This supposedly means that access is possible via scientific processing only, which turns the individual into a representative of a species and genus, eliminates chance and fate via statistical quantification and reduces their history to an episode in an evolutionary process. Or we start to anthropomorphise, and give the plant a human voice and then whisper about the conversations trees have with the each other and the intelligence of fungi. Nature is transformed into a puppet theatre that is animated by our human ideas of stories. And in this context we are unable to perceive the plant *as a plant* in its way.

It is clear how high the historically grown hurdles are, how much our perception and our aesthetic languages are shaped by the marginalisation of nature. The crisis of the imagination leads directly to the question of how we understand ourselves as human beings and our position in the cosmos.

In the second part of TORNADO, the audience enters a hall in which an installation of fans has been set up. To a collage of sound, music and fragments of voices, the fans gradually set themselves in motion, forming fleeting synchronous or counter-rotating patterns with the rotation of their propellers and the oscillating movement of their heads in space, entering into dialogue with each other, fighting against gravity or bumping into each other. The air in the room is stirred up by the fans and set in motion; it forms cascades, flowing patterns and turbulence. At some point, at an unpredictable moment, a spiralling vortex develops in the middle of the room, which gradually thickens and becomes higher and higher. More and more air particles are drawn into the rotating movement and then, suddenly, a tube-shaped trunk stretches up towards the ceiling of the hall. A real, artificial tornado about 4-5 metres high has formed in front of the audience. It dances back and forth, sometimes tilting in one direction, then in the other. At times its tube is wide and strong, then fragile and thin, then it collapses and seems to disappear, only to eerily reappear the next moment.

In his essay, Amitav Ghosh writes about a tornado in his home city of Delhi, which he faces «eye to eye». He thought he could feel the hurricane looking at him. As if it were a being that recognised him. So it is not we who have to subjectify nature in order to recognise it as a counterpart. Instead it is nature that views us by taking shape before our eyes and confronting us. Ghosh describes quite precisely what can happen in the theatre if we accept that we humans are no longer the protagonists who determine the plot with their intentions. Perhaps these are only momentary experiences in which a glimmer of imagination flickers behind the crisis of the imagination. It is possible that they do not correspond to the human pattern of a story, do not recognise the difference between plot and background and do not follow the linear model of time that structures our own narrative space. They are fragile, temporary, erratic, non-determinable and refuse to be available to us. But they tell of the possibility of theatre to make the unimaginable tangible and to be affected by this experience, even if it eludes our traditional ideas of theatre.

Tornado

Welt Ohne Uns

## HISTOIRE D'AMOUR AVEC UN VÉGÉTAL

**VO**

Il est arrivé l'air décontracté alors que personne, encore, n'avait osé entrer dans la caravane. Il y avait bientôt une demi-heure que j'attendais, en plein cagnard, prête à croire que mon projet était mort-né lorsqu'il s'est approché, souriant. Tandis qu'il s'installait derrière le micro, il m'a félicitée pour cette initiative puis il s'est éclairci la voix. « Je m'apprêtais à partir en vacances, ma moto était prête, le soleil était dans le ciel et je me suis dit, bois un petit verre avant de partir et il y avait un citron sur la table, que j'ai coupé et pressé avant d'en recracher les pépins dans l'évier ».

Ainsi débutait l'histoire de Marc et toute ouïe, je l'ai laissé me raconter comment ce petit pépin avait, à son retour, littéralement poussé, enfoui des racines dans la bonde de l'évier, et comment Marc, avec une obstination presque enfantine, s'était alors employé à sauver cette pousse, plein d'une admiration nouvelle pour les plantes et les efforts déployés « pour accomplir cette chose magnifique ».

