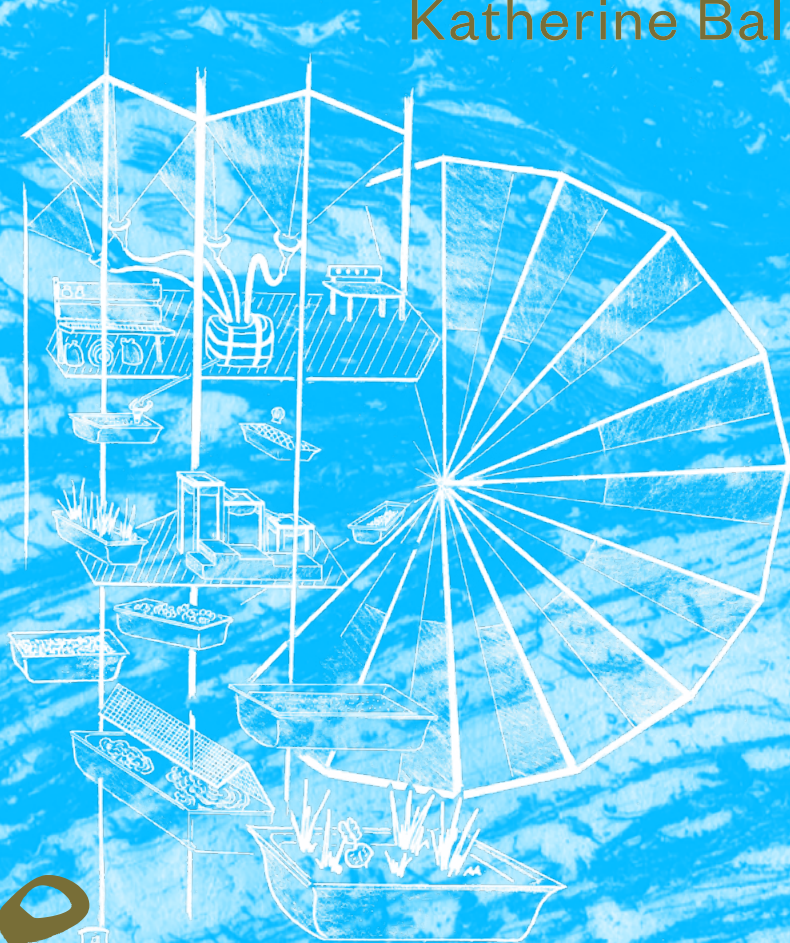
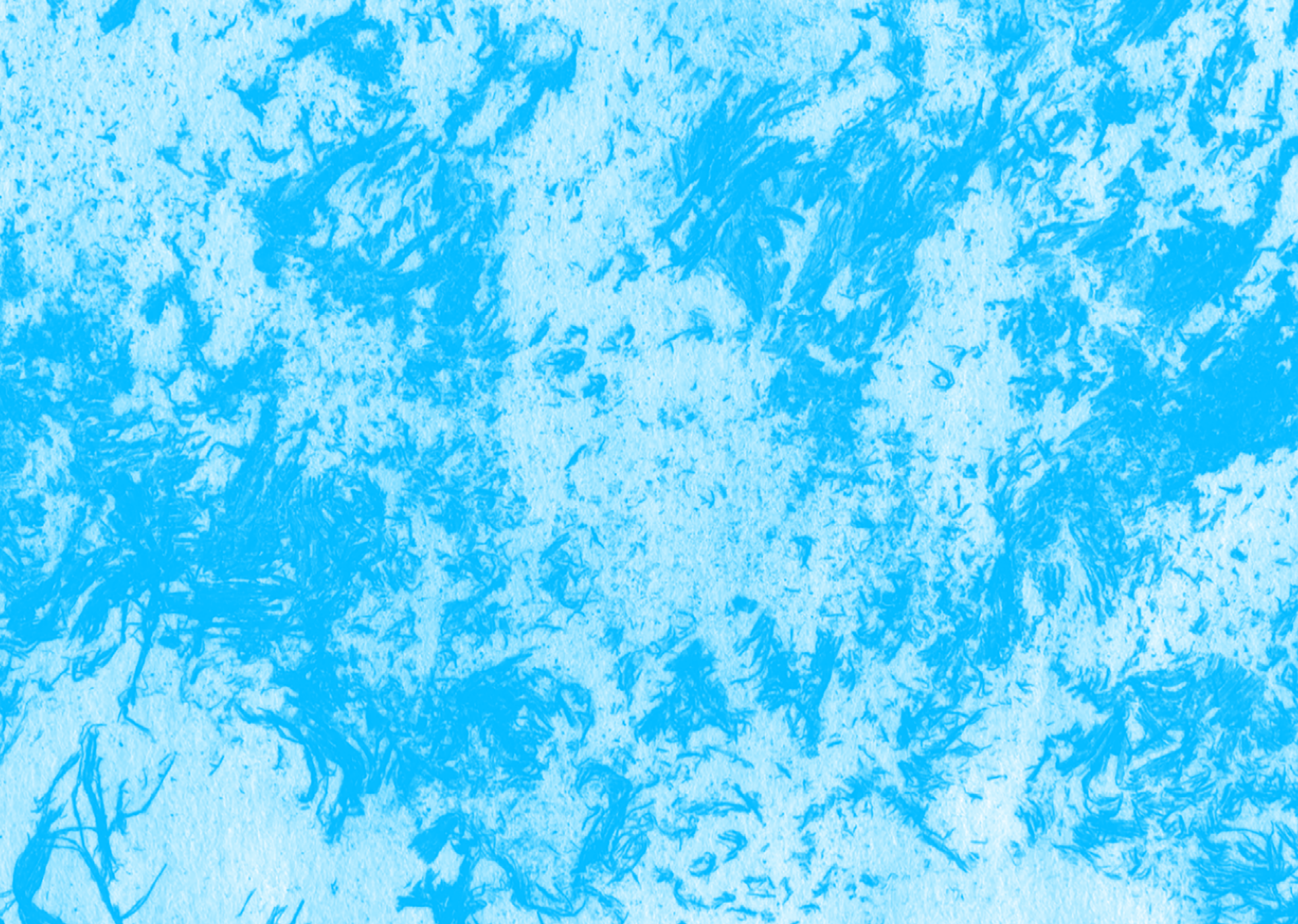
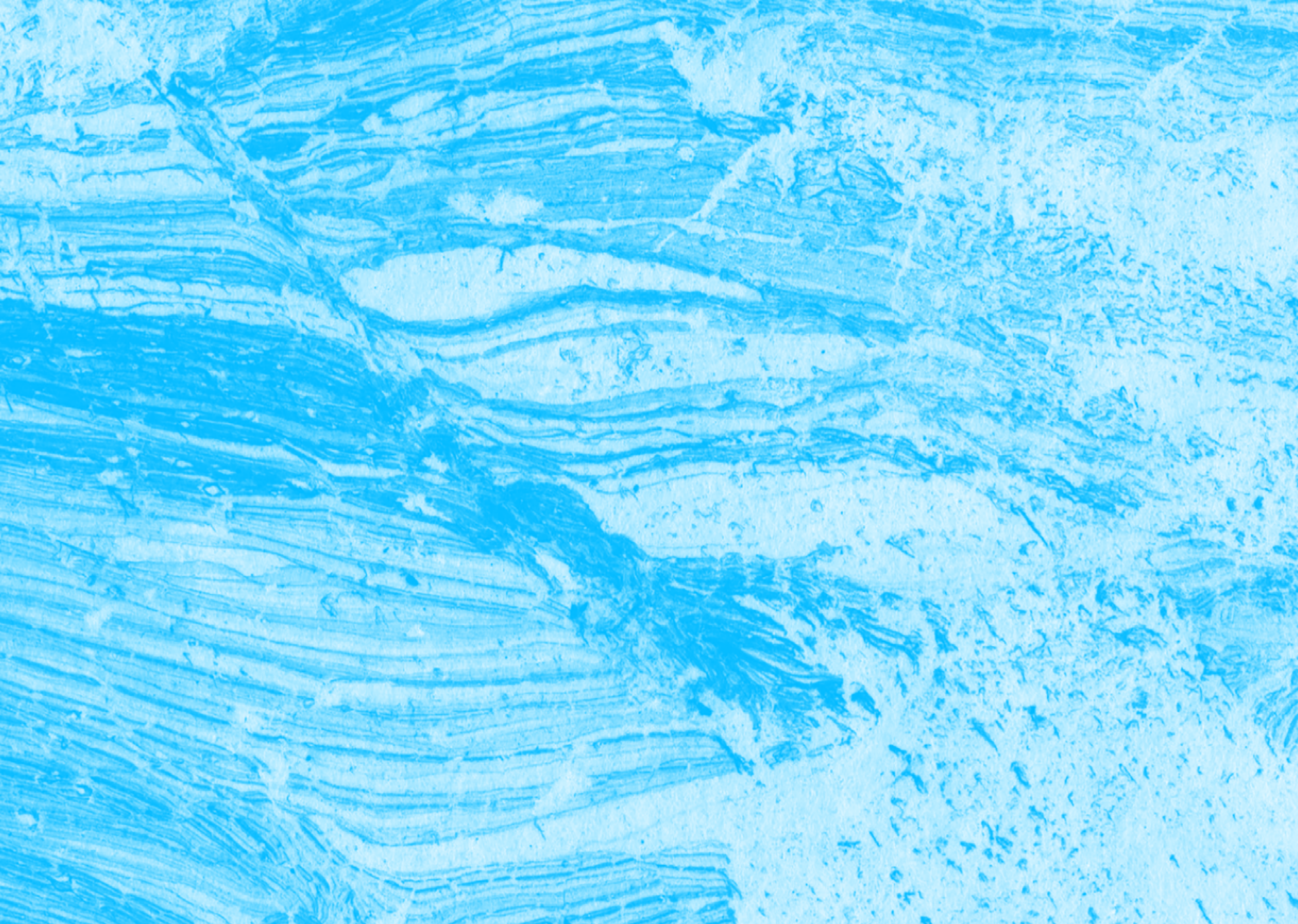




The Water Runs Through Us

Experimental
water filtration systems
and practices





The
Water
Runs
Through
Us

Imprint

The Water Runs Through Us:
Experimental water filtration
systems and practices,
Katherine Ball

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The Water Runs Through Us

Experimental water filtration
systems and practices
at Floating University Berlin

Katherine Ball

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Floating e.V. Members include (2025): Adriana Danae Gahona Miranda, Alexis De Raphelis, Andrea Hofmann, Andrew Wu, Anna Kokalanova, Benjamin Foerster-Baldenius, Benjamin Frick, Benoît Verjat, Berit Fischer, Camilla Bausch, Carla Kienz, Carmen Staiano, Christof Mayer, Coco Wiss, David Morsi, Dorothee Halbrock, Eliza Chojnacka, Erika Mayr, Felix Wierschbitzki, Florian Foerster, Florian Kurzenberger, Florian Stirnemann, Garance Maurer, Gilly Karjevsky, Gusse Güler, Hannah Lu Verse, Inci Güler, Jade Dreyfuss, Jeanne Astrup-Chauvaux, Joanne Pouzenc, Jonas Dahm, Jöran Mandik, Katherine Ball, Katja Szymczak, Kristin Lazarova, Laura Raber, Leonard Struebin, Lena Düspohl, Lisa van Heyden, Lorène Blanche Goe-sele, Lorenz Kuschnig Lefort, Maddalena Pornaro, Markus Bader, Martin Kaltwasser, Martina Kolarek, Mauricio Corbalan, Nina Peters, Raul Walch, Roman Karrer, Ronja Schratzenstaller, Rosario Talevi, Sabine Zahn, Sarah Bovelett, Serena Abbondanza, Silja Teresa Huppertz, Sophia Tabatadze, Stefan Klopfer, Stefan Kreft, Ute Lindenbeck, Vida Ruci.

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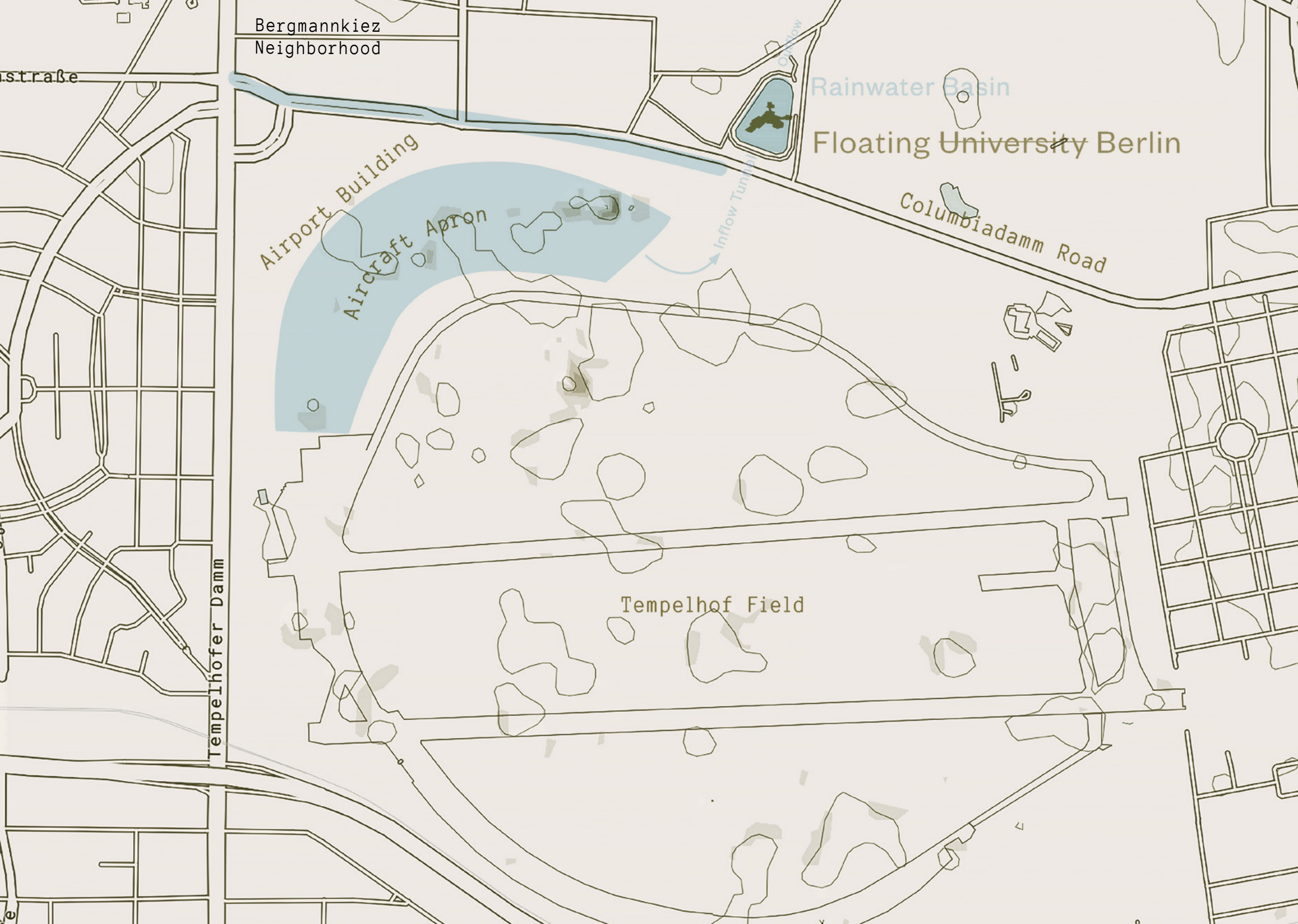
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For Franziska and Thomas
from *after the butcher*, who
stuck with me all the years I
was floating in Berlin.