Nous étions en juillet 2022 ; je venais de lancer un projet ambitieux dont le premier volet, mené à l'Abbaye de Beauport, avait reçu un financement du dispositif gouvernemental Mondes Nouveaux. Au cours des deux mois qui allaient suivre, je collecterais 65 histoires, confiées par des visiteurs d'âges, de sexes, de milieux sociaux, d'origines différents mais qui toutes et tous avaient accepté de répondre à cette incongrue proposition : *racontez une histoire d'amour avec un végétal*. En tant écrivaine, je n'ai jamais douté du pouvoir des histoires — pouvoir d'évasion, d'apaisement, de transmission, d'inspiration, de mobilisation, d'édification. Pour ce projet-là cependant, je ne voulais pas écrire mais écouter. Je voulais amener d'autres personnes à raconter ce que, jamais, elles n'avaient raconté, en conservant la magie de leurs voix.

Concernée par les problématiques environnementales, je suis convaincue que l'art a un rôle à jouer dans la révolution des mentalités qui doit advenir si nous ne voulons pas perdre notre monde. Mais j'ai aussi pleinement conscience du fait qu'il nous faut passer d'une « sensibilisation par l'information », factuelle et intellectuelle, à une modification des comportements, impliquant corps et émotions. Pour vouloir protéger, il faut d'abord pouvoir aimer. Et c'est à ce niveau que les récits oraux peuvent avoir un impact.

L'anthropologue américaine Anna Tsing s'est penchée sur la manière dont le système des plantations qu'a employé l'Europe à partir du XVIe siècle pour étendre ses richesses, a modifié la relation des humains aux plantes, notamment à leur culture, en remplaçant l'amour par la coercition. Ainsi, l'usage de monocultures intensives a-t-il instauré un rapport de domestication extrême guidé par la domination et le contrôle des plants comme des travailleurs contraints à s'en occuper. Toutefois, afin que fonctionne un tel système, les frontières entre cultures mais aussi entre propriétaires et esclaves, entre Blancs et Noirs, entre contremaîtres et mains d'œuvre devaient demeurées nettement établies. C'est selon Anna Tsing, aux femmes blanches que revint la tâche de maintenir ces délimitations, celles de la maison, de la famille, de l'espèce comme de la race. Dès lors le cercle familial, concrétisé par la maison, figea les limites de l'amour. « Avec le fétichisme du domestique, de la maison comme espace de pureté et d'interdépendance, les intimités extra-domestiques, qu'elles aient lieu au sein ou entre les espèces, furent considérées comme des rêves archaïques ou des affaires éphémères »[1].

Ce sont ces aventures extra-domestiques, cette intimité millénaire entre plantes et humains que mon projet a pour ambition de mettre en valeur en reposant les termes de cette relation. Afin d'échapper à une approche productiviste ou utilitaire, et pénétrer dans le si précieux royaume des liens émotionnels et mémoriels, je me suis donc appuyée sur la notion d'amour. Apparaissant d'abord incongrue, elle a aidé les participants à se rappeler de moments de grande proximité avec une plante, un arbre, une fleur, un légume... auxquels furent voués un intérêt, une attention, un soin qui, renforçant leur unicité, les ont rendu porteurs d'une symbolique, voire constitutifs d'une identité. Souvent narrée pour la première fois, l'*histoire d'amour avec un végétal* acquiert une densité, une transmissibilité, une vivacité grâce auxquelles le végétal ne s'envisage plus comme un accessoire, un décor ou un subalterne, mais comme un compagnon, une rencontre vitale, un composant à part entière d'une vie. Ainsi, ces histoires traduisent le souci comme la fascination, le plaisir comme

1 Anna Tsing, *Unruly Edges: Musbrooms as Companion Species*, Environmental Humanities 1, 2012, 141-154.

## A PLANT LOVE STORY

**EN**

He arrived looking relaxed, although no-one had yet dared enter the caravan. I'd been waiting for nearly half an hour, in the middle of a heatwave, ready to believe that my project was dead in the water, when he approached, smiling. As he settled down behind the microphone, he congratulated me on this initiative and then cleared his throat. "I was getting ready to go on holiday, my motorbike was ready, the sun was blazing in the sky and I said to myself, have a little drink before you go and there was a lemon on the table, which I cut and squeezed before spitting out the seeds into the sink".