Thank you for your support
and encouragement, and for
sharing your oasis
with me.

For all the members of
Floating e.V. Association
and participants of Floating
University Berlin.



Bergmannkiez
Neighborhood

straÙe

Rainwater Basin

Floating University Berlin

Columbiadamm Road

Airport Building
Aircraft Apron

Inflow Tunnel

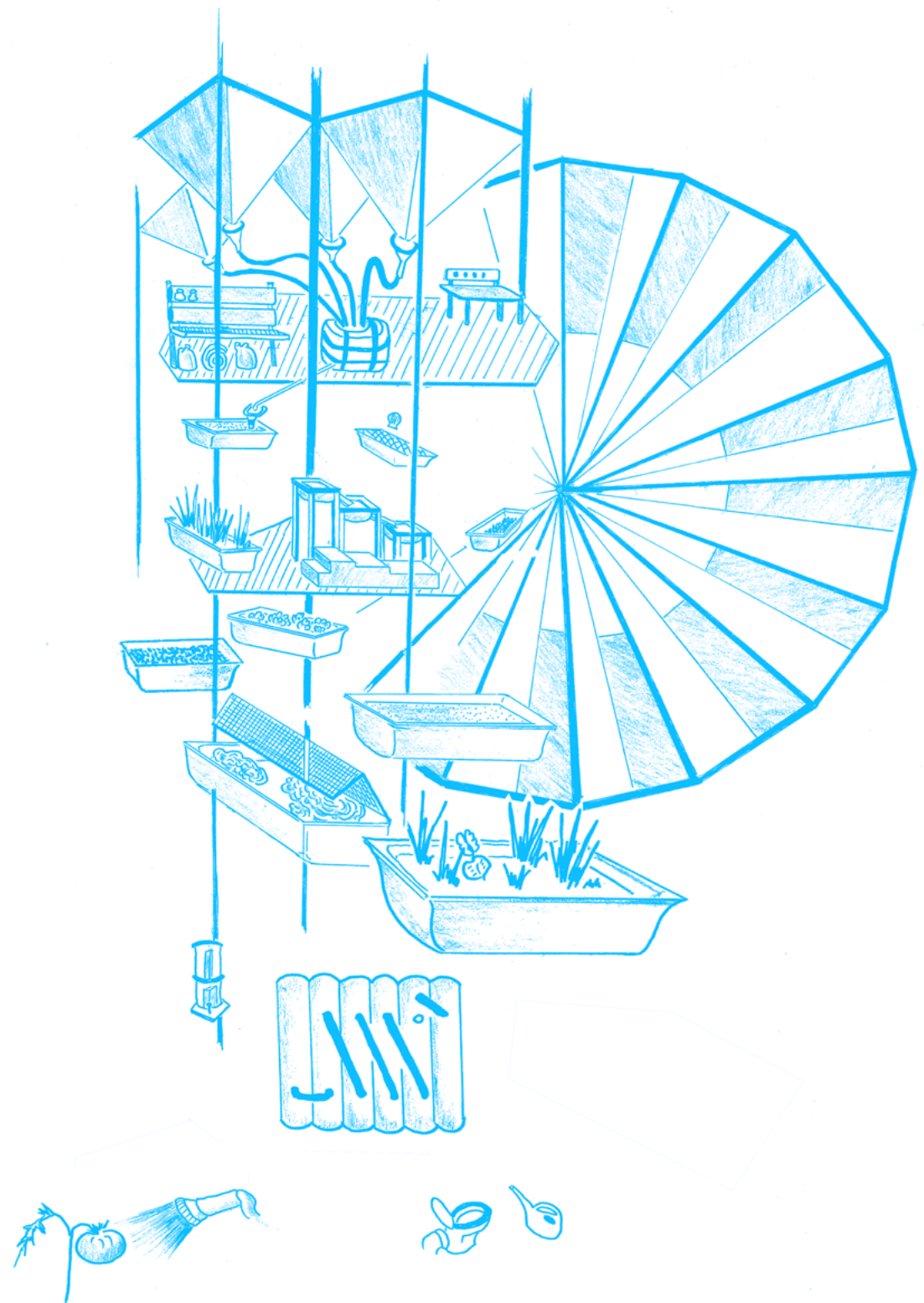
Tempelhof Field

Tempelhofer Damm















I am a product of the American Midwest, land of great lakes—those inland seas of fresh water that swoop through the center of the continent, conjoined blue swaths that gave rise to the steel and concrete metropolises of the rust belt. I was never concerned with water. It emerged from the tap and I used it—for drinking, bathing, washing, flushing, watering, whatever. Water was abundant, even infinite. Where did it come from, where did it go? I had other fish to fry. In August, the fish might even be a Lake Michigan perch. Was that perch laden with heavy metals, miscellaneous industrial contaminants, pesticides, fertilizers, etc.? Maybe. But I wasn't losing sleep over it.

Water just was. Until it wasn't.

Floating ~~University~~ creeps up on you, sneaking out of a solid, dense, laden, old city to pose something fleeting, transparent, buoyant, and new out of capitalism's flotsam and jetsam.

Berlin cedes a decommissioned Nazi airport back to the people, and a public park sprawls across nearly 400 hectares of land in the heart of the city. Hidden in that reclaimed territory, sheltered by groves of trees, hovering above a rainwater basin like ramshackle spacecraft from the distant future or the ancient past, is Floating ~~University~~.

by Teddy Marino

Floating manages to feel both ludicrously incongruous and utterly inevitable at the same time, with its bubbly, inflatable roofs that glow pink at night like giant disco mushrooms and gawky, spindly metal scaffolding: a built environment that seems as if it might blow away in the next storm, an otherworldly sight in stately Berlin and amongst the reeds and grasses and trees that are recolonizing the earth after being cast out for nearly a century.

And what about the water?

At Floating, water is just everything. It is the beating, bubbling, gurgling, life-giving heart of the university that is also an anti-university, the art that is also science, the past (they used charcoal water filters in ancient India) that is also the future, a future that Floating dares to imagine, no matter how preposterous it might seem at first glance. Performative dishwashing.

The rain knows, welcomed here through permeable roofs or dragged up from the basin in a water wheel and into a bathtub circus where sand and zebra mussels and activated carbon and halophytic plants and mushroom mycelium await. Through the bathtubs the rainwater emerges cleansed of humankind's sins—the dust of vulcanized rubber, the slick of oil, the radioactive puff of pollution—and flows back into the basin, out to the Spree River through the city and to the sea.

And again. The water molecules are as old as we are young. They spattered the backs of dinosaurs. They darkened the stone columns of ancient Rome. They dappled the first streets of Berlin. They pounded the roofs of the gas chambers in Auschwitz and Majdanek. They will see what becomes of this earth.

Floating may leave us one day, vanishing as quickly as it came. For now, it beckons us, murmuring the faintest drizzle, roaring the most savage downpour. Step away from the taps and the hoses and the shower heads and the washing machines. Skip across the asphalt and the concrete of your city. Crawl out of the subway tunnels and the vacuum sealed airports. Let your feet sink into the earth.

Walk on water.
Attention must be paid.



For reasons I still do not quite understand, I spent the majority of 2018 in a drainage basin in Berlin. I labored alongside some amazing human beings to transform this huge asphalt bowl of stormwater into a living laboratory for culture and ecology.

My journey to this hidden part of the city began in the summer of 2016. I was in Vienna working on a ten-meter-long-inflatable anti-Nazi caterpillar with high school students. It was a replica of a World War II era Soviet sculpture, only our caterpillar was shiny and silver instead of rubber.

Unfortunately, our collective Tools for Action was run out of the Vienna Festival (Wiener Festwochen) for the neon Swastika emblazoned on the caterpillar's forehead; but I still considered the project a success and I enjoyed the creativity in Europe's leftist scenes.

I looked for opportunities to stay and I found the German Chancellor Fellowship. If I won it, I would get to work on any project I wanted, as long as it was in Germany and as long as I had a host.

I emailed Benni Foerster-Baldenius, a member of a Berlin-based experimental architecture collective called raumlabor.¹ Years earlier in the fall of 2012, I collaborated with raumlabor on an installation at Truth is Concrete, a 24-7 political art festival in Graz, Austria. Raumlabor built a tower of windows, as part of the festival's marathon camp. Inside, I installed a garden of biological disobedience.

Benni replied to my email immediately, *Come be a part of Floating University. It's in a rainwater basin. You can be the water filtration and infiltration artist-in-residence.* I received the fellowship and on

September 11, 2017 I visited the basin for the first time. Benni unlocked a chain-link gate, and we walked down an access road sandwiched between trees on one side and a wall blanketed with unruly volunteer perennials on the other. If we had followed the wall around the basin it would have led us to a garden colony—garden plots and tiny cottages. But instead we followed the driveway, which opened up to an enormous asphalt landing—the rainwater basin, extending about two hundred meters to the south and a hundred meters east to west. The west side of the basin was covered with twenty centimeters of water. The east side was dry as a bone.

In the northwest corner, a small, white cinder block shack peered southward over the basin. It sat a few meters above a concrete tunnel covered by a steel grate. Benni explained that it was an outflow tunnel that led the basinwater into the Landwehr Canal. From the canal it flowed into the Spree River.

Benni pointed south across the basin to an even larger concrete tunnel and steel grate. This, he explained, is where the water flows in from the former airport, Tempelhof. The breeze sent ripples across the basinwater. Reeds swayed. Birds swooped in, landed, swam around. It was very quiet save for the traffic from the south.

Then Benni launched into the ideas he and Florian Stirnemann (also a member of raumlabor) had been generating for years.

They wanted to build a campus in the water. They wanted an auditorium, a bar, a kitchen, inflatable roofs, toilets, and workshops. They wanted an auditorium with a floating stage that could roll back to reveal a swimming pool. They

wanted to relocate a building from the House of the Cultures of the World into the basin. This building was first built on Tempelhofer Feld as a clubhouse for refugee kids. Here it would serve as a space for workshops, meetings, greetings, and enrollment.

Benni spoke of architects, artists, curators, professors, students, and interns. There would be internationals and nationals and neighborhood regulars.

Florian would be the Director of Aesthetics and Construction. Benni would be the social architect and Head of Faculty and Chancellor of Communications. Licia Soldavini, an Italian architect based in Berlin, would be the Vice President for Finances and Neighborhood Connections. Doro Halbrock, a curator from Hamburg, would be the Dean of the Open Weeks, curating guest artists, concerts, parades, and pedagogical public events.

He spoke of winter planning and spring construction—of DIY master carpenters and architecture students who had never picked up a power drill. He spoke of professors and students from twenty European universities, two US universities, and one from Bogotá, Columbia. They would all come to Floating to use it as their own campus to teach their own pedagogy as they saw fit. He spoke of a summer full of public events. He called them the Open Weeks.

We took a walk around the neighborhood. We went across the street to Tempelhofer Feld. We walked to a Sunni mosque, then to Hasenheide public park, and then to the Columbiadamm Cemetery created in 1866. It was filled with Turks, Germans, and soldiers going back to the Third and

Second Reich, to the Franco-Prussian War. He brought us to a grave marker that symbolized Germany's past as a colonizer—it was shaped like Namibia and memorialized the German soldiers who had murdered over 60,000 Herero and Nama peoples while extracting diamonds.

I think it was Benni's hope that the people who frequented these places would also find Floating. In 2018 over 10,000 people circulated through Floating. People came from a few blocks away. People came from all over Europe. People came from Argentina and Japan.

Even the German government took notice of the project, sending a letter demanding to stop calling it a university unless properly accredited. Since then Floating University has been written with a strikethrough—an apt symbol, considering the project itself questions the very concept of institutions.

About twenty of us formed a core team.² Our labor coalesced around water. My role was to develop, construct and care for water filtration systems and practices in Floating University's campus. Floating became a place to reimagine city infrastructure, and how we can co-exist in contemporary urban space.

Natureculture Learning

Raumlabor designed barebone structures of steel scaffolding, wood planks, boardwalks, and soft plastics. The structures reach as high as three stories. As the sun sets behind the airport radar tower, the inflatable roofs light up pink and white. The campus then resembles a space station hovering above its own reflection in water and asphalt.

When it rains, the basinwater levels rise and flood the ground floor. This makes the campus appear to float on water. As the water drains off the asphalt floor, algae grows in thick, spongy mats. Then it desiccates into a stiff, paper-thin carpet that covers the dry, barren asphalt. A French intern Jeanne Astrup-Chauvaux named this phenomenon *cracklement*. The term stuck.

Attached to the water laboratory is a giant hand-powered water wheel, resembling a ferris wheel, that scoops water up from the basin and carries it to the third floor laboratory. Here, the water spills into an upside down road construction cone and then funnels into a series of five bathtubs suspended by steel cables in the center of an open-air, spiral staircase. Each bathtub contains its own unique filter: a biofilm growing on sand, zebra mussels from the Spree River, activated carbon from heating coconut fiber over 700 degrees Celsius, wetland plants—some from the basin and some from a local nursery, and mycelium of pink mushrooms growing on straw. Then this filtered water returns to the basin via a pipe that architecture students from Linz, Austria carved out of a tree trunk.

To collect drinking and washing water, we captured rainwater in giant funnels on the laboratory roof. This rainwater then flowed through a membrane filter. Encased in a small plastic box, the membrane filter is composed of thin plastic sheets with microscopic holes too small for bacteria to fit through, but large enough for water molecules to pass through. We had this water on tap for drinking as well as to wash dishes in the *Spülküche*, or scullery, a.k.a. dishwashing kitchen.