So began Marc's story, and I let him tell me how, on his return, this little seed had literally grown, burrowing roots into the sink drain, and how Marc, with an almost childlike obstinacy, had then set about saving this shoot, full of a new admiration for plants and the efforts made "to accomplish this magnificent feat."

It was July 2022 and I had just launched an ambitious project, the first part of which, at Beauport Abbey, had received funding from the government's New Worlds programme. Over the next two months, I collected 65 stories from people of different ages, genders, social backgrounds and nationalities, all of whom had agreed to respond to this incongruous proposal: *tell me your plant love story*. As a writer, I have never doubted the power of stories - the power to escape, to soothe, to pass on, to inspire, to mobilise, to edify. For this project, however, I didn't want to write, I wanted to listen. I wanted to get other people to tell stories that they had never told before, keeping the magic of their own voices.

Concerned about the environment, I'm convinced that art has a role to play in the thought revolution that needs to take place if we don't want to lose our world. But I'm also fully aware of the fact that we need to move on from "raising awareness through information" - factual and intellectual - to changing behaviour, involving the body and emotions. To want to protect, you must first be able to love. And this is where oral narratives can have an impact.

American anthropologist Anna Tsing has studied the way in which the plantation system used by Europe from the 16th century onwards to expand its wealth changed the relationship between humans and plants, and in particular their cultivation, by replacing love with coercion. In this way, the use of intensive single crop farming has established a relationship of extreme domestication guided by the domination and control of both the plants and the workers forced to look after them. However, for such a system to work, the boundaries between the crops, between owners and slaves, whites and blacks, foremen and workers, had to remain clearly established. According to Anna Tsing, the task of maintaining these boundaries - those of the home, the family, the plants and the race - fell to white women. Consequently, the family circle, embodied by the house, set the limits of love. "With the fetishism of domesticity, the home as a space of purity and interdependence, extra-domestic intimacies, whether within or between species, were regarded as archaic dreams or ephemeral affairs"[1].

It is these extra-domestic adventures, this age-old intimacy between plants and humans, that my project aims to highlight by rethinking the terms of this relationship. To escape a production-driven or utilitarian approach and enter the precious realm of emotional and memorial connections, I based myself on the notion of love. Incongruous at first, it helped participants recall moments of close proximity to a plant, a tree, a flower or a vegetable to which they had devoted interest, attention or care. Reinforcing their uniqueness, this care made them represent a certain symbolism, an identity even an identity. Often told for the first time, the*plant love story* acquires a density, a legacy, a liveliness thanks to which the plant is no longer seen as an accessory, a backdrop or a subordinate, but as a companion, a vital encounter, a fully-fledged component of a life. In this way, these stories reflect the concern and fascination, the pleasure and questions that plants raise for the people who have told me about how they have come into contact with them.

The day pregnant Kedma fell in love with a fuchsia without knowing its name. Delighted by the flowers hanging from a Parisian balcony, she had no idea that the plant was, like her, originally from Haiti and had been stripped of its vernacular name to be named after the German botanist

1 Anna Tsing, *Unruly Edges: Mushrooms as Companion Species*, Environmental Humanities 1, 2012, 141-154.

Céline Curiol *France*

les interrogations que les végétaux suscitent chez celles et ceux qui m'ont livré les manières dont ils les ont fréquentés.

Le jour où Kedma, enceinte, s'est éprise d'un fuschia sans en connaître le nom, ravie par ces fleurs accrochées à un balcon parisien, elle ne se doutait pas que la plante était, comme elle, originaire d'Haïti et avait été démise de son nom vernaculaire pour être nommée d'après le botaniste allemand Fuchs qui l'avait « découverte »... Petite, Sarah se rendait chaque week-end dans la bonzaïerie de son père, un immense espace rempli de centaines et de centaines d'arbustes de tailles diverses. Vingt-cinq ans plus tard, la plupart sont devenus grands pour celle qui se souvient et peine à s'affranchir de cet héritage si vivace et encombrant...

Si « l'expérience de nature disparaît »[2], j'estime opportun et indispensable de collecter, de partager et de diffuser ces récits qui nous amènent à réfléchir à nos expériences de nature et à la nécessité de celles-ci. Ce pourquoi, au cours de ma résidence à la Villa Médicis cette année, j'ai continué de réaliser des enregistrements auprès des jardiniers et des habitants du lieu. À l'avenir, j'aimerais poursuivre la constitution de cette grande archive sonore dont je rêve, qui reflèterait toutes les facettes des relations entre humains et végétaux au début de ce siècle et permettrait d'appréhender les manières dont les premiers comprennent, et donc aussi agissent envers, les seconds.

En 2003, la psychologue Susan Clayton définissait le concept d'*identité environnementale* comme « un sentiment de connexion avec certaines parties de l'environnement naturel non-humain (...) qui influe sur la manière dont nous percevons le monde et agissons envers celui-ci »[3]. Elle put alors constater une corrélation entre l'identité environnementale et les comportements écologiques que les gens déclaraient adopter. Aujourd'hui, forte de ses d'études, la psychologie environnementale défend que « les affects envers la nature engendrent une impression d'appartenance qui peut mener *in fine* à une responsabilité morale vis-à-vis des non-humains »[4]. Ces affects mobilisateurs, l'art et particulièrement le récit d'histoires les éveillent en chacun. Dès lors, croire que ce partage d'expériences de nature façonnera nos comportements et nos choix politiques n'a rien d'absurde.

2 Joanne Clavel, « Expériences de natures, investir l'écosomatique », dans *Le Souci de la nature*, Chapitre 19, p. 321, CNRS Éditions, 2023.

3 Susan Clayton, "Environmental identity: A conceptual and an operational definition," dans *Identity and The Natural Environment: The Psychological Significance of Nature*, MIT Press, 2003, p. 45-46. Traduction de l'autrice.

4 *Ibid.*, p. 327

Fuchs who had 'discovered' it... As a child, Sarah would go every weekend to her father's bonsai garden, a huge space filled with hundreds and hundreds of trees of various sizes. Twenty-five years later, most of them have grown up for the woman who remembers and struggles to free herself from this vivid and cumbersome legacy...

If the "experience of nature is disappearing"[2], I believe it is appropriate and essential to collect, share and circulate these stories. They lead us to reflect on our experiences of nature and the need for them. That's why, during my residency at Villa Medici this year, I continued to make recordings with gardeners and local residents. In the future, I'd like to continue building the great sound archive I've been dreaming of. It would reflect all the facets of the relationships between humans and plants at the beginning of this century, and provide insight into the ways in which the former understand, and therefore also act towards, the latter.

In 2003, psychologist Susan Clayton defined the concept of*environmental identity* as "a sense of connection with certain parts of the non-human natural environment (...) that influences the way we perceive and act towards the world"[3]. She found a correlation between environmental identity and the ecological behaviours that people reported adopting. Today, on the strength of its studies, environmental psychology argues that "affects towards nature give rise to an impression of belonging that can *ultimately* lead to a moral responsibility towards non-humans"[4]. Art and storytelling in particular awaken these emotions in everyone. So there's nothing absurd about believing that this sharing of experiences of nature will shape our behaviour and our political choices.

2 Joanne Clavel, "Expériences de natures, investir l'écosomatique", in *Le Souci de la nature*, Chapter 19, p. 321, CNRS Éditions, 2023.

3 Susan Clayton, "Environmental identity: A conceptual and an operational definition," in *Identity and The Natural Environment: The Psychological Significance of Nature*, MIT Press, 2003, p. 45-46. Translation by the author.

4 *Ibid*, p. 327

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