The dirty dishwashing water then passed through a second set of four bathtubs: sand-biofilm, activated carbon, wetland plants, and mushroom mycelium that hung in a spiral below the first five; and a bacteria-driven moving bed reactor, where it became clean enough to irrigate our greenhouse. There, we grew 35 varieties of tomatoes from across Europe. We also grew potatoes in garden boxes along the boardwalk. It was Benni's ultimate vision that from these humble crops we would one day eat french fries with ketchup. (August 2018: ultimate vision achieved.)

The performative nature of Floating's water filtration systems is intended to insinuate alternative water practices into contemporary architecture—How might our relationship to water change as our architecture changes? How might our daily water practices change? What can we learn from Earth's water filtration practices? Can we be simultaneous consumers and stewards of water? How can we develop a more symbiotic approach to water? What work, both philosophical and practical, awaits us? Floating is a place for asking questions.

Where History Drains

This rainwater retention basin is a biological legacy—filled with nearly one hundred years of pollution from the Tempelhof airport, as well as adjacent sections of the Districts of Kreuzberg, Tempelhof, and Schonenberg. Yet, even in these conditions, life finds its way. Reeds flourish, bird nests abound, frogs sing, foxes trot, algae spreads, insects crawl and buzz and swarm. And we, at Floating, ebb and flow and strive.

The basin is a paradox of urban pollution and urban nature. Here we can literally wade through the tainted waters of the past, grapple with the floods and droughts of the present, and concoct new relationships between city and aquatic habitats.

Though this drainage basin has played a behind-the-scenes role for a hundred years, the Tempelhof airport for which it was built is a historic icon of Berlin. Tempelhof was the Nazi's prized airport and housed the world's largest building of the era. Here, Hitler held the immense and frenzied rallies we've all seen in the black and white footage. The Nazis converted the hangars to factories and forced victims to fabricate fighter jets and weapons.

Following the Allied conquest of the Axis powers, the east and west division of Germany ran straight through the center of Berlin. The Soviets blockaded rail, road, and water access from the west. In response, Allied planes took off from Tempelhof to airdrop sustenance packages to millions of east Berliners. In 1951, Tempelhof would become a West German public airport, similar to any other. It would continue to serve a reunited Germany until 2008, when the airport closed.

Following years of debate, the city converted the airfield into a 385 hectare public park—Tempelhofer Feld. In 2014, the Berlin Senate proposed a development there consisting of five to ten-story buildings and possibly skyscrapers as well. These buildings were intended to consist primarily of commercial spaces, followed by high-income and middle-income condominiums, and lastly low-income housing. In opposition to this proposal, a group of Berlin residents

drafted a referendum called Law for the Preservation of Tempelhofer Feld (ThF Act). The majority of voters decided against the proposed development. Since then, any plans for permanent developments on Tempelhofer Feld have been frozen. The space has remained in the spirit of the common good.

In 2017, a small corner of Tempelhofer Feld, roughly two hectares, became a site for transitional modular homes (white shipping containers) for refugees from Syria, Iraq, Afghanistan, Kurdistan, Pakistan, Palestine, Russia, and Romania. Just beside them sits Circus Kabuwazi, where children living in the refugee camp learn acrobatics with children from across Berlin. On and between old flight runways people run and walk and rollerblade and kite board.

Shin Deep

I began to work on *The Water Runs Through Us* in the summer of 2018, during the Lexicon Editing Week at Floating, organized by Gilly Karjevsky, a curator working at the intersection of art, architecture, and the politics of urban society. Throughout 2018, Gilly led workshops at Floating that invited people to author a lexicon of knowledge generated at Floating. It is no coincidence that the Germans, with their knack for inventing compound words, embraced the lexicon and the method our facilitator Gilly developed for writing it, Silent Conversation. This was the process by which we defined much of Floating's language around water, water filtration, and human relationships with water.

In addition to terms developed during the lexicon workshops and inspired by its framework, *The Water Runs Through Us* includes a section of oral histories I

conducted at Floating in 2018. I asked each participant to reflect on their relationship to water and to share formative experiences with water.

The Water Runs Through Us also includes the results of water tests conducted in 2018 and 2020 by the Berlin water utility, myself, Floating association members and participants. These tests indicated the base level of pollution and the effect of our water filtration systems. We used this data to conceptualize how to redesign the rainwater basin into a hybrid infrastructure that could continue to serve the city yet also improve the water quality and habitat.

I realized, through a saga of great ideas and even greater fails, that technology is essential in addressing our challenges with water, but the essence that's missing is our personal relationships to water. Shin deep in basin mud, I found myself grappling with the imperfect nature of the world.

Staring into the bathtub filters at Floating I glimpsed a reflection of myself—imperfect yet struggling to be perfect. More than once, I waded through floodwaters and chased down furniture as it floated around the basin. I found myself immersed in the chaos of existence. In the basin, I saw a reflection of the relationship between nature and human nature: coexisting and conflicting, connecting and clashing, intertwining and tumbling together, falling apart and falling into each other.

¹ raumlabor translates in English to “space lab” or “space laboratory.” “Raum” = space, referring more directly to room/area/architecture than outer space; “labor” = lab or laboratory.

² The four main people responsible for initiating Floating University were: Benni Foerster-Baldenius, Florian Stirnemann, Licia Soldavini, and Doro Halbrock. The core team in 2018 included: Licia Soldavini, Benni Foerster-Baldenius, Florian Stirnemann, Doro Halbrock, Gilly Karjevsky, Rosario Talevi, Carla Kienz, Jeanne Astrup-Chauvaux, Sarah Bovelett, Lorenz Kuschnig Lefort, Katherine Ball, Teresa Huppertz, Markus Bader, Laura Raber, Christof Mayer, Timo Luitz, Annabelle Dorn, Nina Klöckner, Nina Schäfer, Julian Fargetton, Christina Catala-notti, and Amelie Schindler †.

What is water?

Working with rainwater at Floating University, I began to wonder about water. I had a sense about how it feels, tastes, moves, and transforms, but beyond that I knew very little. What was happening with water at the molecular level, and how might that knowledge shape my daily interactions with this totally mundane yet totally miraculous substance?

One important thing to understand about water: it is a polar molecule. One side of a water molecule is more positively charged, and the other side is more negatively charged. Water's oxygen atom is more negatively charged (because it is more electronegative and therefore attracts more electrons), and it is bonded to two hydrogen atoms, which are more positively charged. The positively charged hydrogen atoms both bond on one

end of the negatively charged oxygen atom rather than equilaterally across the center.

This polarity gives water special properties, like the ability to be a solvent: to dissolve other polar molecules. Polarity also enables water molecules to form hydrogen bonds, which are weak bonds between water molecules that can break and reform constantly. This gives water its fluid nature. In a liquid state, water molecules are attracted to each other and connect together and have some cohesion, but they also break apart, flow past each other, and reconnect. Water molecules are always vibrating. Hydrogen bonds account for the fact that water's solid form is less dense than its liquid form. As ice and snow, water molecules form a lattice of rings around air. This is why ice floats on water.

Water becomes liquid when its temperature rises above 0°C (32°F), but many other polar molecules remain solid until they reach much higher temperatures. Water can be found in liquid form across most of the earth, while other polar molecules remain solid.

How does rain happen?

Water Molecules

- > Water Vapor
- > Raindrop
- > Rain

When water molecules reach a temperature of 100°C, they move too quickly to bond to each other, and they enter a gaseous state. They evaporate off of and out of water bodies, animals, plants, soil, and rocks. These water vapor molecules float in air because they are lighter than dry air, which is mainly nitrogen (~78 percent) and oxygen (~21 percent). Water molecules weigh 18 grams/mol. Dry air weighs around 29 g/mol; nitrogen weighs 28 g/mol, and oxygen weighs 32 g/mol. Air also contains other gases, particles, and pollution (~1 percent). Air is 0.2 percent to 4 percent water.

In its journey to become rain, first, water molecules in the air connect to particles of dust, ice, sea salt, smoke, and pollution. These particles are called condensation nuclei; they provide a surface for water molecules to condense upon. When 1,000,000,000,000,000,000 (one quintillion) water molecules connect together, they become a water vapor droplet. A water droplet measures a thousandth of a millimeter across. The water droplets are so light that they ride updrafts of hot air. Without the updrafts, it would take one water vapor droplet around 33 hours to fall to the ground. Clouds are made of water vapor droplets and also of ice crystals.

When air gets cooler, water vapor droplets condense together and become raindrops. This connecting together is called condensation. When 1,000,000 (one million) water vapor droplets condense together, they become a raindrop. A raindrop measures between 0.1 millimeters to 4.5 millimeters across. So, 1 raindrop ≈ 1 million water vapor droplets ≈ 1 sextillion water molecules. Water molecules float up on hot air and rain down in colder air. This is because hot air is lighter and less dense than colder air, and hot air can hold more moisture than cool air. So hot air rises (and takes water molecules up with it), and cold air sinks (and brings water molecules down with it). In colder air, water molecules condense together, becoming heavier. The sinking cold air and the heavy raindrops are what bring the rain to the ground.

Some raindrops may not fall at all if they are caught in warm winds traveling upwards. The ones that do fall can take several minutes to fall to the ground. For example, it can take a raindrop around seven minutes to fall from a height of 4000 meters. The bigger and higher the raindrop, the faster it will fall, maxing out at around 10 meters per second (36 kilometers/22 miles per hour).

A raindrop can go through the water cycle (evaporating from water on the land or ocean, turning into water vapor in the air, then raining back down on the land or ocean) in as few as nine days or as long as 40,000 years.

The rainwater basin where Floating University is located is 15,150 m² in area. An average of 240,000 m³ of water flows through the basin each year. The average person in Germany uses 121 liters of water per day, or 44 m³ per year, so the equivalent of an annual water supply for 5,500 people flows through the basin each year.



TERMS

This section of the book includes a collection of water-specific vocabulary. The terms form a water lexicon that articulates some of the knowledge and practices generated at Floating University. These terms document what happened and what was learned. They describe the water filtration systems, how they work, and concepts for reimagining how we can work with and relate to water. Some terms are unique to Floating; others are not, but they all carry special meanings and resonances when used in the context of our relationships to water at Floating.

The terms are broken up into five categories:

Water lineages

describe the types of water we encounter at Floating University, where they came from, and what specific qualities and potentials they have.

Infrastructures

include the human-made structures the water encounters on its journey to, through, and away from Floating University, including the rainwater basin and the water filtration systems.

Filters

include the specific filters within the water filtration systems at Floating University. They are technological interventions—they alter water, but they do not necessarily alter our relationships to water.

Water practices

explore the social and embodied interactions people have with water at Floating University, like washing dishes in a dishwashing system that reuses water.

Infiltrations

are artistic, cultural, and even metaphysical interventions. They are social change theories of water that reimagine our relationships to water.

This book emerged from the participatory lexicon process convened during summer 2018 by curator Gilly Karjevsky. Gilly created the lexicon process as a way of capturing knowledge generated by and articulated within Floating University. In critical spatial practices like Floating University, knowledge is difficult to capture because it doesn't easily fit into standard categories, or the intensity of the project does not leave much space for documenting what happened there and what was learned.

During the summer of 2018, referred to as the Floating University semester, Gilly organized collaborative writing workshops around a method she developed called Silent Conversation, and a lecture and conversation series—Hot Terms—to bring people together to develop and discuss terms. Participants collaboratively developed terminology from their ongoing research and experiences on Floating's site. All visitors to Floating University were invited to participate. This was a public process, which did not only describe elements of practice but also embodied the values of the project. At the end of the summer, a core group of editors, writers, graphic designers, and publishers—members of Floating's core team, students deeply engaged in Floating, and special guests invited for the occasion—came together for a lexicon editing week.

I was one of these people. Felix Egle, the graphic designer of this book, was also a member of the editorial team. Together, we edited and worked on not just one big Floating University lexicon but also individual lexicons focusing on different motifs: a water lexicon, an algae lexicon, a rubber boot lexicon, and a Silent Conversation lexicon. I prepared the first draft of these terms in preparation for the lexicon editing week. The Silent Conversation lexicon is available as a pdf on Floating's website and is definitely worth reading. None of the other lexicons were ever formally published.

Gilly organized the participatory lexicon process around four forms of knowledge—applied, situated, embodied, and site-specific. The participatory lexicon process inspired this book, and the four forms of knowledge guided my thinking as I considered how to capture in flat, fixed words some essence of a multidimensional and almost multiversal place where by design, everything is always in flux.

Like the participatory lexicon process, this book is organized around terms. Some terms trace the process of application—the relay between thoughts, designs, materials, tools, methods of production, and actions in making and maintaining the filtration system. Other terms derive from bodily contact with water on site, in the basin, in filtration systems, and from water practices that emerged in daily life at Floating. There are terms that observe what is fixed in the rainwater basin site and what is shifting. Finally, there are terms that grapple with the notion that knowledge is always informed by the location and position of the knower or knowledge producer—in this case, me.

At Floating, I was the Water Filtration and Infiltration artist-in-residence, and the knowledge I gained and produced during my time there was shaped by my particular position and also by the larger context in which Floating—and all of its inhabitants, human and otherwise—resided: in a complex cultural and socio-political web, each gossamer thread slackening and tightening as forces battled for power, control, and ownership. These forces included the city of Berlin, the landlords of the Tempelhof Project (Tempelhof Projekt), the rainwater and the water cycle, the history of the site and its biological legacy of pollution, and the many people—artists and architects, builders and beekeepers, children and chefs, engineers and environmental scientists, lawyers and luddites, professors and park rangers, students and sages, urban planners and urban gardeners, zadists and zoning administrators—who floated an ephemeral dream of the future out of the concrete of the past.

A fundamental paradigm in our research at Floating is to emulate Mother Earth's water cycles rather than mimic Corporate Man's linear sewer pipes.

water lineages

Water will not fall beneath the streets like garbage into landfills. Rather, water flows down the drain, undergoes organic filtration, and flows back out the spout. The University uses its water to meet its needs—and then re-uses it to re-meet its needs. At Floating University, we experiment with four different types of water: rainwater, basinwater, greywater, and blackwater.

Overview of Terms in This Section

- Rainwater
- Basinwater
- Greywater
- Blackwater

Rainwater

Rainwater takes a six-kilometer skydive. On its descent through the urban atmosphere it absorbs particulate pollution, sulfur dioxide, and nitrogen oxides. This now-tinctured rainwater spills off the roofs of Floating University's buildings and funnels through a membrane filter that transforms it into drinking water.

Basinwater

Basinwater comes from rainwater that lands on the Tempelhof Airport and its access road, Columbiadamm. This tonic of rainwater, automobile oil, brake linings, vulcanized rubber, cigarette chemicals, and trash drains into the large open-air basin where Floating University "floats." Inside, it raises the water level—sometimes flooding the buildings—and seeps through the wetland plants growing in the basin. This is emblematic of the conflict/relationship between "nature" and human culture (civilization, the city, etc.) within the rainwater basin. The polluted water is bad for the plants, but without the water the plants would not be able to survive in the basin. Somehow the plants manage to eke out an existence in the polluted conditions. If the basin were not there at all (had human civilization not encroached on this particular patch of earth) there would be a forest in place of the wetland. The basinwater flows out of the basin and into Berlin's canal system, which flows to the Spree River.

Greywater

Greywater is water that becomes "dirty" through use. There is a whole spectrum of greywater, from ultralight to extra dark. Dark greywater comes from washing dishes in our offshore kitchen and is laden with grease, fat, and food particles. Light greywater comes from washing your hands with soap, while ultralight greywater comes from rinsing organic vegetables. We sort, filter, and then reuse greywater according to its shade.

Blackwater

Blackwater is the most delicious. Produced by toilet water's interaction with human waste, blackwater is full of nutrients for plants, but it is also full of pathogens. When it rains a lot, municipal water systems often flush blackwater directly into the nearest body of water without treating it first, polluting rivers, lakes, and oceans. This poses a risk to human health and the health of the many species who live in and around the water. There are alternatives. It is possible to use aerobic decomposition to turn blackwater into fertilizer and anaerobic digestion to create methane gas for cooking. City sewers could be updated to separate stormwater and wastewater, or even grey wastewater from black wastewater. Flush toilets can be replaced with vacuum toilets, which reduce water use, or with compost toilets that cycle excrement and urine into soil, returning the nutrients to the land rather than exporting them directly into water bodies.



lineage grid

For more detailed explanations, please see "Water Practices" pages 86-87

WATER	GRADIENTS	INGREDIENTS	SOURCE
DRINKING	Tap Water	Water with some minerals and very low levels of nutrients and microorganisms	aquifer, lake, river, or reservoir via municipal system and filters
RAINWATER	Drinkable	Water with very low minerals, nutrients, and microorganisms	rain via membrane filter
	Unfiltered	Water with very low minerals and nutrients, and some microorganisms	rain
GREYWATER	Ultra Light	Water with sand and small pieces of vegetables	cooking
	Light	Water with soap residue	dishwashing
	Medium	Water with sand, small pieces of vegetables, and pesticides	cooking
	Dark	Water with soap	dishwashing
	Extra Dark	Water with soap and lots of food, oil, and coffee	dishwashing
BLACKWATER	Goldwater	Water with urine and high nitrogen nutrients	urine via toilet and human body
	Blackwater	Water with feces, nutrients, and very high microorganisms	feces via toilet and human body
BASINWATER	Diluted	Water with "normal" nutrients and micro-organisms, some chemicals and trash	rain / basin via street and airport runoff
	Concentrated	Water with high nutrients (decaying), some microorganisms, chemicals, and trash	rain / basin via street and airport runoff
	Intense	Water with high nutrients (fresh), micro-organisms, chemicals, and trash	rain / basin via street and airport runoff

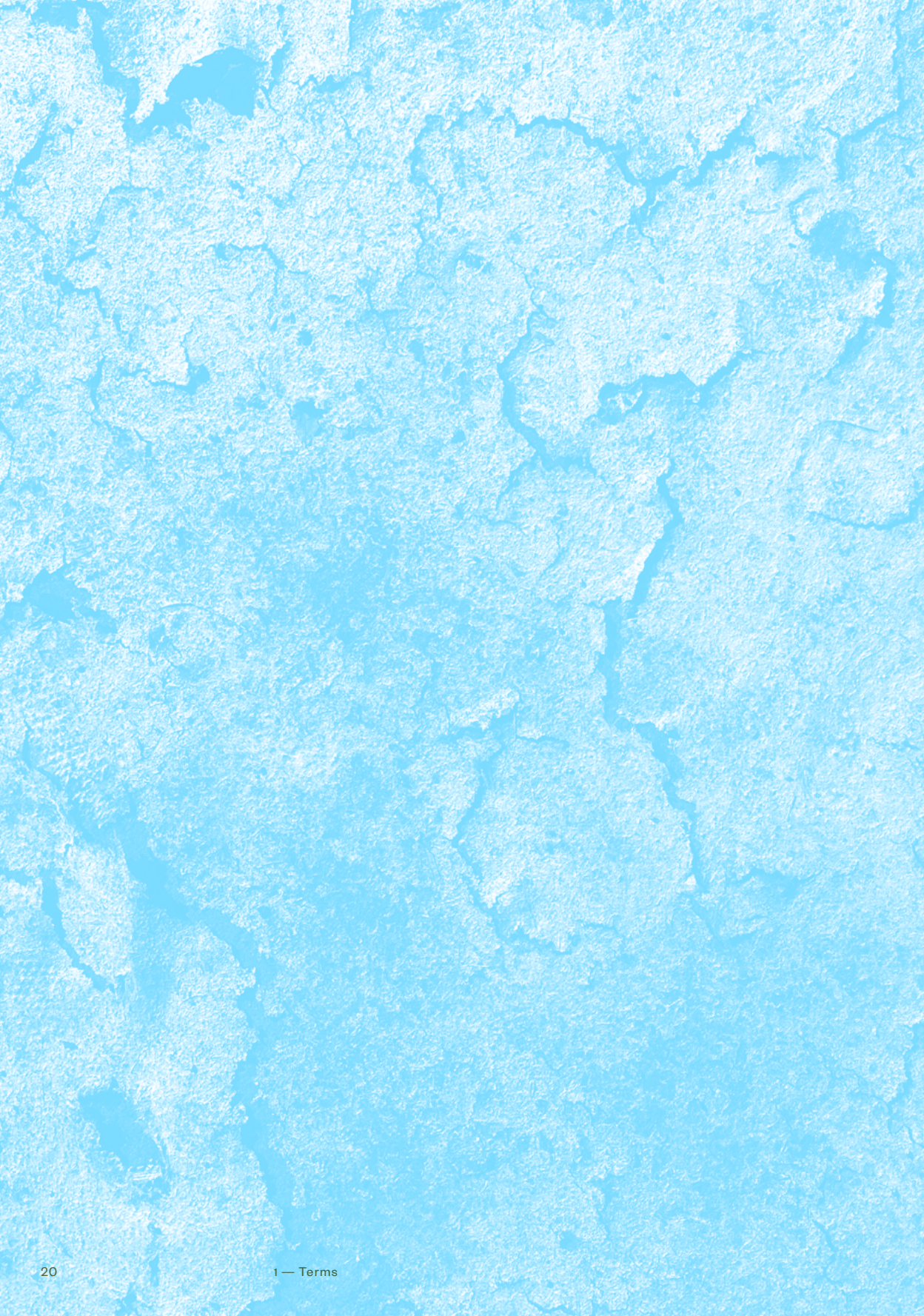
How will life change as our relationship to water transforms, and we shift from being consumers of water to stewards of water?

infrastructures

Overview of Terms in This Section

- Rainwater Basin
- Inflow Tunnel
- Outflow Tunnel
- Performative Water Laboratory
- Water Wheel
- Rainwater Collection Funnels
- Membrane Filter
- Bathtub Filters
- Moving Bed Reactor
- Spülküche Cascade
- Offshore Kitchen
- Rinsing Stations
- WC
- Greenhouse

Floating University Berlin re-envisioned an urban water infrastructure that invites public participation. Some of Floating's water infrastructures were pre-existing parts of the site. We created other elements of our water infrastructures in public workshops that brought together neighbors, students, and a range of other participants from Berlin and beyond.







Rainwater Basin

The rainwater basin is a working infrastructure in Berlin's water system. It was designed in the early 1930s as a rainwater retention basin to serve the Tempelhof airfield and adjacent avenues, and it is still in use today. Rain landing on the airport building, its concrete apron, and its access road Columbiadamm drains into the basin. The rainwater basin is 15,150 m² in area. 240,000 m³ of water flows through the basin per year on average. From the basin, the water slowly drains into the Landwehrkanal. This canal flows to the Spree River, which like many urban rivers is too polluted to swim in. The Spree finds its way to the Atlantic Ocean by merging into the Havel River, then the Elbe, and finally the North Sea in the northwest of Germany.

When the water level in the basin fluctuates, the basin undergoes a metamorphosis. After rainstorms, the basin fills with water and turns into an inner-city oasis. A self-organizing flora of wetland plants and animals live in this cocktail of humans and nature. Birds nest and frogs lay eggs in the wetland reeds. Bats come out at night, flying swiftly in arcs to snatch insects out of the air. Foxes trot along the banks and investigate the outflow tunnel. Baby ducks born in the basin swim around until they are old enough to fly. People walk around the basin in rubber boots. There are no boots for the baby ducks.

From the street outside, you wouldn't even know the basin is there. Surrounded by trees and a Gartenkolonie of allotment gardens, the basin is recessed into the ground. Inside the basin, you can almost forget the city is there. The sounds of city commotion are nearly silenced. In early spring, nightingale birds call out all night long across this small, vibrant disruption in the urban fabric.

When it has not rained for a long time, the water in the basin drains out and evaporates until there is only a large 20 centimeters-deep puddle on its southwest side, and the eastern side becomes bone dry. Cracklement occurs when the layer of algae covering the pond dries out and cracks, becoming almost like giant sheets of torn paper.

In heavy rainstorms, the water can rise from 20 centimeters to over one meter in only a few hours. The buildings flood, and the boardwalks are completely submerged. In the rainstorm on 12 July 2018, the water rose up to the top of our waders—chest high. Garden boxes, filled with flowers in full bloom, were underwater. When the flood began to recede, we came to rescue the furniture floating around in the basin, and water sloshed into our rubber boots. Floods happen multiple times each year, especially in the summer. The basin's water level typically drains down to 40 centimeters the next day.



The basin is a living example of nature borne out of the Anthropocene. For over 3.5 billion years,^[1] life on Earth existed independently from humans. Since humans began to evolve between 6 million to 300,000 years ago,^[2] we have been modulating the environment, like most species. Now, humans are the dominant influence on the environment. The nature that manages to survive within human-dominated landscapes is a new mutation—a byproduct of human contamination. Behold the rainwater basin. It is at once a biological legacy and an image of the future.

Inflow Tunnel

Water flows into the basin via a large tunnel that runs underneath Columbiadamm Road. It is connected with the road and the drainage system in Tempelhof Airfield. The tunnel is big enough to walk through, should you be brave enough. It looks like the perfect place to shoot a horror movie. A metal grate covers its mouth. As you wade up to it, the water gets deeper, coming nearly up to the top of your rubber boots. Looking inside, straight down the tunnel, it is completely black. It drips with omens. The smell of anaerobic bacteria wafts out, with a faint scent of the sudden death that awaits if you were to enter and be caught in a flash flood. Climb through the metal grate and walk into the abyss. Smaller sewer tunnels intersect the inflow tunnel. Soon, the light at the beginning of the tunnel disappears. A flashlight reveals mushrooms growing along the tunnel's walls. Pass under Columbiadamm Road; the cars rumble above. You'll encounter another metal grate, woven with waterborne trash, marking the point where the tunnel passes the road and continues under Tempelhof Airfield. You can keep walking under the airfield for close to an hour without reaching the end of the tunnel. It gets smaller and smaller until you can only continue by crawling. The only way to get back out onto Tempelhof Airfield from the tunnel is to climb up through a manhole.

When it rains, it takes 15 minutes for the water to fill up the tunnel and start flowing into the basin. But when it does, the tunnel produces a dramatic effect: it creates a river with small rapids in the basin. It is a strange site—a lake with a river flowing in it. Within 30 minutes, the whole basin can go from half empty to full, brimming with water on both shores.

Outflow Tunnel

Water flows out of the basin via a smaller outflow tunnel at the north end of the basin. A pump house on top of the tunnel raises and lowers a metal barrier, a long rectangular beam that floats on top of the water to prevent oil skims from leaving the basin and traveling to Landwehrkanal and then the Spree River. The outflow used to be surrounded by reeds, so thick that you couldn't walk through them. The reeds filtered the basinwater and created a wetland habitat for birds, frogs, insects, and microorganisms. In 2020, Tempelhof Projekt, the company founded by the Berlin Senate to be responsible for the maintenance and gradual development of the



1
The earth is estimated to be 4.5 billion years old. The oldest fossils on record are 3.4 billion years old. The first plants (algae) evolved one billion years ago. The first animals evolved 800 million years ago. The first land plants evolved around 450 million years ago.

Schopf *et al.*, "SIMS analyses of the oldest known assemblage of microfossils document their taxon-correlated carbon isotope compositions," 54.

Morris *et al.*, "The Timescale of Early Land Plant Evolution," E2276.

2
The oldest *Homo sapiens* fossils are 300,000 years old. A common ancestor between *Homo sapiens* and Neanderthals lived between 550,000 and 750,000 ago. *Sahelanthropus*, the oldest known species in the human family tree, an ape that walked upright on two legs, lived six million years ago.

Handwerk, "An Evolutionary Timeline of Homo Sapiens."



airport (and the basin as an infrastructure serving it), cut down the reeds in front of the outflow tunnel. In 2022, they came with bulldozers and began removing the reeds entirely from the basin. Now in 2025 some of the reeds have grown back, but Tempelhof Projekt plans to come and do “a final cleaning”. There is a small bridge over the outflow tunnel where you can stand and watch the water flow out. You’ll see bits of trash, styrofoam, cigarette butts, organic debris, and frogs poking their heads up out of this urban sludge. The basin’s beekeeper, Jonas, traverses this bridge each time he visits the hives, which live in the steep forest that extends upwards from the asphalt shore.

Performative Water Laboratory

The performative water laboratory is the heart of the water filtration system at Floating University. The water laboratory was designed as a tower which pumps water throughout the university structure. The laboratory collects water from the basin and sky. Its roof is made out of large funnels (*Trichter*) that collect rainwater. A giant water wheel turns at its side, pumping water up from the basin. Nine bathtubs hang in a spiral through the center of the tower, each filled with a different water filter. Pipes and tubes encircle and intersect the laboratory.

When philosopher Bruno Latour came to visit, he asked, “How is it performative?” Good question. Taking care of the filters in the laboratory is a constant, complex, vigorously athletic, and theatrical undertaking. It requires endless climbing of the laboratory’s scaffolding in order to maintain filters in different bathtubs, hauling containers of water up and down, balancing on scaffolding bars to install wind protection on the mushroom bathtubs, juggling questions from visitors, and getting drenched with water. This human work is an acrobatic performance. And then there is the dance of the water itself: the infinite rising, falling, spilling, tumbling, racing, churning, creating, and destroying.

The shelves of the laboratory are a cabinet of curiosities, an assortment of tools, materials, and implements—everything you need to experiment, fabricate, grow, and inoculate water filters. The laboratory is a fluid territory in more ways than one. The work of water is like water: always changing, always in motion. One day you might walk up the steps of the laboratory and discover a filter workshop taking place. You could find yourself sticking your hands into layers of moist straw, crumbling mushroom spawn over it like lasagna, then pouring active carbon into a bathtub, black powder coating your skin, dusting your hair, clinging to the fibers of your shirt, getting under your fingernails, giving you a black-tipped manicure. The next day as you walk up the steps, you might find



the whole scaffolding vibrating with a sound experiment by Modular Pi, a sound artist from Vienna. Another day, you might see people lying on the floor practicing deep listening. You might hear the Kurdish women’s liberation text *Jineology* being read aloud by a feminist reading circle or find people sharing stories about their personal experiences with water. These are some happenings that have transpired in the water laboratory at Floating University. This is another way in which the laboratory is performative.

From the laboratory, you can look out over the cityscape of Berlin and watch the sun setting over the basin. It disappears down behind the airport’s radar tower and the forest encircling the basin.

Water Wheel

An electric pump pulls water from the deepest part of the basin to a large wooden container under the water wheel. Then pipes attached to the wheel scoop the water out of the wooden container. The pipes are cut at an angle to be able to lift the water to the top of the tower. The pipes spit the water out onto a large plastic sheet at the top of the tower, which funnels it into a 20-liter plastic container. This container splits the water in two directions, one pipe goes to the WC, and another pipe goes to the first bathtub in the spiral of bathtubs.

Rainwater Collection Funnels

The roof of the water laboratory is made out of funnels that collect rainwater and pass it down to the Spülküche (washing kitchen) for washing dishes. Hanging from the tower’s scaffolding like an upside-down mountain range, each funnel connects to a tube that transports the rainwater into an IBC container.^[3] The IBC, a repurposed molasses container, is made out of food-safe plastic and holds one cubic meter of water. On its way from the IBC container to the Spülküche, the rainwater passes through a membrane filter. This removes any bacteria (for example, from bird poop in the funnels) and any particulate pollution from the Berlin air.

Membrane Filter

The membrane filter turns rainwater into drinking water. The membrane filter is suspended between the IBC container (top floor / laboratory) and the Spülküche (middle floor). Then the water flows into a transparent bucket, which contains the membrane filter. After traveling through the membrane filter, the water goes through a hose to the top sink of the Spülküche. For more information, please see “Membrane Filter” in “Filters.”

³ IBC stands for Intermediate Bulk Container. It is a standardized, industrial grade, reusable container used for storing and transporting bulk liquids and powders.



Bathtub Filters

Nine bathtubs hang down from the ceiling of the water laboratory. Each contains a different biological filter, which you can read about in the “Filters” section. The bathtubs are interconnected via a piping system. The laboratory’s staircase spirals up around them. Bathtubs one through five filter basinwater, and bathtubs six through nine filter greywater from washing dishes.

Here’s how the water flows through the bathtubs:

The water wheel pumps water up from the basin to the top of the water laboratory. The water flows into an upside-down orange construction cone, which softly directs the water flow into the first bathtub. Then the water journeys down through bathtubs two, three, four, and five.

Our utopian fantasy is that the filtered basinwater that comes out of bathtub five will be clean enough to swim in. Under EU regulations, swimming water needs to have under 500 colony-forming units of *E. coli* bacteria per 100 milliliters. When the Berlin Wasserbetriebe (the water utility) tested our water, the results showed that our filters are having a positive effect, but we did not achieve bathing quality levels.

Dishwashing water from the Spülküche drains through bathtubs six, seven, eight, and nine and then enters the moving bed reactor (see following term).

Another utopian fantasy was that the filtered greywater would be clean enough to water our greenhouse. This fantasy turned out to be an achievable one. We water all of the tomatoes in our greenhouse with filtered greywater.

Buried in the bottom of each bathtub is a drainage system made out of a plastic drainage tube covered in coconut fiber. We used this to solve two major design questions: how do you let the water flow from one bathtub to another without allowing the filter to move as well? How do you avoid the filter medium clogging the drain?

Moving Bed Reactor

A moving bed reactor is a decentralized water treatment plant. It is a series of tanks, filled with different bacteria, that can turn greywater into bathing-quality water in one day. As the water moves from one tank to the next, it gets progressively “cleaner” as the bacteria eat the nutrients and break down organic compounds in the water. For more information about the moving bed reactor, please see the section “Filters.”



Bathtubs six through nine are connected to the moving bed reactor, but bathtubs one through five are not. This is because we only had one moving bed reactor, and it did not make sense to mix the basin-water and the greywater, since their content is different. Greywater is easier to reuse because it does not contain heavy metals or persistent organic pollutants like basinwater. If we had two moving bed reactors, we would have connected bathtubs one through five to the second one. A series of water tests would need to be made to analyze the effect of the moving bed reactor on the basinwater.

Spülküche Cascade

The washing kitchen, or Spülküche, is where we wash our dishes at Floating University. The Spülküche uses gravity to cascade water from one washing container to the next. When the water in the Spülküche is “dirty” and needs to be changed, or “refreshed,” water drains from one container to the next through a series of wooden slides, cycling cleaner water down to the dirtier containers. Our Spülküche was constructed by students from the University of Arts (UdK–Universität der Künste) in Berlin. The beauty of the UdK students’ design—five towers on wheels—is that it makes the reuse of water both visible and playful. For more information about how the Spülküche works, please see “water practices.”

Offshore Kitchen

The cooking kitchen at Floating University, known as the offshore kitchen, was designed and constructed by a wonderful group of students from UdK as part of their Space Production Studio course. They built mobile towers with stoves, chopping boards, and containers for washing vegetables. One thing that is quite special about this kitchen: it has no sink. The intention was to make it impossible for cooks to use infinite water in the kitchen, but this also encourages experimentation—how does using water differently in the kitchen impact the practice of culinary art? One example: during the spring Open Weeks, Portuguese cooking collective AFAVA often reserved water from boiling red beets or black beans and reused it as stock for infusing rice and other vegetables, concocting unique flavors and colors.

Rinsing Stations

For preparing vegetables in the offshore kitchen, there are plastic containers recessed into custom-made countertops, supported by scaffolding. These can be used for different purposes: rinsing, soaking, composting, and peeling. The plastic containers can be easily inserted and removed from holes cut in the countertops.



These were inspired by rinsing stations built in the temporary kitchen during the construction phase—two plastic containers for rinsing vegetables placed at different heights on the kitchen counter. The top container was for rinsing less dirty vegetables (tomatoes, peppers, cucumbers). The bottom container was for rinsing dirtier vegetables (potatoes or lettuce). It has been interesting to see how so much of the temporary infrastructure that was built out of necessity in the building stage influenced the University’s “permanent” infrastructure. The rinsing stations enable chefs to wash multiple heads of lettuce by submerging them in water and letting gravity bring the dirt to the bottom. This avoids using infinite running water to rinse lettuce in a colander. When the water in the top container gets “dirty,” it can be drained into the bottom container via a plastic spigot. The water from the bottom container can be emptied into the water filtration system or reused to wash dirty dishes.

The rinsing stations emphasize the importance of using organic vegetables. Who would want to use pesticide-contaminated water for drinking, cooking, or washing? Then why is it okay to rinse vegetables coated in pesticides in our normal kitchen sinks? When you reuse the water directly—rather than sending it down the drain and off to an invisible network of municipal water infrastructures—there is a consciousness (and sometimes discomfort) that arises about what is in the water.

Carrying your own water awakens a similar consciousness about how much water you use. When water is transported by pump, emerging from our faucets and showerheads as if by magic, it is easy to lose awareness of how much water we are cycling through each day.

WC

At Floating University, the toilets are flushed with a mixture of basinwater, rainwater, and greywater. The roof of the WC angles rainwater into a small pool in the center of the octagonal structure. Pipes from the laboratory also pump water from the basin into the pool. When you wash your hands, the sink angles the soapy water down into the pool. You flush the toilet by dipping a watering can (Gießkanne) into the small pool and then pouring it into the toilet to flush. The toilets at Floating University are water toilets, not composting toilets. Like conventional toilets, they mix the black and goldwater (urine) together, and this wastewater is pumped to the city sewer system rather than being filtered on site. We discussed the possibility of filtering, anaerobically digesting, or composting the black and goldwater on site, but we decided that dealing with the blackwater of 10,000 visitors in our first year was more than our team of twenty people, budget of cultural funding, and floodable site could handle.



Once flushed, blackwater mixes with domestic, trade, and industrial wastewaters, as well as rainwater, and flows to the nearest of Berlin’s 146 pumping stations. The city sewer system is operated by the Berliner Wasserbetriebe. It is a combined sewer system collecting wastewater and rainwater together rather than separating them. From the pumping station, wastewater flows to one of six sewage treatment plants (Klärwerk) in Berlin. After being treated, wastewater is discharged back into rivers and lakes. There are five rivers running through the city—the Spree, Havel, Dahme, Panke, and Wuhle rivers—thirteen lakes within or on the outskirts of the city, and numerous canals. During heavy rainfall, the sewer system cannot cope, and rainwater combined with the wastewater (including the blackwater) flows untreated into nearby rivers and lakes. In a storm, Floating’s untreated blackwater would likely flow directly to the Landwehrkanal and Spree River.

Greenhouse

From the street, you enter Floating University through a gate and walk out onto a skybridge extending through the forest into the top floor of the greenhouse. It is a scaffolding structure with wooden garden beds (Hochbeet) suspended in the air at multiple levels. Vines crawl up and down the structure: grapes, beans, zucchini, cucumber. The greenhouse is planted and cared for by the garden group. Everything is watered with filtered greywater from washing our dishes. Over 35 varieties of tomatoes from around the world grow in the greenhouse. Their seeds are shared on our tomato cards.



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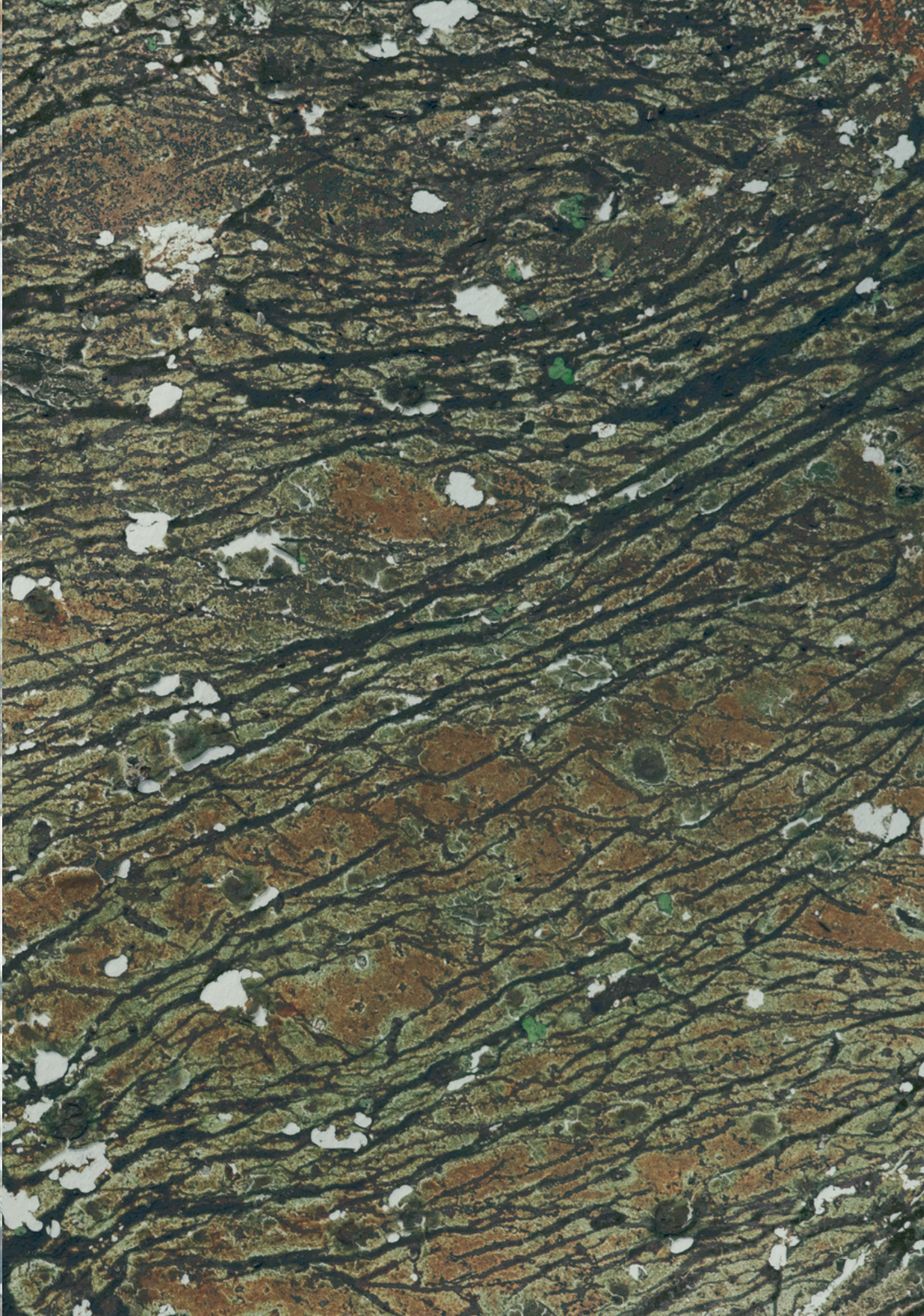














Filters

Overview of Terms in This Section:

- Bathtub Filters
 - Bathtub 1: Sand-biofilm
 - Bathtub 2: Zebra Mussels
 - Bathtub 3: Activated Carbon
 - Bathtub 4: Halophyte Wetland Plants
 - Bathtub 5: Mushroom Mycelium
 - Bathtub 6: Sand-biofilm
 - Bathtub 7: Activated Carbon
 - Bathtub 8: Mushroom Mycelium
 - Bathtub 9: Aquatic Floating Plants
- Membrane Filter
- Moving Bed Reactor

Bathtubs 1 and 6: sand-biofilm filter

The filter in the first and sixth bathtubs is a composite of sand and a biofilm. A biofilm is a community of microorganisms—bacteria, yeast, and fungi—that forms a goo. This gooey matrix enables the microorganisms to stick to each other and to surfaces, like the sand. The sand slows down the water's flow, giving the biofilm time to digest nutrients—organic and chemical compounds—in the water. The biofilm matrix functions as a versatile, external digestive system capturing pathogens, harmful bacteria, and pollution to immobilize and digest them.^[1] It acts as an ultimate recycling yard, breaking down complex compounds into simple building blocks for life.^[2] It is a large genetic archive, keeping components of broken-down cells available, including DNA.^[3]

The biofilm's microscopic collective self-produces its slimy coating of extracellular polymeric substances out of proteins, sugars, lipids, and nucleic acids like DNA, and mixes them with water in the fine structure of the matrix.^[4] ^[5] ^[6] ^[7] The matrix keeps the microorganisms close together, allowing intense interactions to occur, including cell-to-cell communication, horizontal gene transfer, and the formation of synergistic microconsortia.^[8] Through hydraulic decoupling, the slime matrix protects the organisms from drying out.^[9] Outside the biofilm it can be dry, but inside, the biofilm stays moist.^[10] The matrix also protects organisms in the biofilm from antibiotics, heavy metals, biocides, and ultraviolet radiation.^[11]

The biofilm matrix is a complex, highly differentiated, multicultural community much like our own city.^[12] It is a city for microbes, covered in slime, filled with different niches where each microbe can find its place.

In sand, a biofilm can take three weeks to grow^[13] and start functioning cohesively and effectively. Under supportive conditions, the biofilm becomes more robust with age, like fine wine or cheese. As the biofilm grows, it also slows down the water and increases the water's residence time with the filter. Biological filtration aims to increase residence time—slowing the water down and giving the filters time to do their work.

To make a sand filter in the bathtub, we first put down a layer of stones, then gravel, then sand.

10 cm of stones (2–3 mm in diameter)
10 cm gravel (0.5 mm in diameter)
30 cm of filter sand (~0.15 mm diameter)

Sand filters are one of the oldest methods of water filtration. The *Suśrutasaṃhitā* (Sushruta Samhita), an ancient Sanskrit text, writes about using sand and gravel to filter water for drinking in 300–400 CE in South Asia.^[14] The first well-documented use of sand filters in Europe dates to 1804, when the owner of a bleachery in Paisley, Scotland, installed an experimental filter.^[15] After being refined by water engineers, the method was used to create the first treated public water supply in London in 1829.^[16]



- [1] Flemming and Wingenger, "The Biofilm Matrix," 623.
- [2] Flemming and Wingenger, "The Biofilm Matrix," 628.
- [3] Flemming and Wingenger, "The Biofilm Matrix," 623.
- [4] López, Vlamakism and Kolter, "Biofilms," 1.
- [5] Flemming and Wingenger, "The Biofilm Matrix," 623.
- [6] Sutherland, "The Biofilm Matrix—an Immobilized but Dynamic Microbial Environment," 222.
- [7] Schmitt and Flemming, "Water binding in biofilms," 77.
- [8] Flemming and Wingenger, "The Biofilm Matrix," 624.
- [9] Flemming and Wingenger, "The Biofilm Matrix," 630.
- [10] Flemming and Wingenger, "The Biofilm Matrix," 630–31.
- [11] Flemming and Wingenger, "The Biofilm Matrix," 624.
- [12] Watnick and Kolter, "Biofilm, City of Microbes," 2675.
- [13] Widodo *et al.*, "Utilization of Bio-sand Filter Technology to Reduce the Hardness of Groundwater in Bangunjiwo Village, Yogyakarta," 4.
- [14] Tankersley *et al.*, "Zeolite water purification at Tikal, an ancient Maya city in Guatemala," 5.
- [15] Scott, G. R., "Short History of Filter Construction and Operation," 749.
- [16] UCLA Fielding School of Public Health, "Brief History During the Snow Era (1813–58)."

Bathtub 2: Zebra Mussels

Zebra mussels (*Dreissena polymorpha*) are small, striped molluscs that filter water through their gills. They filter out particles as small as 0.07 micrometers,^[17] like bacteria, algae, phytoplankton, and zooplankton.^[18] Each zebra mussel can filter one liter of water per day.^[20]

At Floating University, our zebra mussel filter was a disaster. We brought the zebra mussels from the Spree River, where they were stored on nets by scientists with Flussbad (a project in Berlin that is trying to use biological filters to clean a section of the Spree River so people can swim in it). We canoed out into the river and hauled one of the nets filled with zebra mussels (which was extremely heavy) out of the river water, transported it in a cargo bike back to Floating, and put the mussels in the second bathtub. Along the way, the zebra mussels started dying, and they continued to die. Zebra mussels need to have water constantly flowing through them, bringing in fresh oxygen. The water flow in our filtration system was not enough to keep them alive. In theory, the idea was good. In practice, it was bad. The zebra mussel filter was replaced with aquatic plants. (Please see the description in bathtub 9.)

This was not my first encounter with zebra mussels. I grew up in the Detroit area in the 90s, and the zebra mussels came like an invasive apparition, traveling to Lake St. Clair on freighter ships from Russia, or so the rumor went. Zebra mussels were so good at cleaning the water that soon the lake was crystal clear. This allowed more sunlight to stream down to the bottom of the lake, and soon the entire lake was filled with seaweed, which changed the flavor of our municipal water. I remember some mornings my mom would fill up a glass of water from our kitchen sink and say, "Hmm, it tastes like fish again."



[17] A micrometer is 0.001 millimeters. It is written as μm .

[18] Phytoplankton are microscopic plants. Zooplankton are small marine animals, including microscopic animals, the young of larger invertebrates and fish, and weak swimmers like jellyfish. An organism is considered plankton if it is carried by tides and currents, and cannot swim well enough to move against these forces. The word "plankton" comes from the Greek word planktós "drifter" or "wanderer."

National Oceanic and Atmospheric Administration National Ocean Service, "What are plankton?"

[19] Sprung and Rose, "Influence of Food Size and Food Quantity on the Feeding of the Mussel *Dreissena Polymorpha*," 527, 529.

[20] Benson *et al.*, "*Dreissena polymorpha* (Pallas, 1771)."

Bathtubs 3 and 7:
Activated Carbon

Activated carbon, which you'll find in bathtubs three and seven, is a special material because it is filled with tiny pores the size of molecules.^[21] In these voids it can sequester pesticides, chemicals, and metals through a process called adsorption, not to be confused with absorption. Activated carbon has many different uses, including purifying water and sugar and separating gas mixtures.

Activated carbon can be made from wood, coconut shells, nut shells, fruit pits, coal, peat, and synthetic organic polymers.^[22] The pores form when the material is activated thermally by heating it to 700–1000 °C (1300–1800 °F)^{[23] [24]} with steam or carbon dioxide. It can also be activated chemically with phosphoric acid, zinc chloride, or potassium hydroxide.^{[25] [26]} During activation, the voids form because of structural disorder.^[27] Certain carbons do not order themselves into a graphite lattice, like most carbons do. These non-graphitizable carbons are disordered, but not disorganized; when activated, they form a maze of voids. The properties of activated carbon depend on this disorder.^[28]

Adsorption, the adhesion of a substance (atoms, ions, or molecules from a gas, liquid, or dissolved solid) onto a surface, occurs because the voids are surrounded by carbon atoms.^[29] In activated carbon, what is adsorbed is not permanent. It is constantly in flux. Each molecule that is adsorbed is replaced with another molecule about every trillionth of a second.^[30] A carbon particle can have more than six trillion pores, constantly adhering, releasing, and exchanging molecules. A carbon particle is about one mm³ and has one trillion pores per one mm².^[31]

Activated carbon is not a single chemical entity but a generic name for a class of substances. The material an activated carbon is made from and the process used to activate it affects what it can adsorb. One type of activated carbon may be better for purifying water while another type may be better for purifying sugar.^[32]

Activated carbon can adsorb pesticides;^[33] chemicals; heavy metals (including mercury,^[34] lead,^[35] chromium,^[36] copper,^[37] zinc,^[38] nickel,^[39] and cadmium^[40]); some medications;^[41] chlorine;^{[42] [43]} polychlorinated biphenyls (PCBs);^[44] hydrocarbons, including polycyclic aromatic hydrocarbons (PAHs);^[45] per- and polyfluorinated substances (PFAS);^[46] cyanide,^[47] atrazine,^[48] radioactive gasses,^[49] some volatile organic compounds (VOCs) that cause cancer;^[50] and organic matter that can affect taste, odor, and color. The water leaving the filter should be fairly clear. Activated carbon does not remove hard water minerals (calcium and magnesium),^{[51] [52]} most metal ions,^[53] nitrate,^[54] or chloride^[55] to a significant degree. It removes some but not all fluoride.^{[56] [57]}

[21]	Marsh and Rodríguez-Reinoso, <i>Activated Carbon</i> , 1.	[39]	Abdulrazak, Hussaini, and Sani, "Evaluation of removal efficiency of heavy metals by low-cost activated carbon prepared from African palm fruit," 3151.	[54]	United States Environmental Protection Agency, "Frequently Asked Questions About Nitrate and Drinking Water."
[22]	Marsh and Rodríguez-Reinoso, <i>Activated Carbon</i> , 1.				
[23]	Bergna <i>et al.</i> , "Effect of Some Process Parameters on the Main Properties of Activated Carbon Produced from Peat in a Lab-Scale Process," 2838.	[40]	Abdulrazak, Hussaini, and Sani, "Evaluation of removal efficiency of heavy metals by low-cost activated carbon prepared from African palm fruit," 3151.	[55]	Saha <i>et al.</i> , "Household Water Treatment Techniques and Devices: Activated Carbon Filtration," 1.
[24]	Chowdhury <i>et al.</i> , <i>Activated Carbon: Solutions for Improving Water Quality</i> , 3.	[41]	Ek <i>et al.</i> , "Activated carbon for the removal of pharmaceutical residues from treated wastewater," 2372.	[56]	Konno <i>et al.</i> , "Neither hollow-fibre membrane filters nor activated charcoal filters remove fluoride from fluoridated tap water," 443.
[25]	Chowdhury <i>et al.</i> , <i>Activated Carbon: Solutions for Improving Water Quality</i> , 3.	[42]	Saha <i>et al.</i> , "Household Water Treatment Techniques and Devices: Activated Carbon Filtration," 1.	[57]	Senewirathna <i>et al.</i> , "Fluoride removal in drinking water using activated carbon prepared from palmyrah (Borassus flabellifer) nut shells," 1.
[26]	Marsh and Rodríguez-Reinoso, <i>Activated Carbon</i> , 9.	[43]	Foller <i>et al.</i> , "Removal of chlorine and monochloramine from tap water using graphene oxide membranes," 1.		
[27]	Marsh and Rodríguez-Reinoso, <i>Activated Carbon</i> , 4.	[44]	United States Environmental Protection Agency, "A Citizen's Guide to Activated Carbon Treatment."		
[28]	Marsh and Rodríguez-Reinoso, <i>Activated Carbon</i> , 3.	[45]	Lamichhane, Krishna, and Sarukkalige, "Polycyclic aromatic hydrocarbons (PAHs) removal by sorption: A review," 336.		
[29]	Marsh and Rodríguez-Reinoso, <i>Activated Carbon</i> , 1.	[46]	United States Environmental Protection Agency, "Reducing PFAS in Drinking Water with Treatment Technologies."		
[30]	Marsh and Rodríguez-Reinoso, <i>Activated Carbon</i> , 6.	[47]	Depci, "Comparison of activated carbon and iron impregnated activated carbon derived from Gölbaşı lignite to remove cyanide from water," 466.		
[31]	Marsh and Rodríguez-Reinoso, <i>Activated Carbon</i> , 5.	[48]	Tan <i>et al.</i> , "Sorption of mercury (II) and atrazine by biochar, modified biochars and biochar based activated carbon in aqueous solution," 727.		
[32]	Hassler, <i>Activated Carbon</i> , 2.	[49]	Qiao, <i>et al.</i> , "Dynamic adsorption properties of activated carbon for radioactive noble gas treatment in offshore floating nuclear power plant," 210–211.		
[33]	Seyhi <i>et al.</i> , "Adsorption of an organochlorine pesticide using activated carbon produced from an agro-waste material," 1811.	[50]	Chowdhury <i>et al.</i> , <i>Activated Carbon: Solutions for Improving Water Quality</i> , xxvii–xxix.		
[34]	Chen <i>et al.</i> , "Performance of CuCl2-Modified Activated Carbon on Mercury Capture after Injection in an Entrained Flow Reactor," 5557.	[51]	Saha <i>et al.</i> , "Household Water Treatment Techniques and Devices: Activated Carbon Filtration," 1.		
[35]	Abdulrazak, Hussaini, and Sani, "Evaluation of removal efficiency of heavy metals by low-cost activated carbon prepared from African palm fruit," 3151.	[52]	Kamrin <i>et al.</i> , "Home Water Treatment Using Activated Carbon."		
[36]	Landrigan and Hallowell, <i>Removal of chromium from plating rinse water using activated carbon</i> , 1.	[53]	Saha <i>et al.</i> , "Household Water Treatment Techniques and Devices: Activated Carbon Filtration," 1.		
[37]	Abdulrazak, Hussaini, and Sani, "Evaluation of removal efficiency of heavy metals by low-cost activated carbon prepared from African palm fruit," 3151.				
[38]	Zhang <i>et al.</i> , "Rapid Removal of Zinc(II) from Aqueous Solutions Using a Mesoporous Activated Carbon Prepared from Agricultural Waste," 16.				

Granular activated carbon will not filter out all bacteria, protozoa, viruses, and other microorganisms, which can travel in between the individual granules of activated carbon and associate with the carbon.^{[58] [59]} Granular activated carbon looks like a black gravel or coarse sand depending on the diameter of the granules. Extruded activated carbon, which looks like a solid block or tube, can filter out bacteria, protozoa, and other microorganisms if it has a small pore size, for example, of one nanometer (0.001mm) in diameter. Extruded activated carbon is made by mixing activated carbon with a binder and extruding it through a form.

If all of its pores were spread out, one teaspoon of activated carbon could have the equivalent area of a football field.^[60] But its pore spaces are not infinite. Activated carbon can become saturated. Once all the pores are occupied, to adsorb any new molecules, the pores must release the molecules they have already adsorbed. The molecules released go back into the water and flow through the filter. This is why the activated carbon filter needs to be replaced before it becomes saturated, approximately each year depending on use. Backwashing and thermal regeneration can renew the carbon, but wastewater from backwashing needs to be treated; the bathtub filters were not designed for backwashing. For thermal regeneration the activated carbon would need to be transported off-site to a special facility.

The medicinal use of charcoal, a precursor to activated carbon, dates back to ancient Egypt (1500 BCE).^[61] The process for activating carbon was officially discovered in the 1800s. European industrial use of activated carbon began in the early 1800s, when the sugar industry began using bone char to filter and decolorize sugar.^[62] The production and patenting of activated carbon began in 1900.^[63]

One thing people often ask at Floating University is if it is possible to make activated carbon at home. Probably not, thanks to the extremely high temperatures (or chemicals) required to make activated carbon, but it is possible to make biochar yourself, which has the ability to adsorb many pollutants and impurities, though not to the extent that activated carbon does. I first saw biochar being made in Florida in a forest garden stewarded by John Rogers, a former NASA rocket scientist. Rogers uses a top-lit updraft oven to make biochar out of wood chips from commercial arborists. He also recommends the Japanese cone kiln and top-lit open draft units.



- [58] Zhang *et al.*, "Bacterial Community and Function of Biological Activated Carbon Filter in Drinking Water Treatment," 122.
- [59] Saha *et al.*, "Household Water Treatment Techniques and Devices: Activated Carbon Filtration," 1.
- [60] Engber, "How does Activated Carbon Work?"
- [61] Hassler, *Activated Carbon*, 3.
- [62] Hassler, *Activated Carbon*, 3.
- [63] Hassler, *Activated Carbon*, 4.

Bathtub 4: Halophyte Wetland Plants

Naturally occurring wetlands can remove a range of pollutants from water, including organic matter, nutrients (fertilizers like nitrogen and phosphorus), and metals (arsenic, cadmium, chromium, mercury, lead, zinc, aluminum, iron, and manganese).^[64]^[65] To some extent, wetlands can also filter pathogens (bacteria, viruses, protozoans).^[66]

Humans have been constructing wetlands to filter sewage water since ancient Egypt and ancient China.^[67] In Europe, the first documented scientific experiments treating wastewater with wetland plants were led by Käthe Seidel in 1952 at the Max Planck Institute in Germany.^[68]^[69] Her research was heavily criticized (e.g., Nümann, 1970^[70]), but many researchers continued exploring her ideas and eventually confirmed that wetlands can effectively treat certain types of wastewater.^[71]^[72] Constructed wetlands use natural functions of soil, sunlight, vegetation, and other organisms to filter water. They are typically constructed in sequence, so that water flows from one wetland to the next. Three common forms of constructed wetlands are surface flow wetlands, horizontal subsurface flow wetlands, and vertical subsurface flow wetlands.^[73]

Different contaminants are removed by different types of plants. In the filtration system at Floating University, we used halophytic plants. They were recommended by artist Marjetica Potrc, who teaches at Hamburg School for Visual Art and Design School (HFBK) and brought her class Design for a Living World to Floating. Potrc used halophytic plants in *Of Soil and Water: King's Cross Pond Club*, a natural bathing pond in London and artwork collaboration with Ooze.^[74] Halophytes, which constitute 1 percent of the world's flora, can grow in salty water and sediments. They evolved in seashores, marshes, sloughs, mangrove swamps, and saline semi-deserts. They are typically emergent plants which means they grow in water and are rooted in underwater soil or sediment. When used in water filtration, halophytes are often planted in stones and sand instead of soil or clay. Halophytic plants and the bacteria they associate with accumulate nutrients and pollution in their biomass and vacuoles.^[75] They can remove salt, phosphorus, nitrogen, heavy metals, and volatile compounds from water and soil polluted and enriched with nutrients from fertilizers, soaps, metals, and petroleum hydrocarbons.^[76]

Some halophytic plant varieties we planted at Floating include:

Cyperus longus—galingale / Langes Cypergras
Iris pseudacorus—yellow iris / Sumpf-Schwertlilie
Juncus effusus—common rush / Flatter-Binse
Caltha palustris—marsh marigold / Sumpfdotterblume
Mentha aquatica—water mint / Wasserrminze
Lythrum salicaria—purple loosestrife / Gewöhnlicher Blutweiderich
Phragmites australis—common reeds / Schilfrohr



- [64] Coveney *et al.*, “Nutrient removal from eutrophic lake water by wetland filtration,” 141.
- [65] Li *et al.*, “Metal pollution across the upper delta plain wetlands and its adjacent shallow sea wetland, northeast of china: Implications for the filtration functions of wetlands,” 5934.
- [66] Maiga, von Sperling, and Mihelcic, “Constructed Wetlands,” 3.
- [67] Brix, “Use of Constructed Wetlands in Water-Pollution Control—Historical Development, Present Status, and Future Perspectives,” 211.
- [68] Vymazal and Kröpfelová citing Seidel, *Die Flechtbinse Scirpus lacustris*, 37–52.
- [69] Brix, “Use of Constructed Wetlands in Water-Pollution Control—Historical Development, Present Status, and Future Perspectives,” 212.
- [70] Vymazal and Kröpfelová citing Nümann, “Die Möglichkeiten der Gewässerreinigung mit höheren Pflanzen nach den bisherigen Untersuchungsergebnissen und theoretischen Überlegungen,” 149–158.
- [71] Vymazal and Kröpfelová, *Wastewater Treatment in Constructed Wetlands with Horizontal Sub-Surface Flow*, 5.
- [72] Brix, “Use of Constructed Wetlands in Water-Pollution Control—Historical Development, Present Status, and Future Perspectives,” 212.
- [73] Vymazal and Kröpfelová, *Wastewater Treatment in Constructed Wetlands with Horizontal Sub-Surface Flow*, vi–vii.
- [74] Ooze is an international design practice operating between the fields of art, architecture, and urbanism. www.ooze.eu.com

Potrc and Ooze, *Of Soil and Water: King's Cross Pond Club*.
- [75] Flowers and Colmer, “Salinity tolerance in halophytes,” 956.
- [76] Yasseen and Al-Thani, “Endophytes and Halophytes to Remediate Industrial Wastewater and Saline Soils: Perspectives from Qatar,” 25–26.

Bathtub 5 and 8: Mushroom Mycelium

Mushrooms grow in bathtubs five and eight. The reproductive organs of fungi, mushrooms are capable of sequestering heavy metals. [77] [78] Mushrooms grow from mycelium, the vegetative organ of fungi. Mycelium, a threadlike meshwork, is capable of filtering water in a process known as mycofiltration. [79] [80] [81] [82] The mycelium acts like a living sieve, caching nutrients, bacteria, and chemicals; digesting them; breaking them down; and making them into usable building blocks for life. The heavy metals caught by mycelium are not broken down but are sequestered in the mushrooms.

At Floating, we are experimenting with nine different types of mushroom mycelium:

Pleurotus ostreatus—oyster / Austernpilz
Pleurotus salmoneostramineus—pink oyster / Rosafarbener Seitling
Pleurotus cornucopiae var. *citrinopileatus*—golden oyster / Limonenseitling
Pleurotus eryngii—king oyster / Kräuterseitling
Pleurotus ostreatus "Florida"—Florida oyster / Sommerausternseitling
Pleurotus pulmonarius—phoenix oyster / Cremeweißer Seitling
Lentinula edodes—shiitake / Shiitake
Pholiota microspora—nameko / Goldkäppchen
Stropharia rugosoannulata—king stropharia / Kulturträuschling

I first learned about the concept of mycofiltration from Paul Stamets's book *Mycelium Running*. At Floating, we have not found much success with mycofiltration. Although we have grown many beautiful pink mushrooms, in our experience, the mycelium does not seem to be very happy living in water. At Floating, we were not able to replicate what Stamets showed is possible in his lab and fieldwork.

This is not meant to dismiss mycofiltration, but rather to emphasize the importance of more people getting engaged with it, trying to implement it, troubleshoot, improve, and develop sound methods.

It is one thing to read about a theory in a book or scientific paper, and it is another thing to try to make it happen in practice. We might get excited about environmental "solutions" that we hear or read about, and while these might work in theory or in the lab under carefully controlled and supported conditions, getting them to work in the real world, at a scale large enough to make an impact, can be an entirely different story. It's important for environmentalists and scientists to work intimately and openly with concrete action in the here and now so our dreams can merge with reality rather than getting lost in pipe-dream solutions.



- [77] Stamets, *Mycelium running: How mushrooms can help save the world*, 103–111.
- [78] Kokkoris *et al.*, "Accumulation of heavy metals by wild edible mushrooms with respect to soil substrates in the Athens metropolitan area (Greece)," 286–294.
- [79] Stamets, *Mycelium running: How mushrooms can help save the world*, 58–68.
- [80] Taylor *et al.*, "Removal of *Escherichia coli* from synthetic stormwater using mycofiltration," 81.
- [81] Pini and Geddes, "Fungi are capable of mycoremediation of river water contaminated by *E. coli*," 1.
- [82] Kennen and Chadderton, "Using Mycofiltration Treatment for Stormwater Management."

Bathtub 9: Aquatic Floating Plants

Aquatic plants help filter water by absorbing nutrients, like phosphorus and nitrogen. This results in clearer water, less algae, and less eutrophication. Aquatic plants also absorb carbon dioxide and release oxygen into the water, improving the environment for fish and making the water less acidic. Free-floating plants have no roots anchored in soil. They draw their nutrients directly from the water, feeding on nutrients that would otherwise feed algae.

Some varieties of aquatic floating plants we grow at Floating are:

Nymphaea spp.—water lilies / Seerosen
Limnobiium spongia—frogbit / Froschbiss
Eichhornia crassipes—water hyacinth / Wasserhyazinthe
Pistia stratiotes—water lettuce / Wassersalat
Nasturtium officinale—watercress / Brunnenkresse
Ipomoea aquatica—water spinach / Wasserspinat
Nelumbo nucifera or *lutea*—edible water lotus / Speiselotos



Membrane Filter

The membrane filter we use at Floating is capable of turning rainwater into drinking water.^{[83] [84] [85]} Although rainwater itself is free from most bacteria, it can pick up bacteria when it lands on a surface, such as a roof. The membrane filter operates with this principle: a thin sheet of plastic with microscopic holes allows water to pass through, but the holes are so small that bacteria cannot fit through them.

The membrane filter at Floating University is shaped like a small box, around 40 cm x 40 cm x 10 cm. It sits in a transparent bucket filled with rainwater and is the connection point to a bucket of drinking water below. Rainwater passes through five plastic membrane sheets into the tubes inside the filter and flows down into the drinking water bucket below.

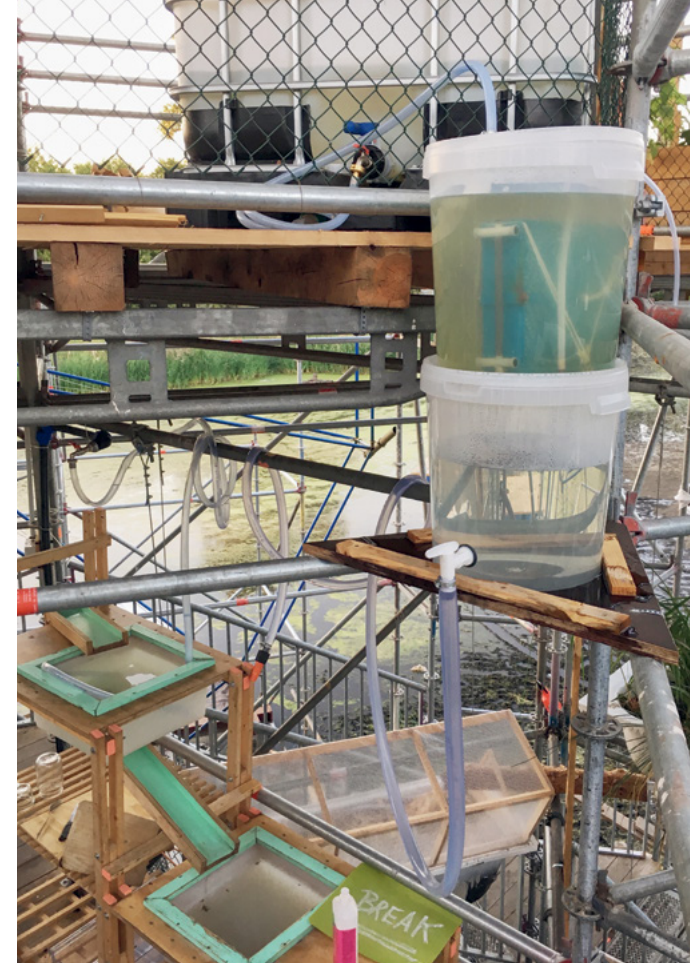
The membrane filter was made by MARTIN Systems GmbH. It is called the Cube-Mini^[86] and costs under €100 to make. Project Engineer José Ordóñez helped install it in a workshop with students from HFBK's Design for the Living World class. It turns our rainwater into drinking water and provides dishwashing water for our Spülküche. To remove metals and other compounds from the rainwater, we spooned activated carbon in between the plastic sheets. The whole setup, with the filter, buckets, and connectors, costs around €200.

Moving Bed Reactor

The moving bed reactor is made with six columnar water tanks. Each tank in the moving bed reactor is aerated and filled with foam cubes. Bacteria live in the water, on the inside surface of the tanks, and on the foam cubes spinning around in the bubbling water. The foam cubes provide more surface area of habitat for the bacteria to live on. Connecting pipes allow water to pass from one tank to the next, but the foam cubes stay put. The connecting pipes have holes that are too small for the cubes to fit through, but they allow the water to flow through.

The aeration of the tanks is critical because it creates an aerobic environment. Bacteria that live without oxygen, anaerobic bacteria, produce stinky methane gas when they decompose nutrients. Aerobic bacteria—bacteria that live in the presence of oxygen—have more robust metabolic reactions and smell better than anaerobic bacteria.

The German name for moving bed reactor is *Wirbelbettreaktor*, which translates more closely to “vortex bed reactor.” The vortex is the shape of movement created by the aeration. One difference between a tornado and a vortex is that a tornado throws things away from it while a vortex sucks things into its center.



- [83] MARTIN Systems GmbH, “Drinkable Water: Cube Mini Filter.”
- [84] Kus *et al.*, “Water quality of membrane filtered rainwater,” 208.
- [85] Kus *et al.*, “Household rainwater harvesting system—pilot scale gravity driven membrane-based filtration system,” 796–797.
- [86] MARTIN Systems GmbH, “Drinkable Water: Cube Mini Filter.”

In each tank, a different community of bacteria specialize. In the first tank, the greywater flows in, filled with complex compounds of pollution. The bacteria living in the first tank specialize in breaking down complex compounds. In the next tank, the bacteria specialize in breaking apart segments of the compounds. The compounds are reduced to smaller and smaller pieces, and the bacteria specialize accordingly, until in the last tank the bacteria specialize in breaking apart minute fractions of the compounds, finally rendering them harmless. The bacteria are not put into the system by a human—they are already in the water—and they self-organize by finding the tank that suits them the best and then reproduce within it. The foam cubes support this by preventing the bacteria from continually washing away and enabling them to build up a significant population to filter the water. The moving bed reactor is powered by electricity.

Floating University's moving bed reactor was made in collaboration with Nolde and Partners, a water engineering group in Berlin that specializes in these systems. It is a prototype for an inexpensive, easy-to-make, small-scale moving bed reactor. It uses off-the-shelf parts like garden soaker hoses (drip hoses), which serve as aeration tubes. The moving bed reactor can filter 1000 liters of water each day. In Floating's offshore kitchen we use around 300 liters of water per day to wash dishes. After our greywater is treated by the moving bed reactor, we use it to water the tomato plants in our greenhouse.

Erwin Nolde and his colleague Holger Sack built and maintain a larger version of this system at Roof Water Farm in Berlin. The moving bed reactor at Roof Water Farm has been cleaning water for 250 residents for the last 15 years at lower cost and to higher quality than most municipal systems. After the water is treated in the moving bed reactor, it typically has two to four colony-forming units of *E. coli* bacteria per 100 milliliters.^[87] EU regulations stipulate that bathing water needs to have less than 1000 colony-forming units of *E. coli* bacteria per 100 milliliters of water.^[88] EU regulations for drinking water do not allow any colony-forming units of *E. coli* bacteria.

By cleaning water with a decentralized, on-site plant, people are able to have more engagement with the everyday infrastructures their lives depend on. A hyperlocal moving bed reactor means that zero energy is expended pumping water to a centralized plant or constructing and maintaining sewer pipes underneath the entire city. The moving bed reactor does require electricity to power its pumps, but this is minimal and could be replaced with on-site renewable energy.



- [87] Saidi *et al.* "Organic matter degradation in a greywater recycling system using a multi-stage moving bed biofilm reactor (MBBR)," 3330.
- [88] European Union, Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality.

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water practices

We use water every day, all day, but many of us never give our water practices any thought. When water goes directly down the drain, our relationship with water is only 15 centimeters long.

We only see the water we are using, and we have no sense of where it is coming from or where it is going. We don't have any opportunity to reuse the water after it disappears down the drain. Throughout most of the Global North, our water infrastructures conspire to keep us mindlessly using—a turn of the faucet, and drinking-quality water flows from the tap; a flush of the toilet, and our waste, along with up to 11 liters of water, get whisked away through a hidden network of pipes. The phrase “running water” has become a byword for civilization. This ease comes at a steep cost.

Overview of Terms in This Section

- Water Lineage
 - Ingredients / Gradient / Source
 - Clean vs. Dirty
 - Shades of Greywater—or: Rainbow of Wastewater
- Water Filtration Practices
 - Prevent "non-water stuff" from getting in the water
 - Use drinking water for drinking
 - Return water to the hydrologic cycle
- Water Reuse practices
 - Analog Water Sorting
 - Dishwashing Practice
 - How to Spülküche

Floating University is trying to reorient, re-think, and reimagine the way we use water. How can we pay attention to our water practices? But also—how can we be more playful and creative with those practices? Can we keep an open mind about what it means for water to be “clean” or “dirty”? Can we think about the “ingredients” in our dirty water, informing how it can be reused or filtered? Can we get to know our water? Could water become something that we relate to instead of use?

WATER LINEAGE

Thinking about water lineage is a way to broaden our narrow conception of water as “clean” or “dirty” and to let go of our fixation on purity. Truly pure water has no minerals or life.

INGREDIENTS / GRADIENT / SOURCE

Categorizing water based on its lineage—what is in it (ingredients), how much is in it (gradient), and where it came from (source)—can allow us to make more informed decisions about how we can use, reuse, sort, or store water. Considering water lineage helps us see what water is actually composed of, rather than focusing on an artificial binary like clean and dirty.

CLEAN VS. DIRTY

Many of us living in the Western world’s version of civilization categorize water in two ways: clean and dirty. Clean water comes out of the tap. Dirty water goes down the drain. Mixing all of the dirty water and sending it down the drain to the wastewater sewage treatment plant is like throwing your trash and recycling together and sending it all to the landfill. Once they are mixed together, it is nearly impossible to pull them apart. Creating new water infrastructures, like the Spülküche at Floating, supports the practice of sorting “dirty” water based on its ingredients, gradient, and origin and allows us to easily and logically reuse water.

In houses and apartments with conventional water infrastructures, greywater from showering or from the kitchen sink can be used to wash laundry, flush toilets, and water the yard or garden. In my travels as an artist researching and working with creative water reuse, I have seen and worked on many low- and high-tech projects to rewire and reinvent water infrastructure. In the Mojave Desert in California, where it rains only 10 to 15 centimeters per year, I met with families who divert the outflow of their laundry machines into the yard around their house;

an elderly couple who places a bucket under the shower while the water heats up and reuses this water for washing dishes, cleaning, or flushing the toilet; and other households who catch water from washing vegetables and use it to water the plants in their yards, which are already designed to need as little irrigation as possible. There are lots of DIY options like these, but in many cases, we need new infrastructures to enable new water practices.

WATER GRADIENTS: RAINBOW OF WASTEWATER

There are many shades of grey in greywater. It is a spectrum. For instance, water from rinsing organic vegetables is ultralight greywater. It is only “dirty” with a little sand or soil. Washing your dishes produces dark greywater, which has soap, oil, and food in it. Light greywater can easily be reused to water your plants, while dark greywater is a little more difficult to reuse without filtering. By developing new forms of everyday infrastructure—like the rinsing stations and Spülküche at Floating—that sort greywater by shade, we can create possibilities for filtering and reuse that are otherwise out of reach for most people whose homes, schools, or workplaces are outfitted only with conventional water infrastructures.

Blackwater can also be separated as urine and feces. By reshaping the toilet into two compartments, one for goldwater and one for true blackwater, we can recycle the nutrient-rich fertilizer and fuel our bodies produce. Urine, when diluted 20:1 with water, is easy to reuse as a plant fertilizer rich in nitrogen. Feces are easier to compost if they are kept separate from urine and excess water. Composting toilets can even benefit from this separation. But separating toilet wastewater does not make sense for toilets connected to conventional water systems where the waste is flushed and mixed together and there is no possibility of reuse. It would, however, make sense in a place like Floating, which has on-site water

filtration systems for treating different gradients of water, where it would be feasible to add a new filter system that treats the blackwater independently from the goldwater.

There are two important examples of this practice being deployed in domestic infrastructures in Germany: Block 6 in Berlin and Jenfelder Au district in Hamburg. At Block 6, domestic wastewater produced by the ~250 tenants is separated into two flows, greywater and blackwater, and treated on site in two moving bed reactors designed and run by Nolde and Partners.^[1] Block 6 was a project of the International Building Exhibition 1987 and a model project of the Experimental Housing and Urban Development (EXWOST) research programme. Jenfelder Au is a new housing development (2022) supported by the water utility Hamburg Wasser. Jenfelder Au separates rainwater, wastewater, and blackwater and treats it in different plants and landscapes in the district.^[2]

It seems inevitable that there will be a shift in thinking around our water infrastructures, with more intelligent, sustainable wastewater systems being integrated into new and renovated buildings.

1
Roof Water Farm,
“Block 6 in
Berlin-Kreuzberg.”

2
Hamburg Wasser,
“Hamburg Water
Cycle.”

Some different ways to perceive water:	
Conventional water perception (or categorization)	Gradient water perception
→ Clean water → Dirty water Expanded “green/eco” water perception → Drinking water → Rainwater → Greywater → Blackwater	→ Drinking » Drinking water → Rainwater » Drinkable » Unfiltered → Greywater » Ultralight » Light » Medium » Dark » Extra Dark → Blackwater » Goldwater » Blackwater → Basinwater » Diluted » Concentrated » Intense
Ingredient water perception	Source perception
Water with... → minerals and very low levels of nutrients → very low minerals, nutrients, and microorganisms → low minerals, some nutrients, and microorganisms → soil → soil and small pieces of vegetables → soil, small pieces of vegetables, and pesticides → food → lots of food → soap → soap, food, and oil → soap, sand, dust, soil, and microorganisms → urine and high nitrogen nutrients → feces, nutrients, and very high microorganisms → nutrients and microorganisms, some chemicals and trash → high nutrients (decaying), some microorganisms, chemicals, and trash → high nutrients (fresh) and microorganisms, some chemicals and trash	→ from aquifer or surface (lake, river, reservoir) via municipal system and filters → from rain via membrane filter → from rain → from cooking → from dishwashing → from cleaning → from urine via toilet and human bodies → from feces via toilet and human bodies → from rain / basin via street and airport runoff

→ Drinking water Water with very low levels of nutrients, microorganisms, and some minerals. Surface or groundwater that is pumped from a lake, river, reservoir, or aquifer via the municipal system and its filters.	→ Goldwater Water with urine and high levels of nutrients, especially nitrogen filtered through the human body. It can be diluted in water 20:1 and used to fertilize plants.
→ Drinkable rainwater Water with very low levels of nutrients, microorganisms, and minerals. Rainwater that has been filtered through a membrane filter.	→ Blackwater Water with feces, urine, and high levels of microorganisms (especially pathogens) filtered through the human body. If urine is separated from blackwater, feces contain some nutrients, including potassium, nitrogen, and phosphorus, however not in high levels. Blackwater can be anaerobically digested to make methane gas as a fuel for cooking, heating, and electricity generation. It can also be dewatered, composted, and returned to the soil.
→ Rainwater Water with low levels of nutrients, microorganisms, and minerals. Unfiltered rainwater can be used for watering plants, washing dishes, and cleaning. When it lands on a surface or is collected in a container, it encounters microorganisms and therefore should not be used for drinking unless filtered with a membrane or comparable filter.	→ Basinwater Water with nutrients and microorganisms, some chemicals and trash from the former Tempelhof Airport, Columbiadamm Road, and Bergmannkiez Neighborhood. It filters through the wetland in the basin and goes to the canal, river, and ocean.
→ Ultralight greywater Water with sand and small pieces of vegetables, from rinsing organic/biological vegetables. It can easily be reused for watering plants, washing dishes, and cleaning. It can be reused for cooking or washing more vegetables if it is filtered through a cloth.	→ Basinwater (diluted) When diluted after frequent rain storms, this basinwater contains a nearly normal amount of nutrients (for outdoor water bodies), with very little algae. It contains microorganisms, some digested and undigested chemicals, decomposed and non-decomposed trash particles. When unfiltered, reuse possibilities are limited to toilet flushing. With further filtering and testing, this water can be turned into swimming-quality water. This is the most reusable form of basinwater.
→ Light greywater Water with soap residue from rinsing dishes in the top tower of the Spülküche (tower 4). It can be reused for soaping up dishes in the middle tower of the Spülküche (tower 3).	
→ Medium greywater Water with sand, small pieces of vegetables, and pesticides from rinsing conventional vegetables, sprayed with pesticides. After filtering, it can be reused for cleaning or watering plants.	
Water with food and therefore nutrients from cooking, such as water used for boiling beans. It can potentially be reused in the kitchen as a stock. The food can also be strained out and composted. The water can be filtered and reused to water edible plants.	
→ Dark greywater Water with lots of soap from washing dishes in the middle tower of the Spülküche (tower 3). It can be reused for rinsing dishes in the lower tower of the Spülküche (tower 2).	
Water with lots of food comes from soaking kitchen pots. The food can be strained out and composted. The water can be filtered and reused to water edible plants.	
→ Extra Dark greywater Water with soap and lots of food, oil, and coffee. Soapy water with high nutrients from food particles and coffee grounds comes from rinsing dishes in the lower tower of the Spülküche (tower 2). It can be filtered and reused to water plants. (The coffee grounds are used to absorb oil in the first step in the Spülküche, before the initial rinse.)	
Water with soap, sand, dust, and microorganisms from cleaning floors, surfaces, toilets. If biological cleaners are used, it can be filtered and reused to water plants.	

Analog Water Sorting

Analog water sorting applies the concept of trash recycling to water. It separates water based on its lineage. By sorting different varieties of dirty water from different sources in different containers, we can filter and reuse it accordingly. This process makes wastewater visible, which helps develop informed reuse practices. This also helps us develop a longer relationship with water, giving us time to co-habitate with it and co-evolve a sustainable practice.

It's like the difference between a digital watch that only shows you the present time in numbers, versus an analog watch with an hour and second hand, which shows you the time in relation to all the other hours in the day. An analog relationship with water allows us to see beyond the 15 centimeters from faucet to drain. It allows us to see where our water has been and where it is going.

Prevent "non-water stuff" from getting in the water

One of the most important elements of water filtration is to try to prevent as much "non-water" stuff as possible from going into the water in the first place. Then you don't have to filter it out. For instance, when you go to wash a dirty dish, it makes sense to get as much of the food off the plate as possible and compost it, rather than mix it with water. Composting allows food nutrients to be recycled back into soil. When food nutrients enter the water they can support the growth of microorganisms and algae. A high level of nutrients can encourage overgrowth, and especially in the case of algae, this can result in hypoxic conditions, where the algae uses all the oxygen in the water, blocks the sunlight, and prevents other life from surviving in the water.

Use drinking water for drinking

We need so little water for drinking. Typical daily water use per person in Germany is:

- 5 liters: drinking and cooking
- 44 liters: showering, bathing, handwashing, personal hygiene
- 33 liters: toilet
- 15 liters: laundry
- 7 liters: dishwashing
- 7 liters: cleaning, gardening, car care

121 liters: total daily water use per person in households and small businesses in Germany^[3]

Our water infrastructure is designed to provide drinking-quality water for almost all of our water needs, from bathing to dishwashing to gardening, but we don't need to use drinking-quality water for most household purposes.

New, relatively easy-to-install domestic infrastructures that allow people to use different kinds of water for non-drinking purposes include: a rinsing station in the kitchen, a rain barrel outside, and a bucket under the shower to catch water as it heats up. This water could be used for cleaning, watering plants, or flushing the toilet.

There are other, more complicated infrastructures that would allow us to better manage our water use. A moving bed reactor, scaled to the number of users, that connects to indoor plumbing could reuse greywater for sanitary water purposes (handwashing, showering, cleaning, toilet flushing, laundry). Diverting water from bathroom sinks to toilet flushing is an option. There are toilet-top sinks where you can wash your hands as the toilet is filling up, however, the designs for these could be improved because the sinks are often small, and the water is only cold. To divert a normal bathroom sink to toilet flushing there would need to be a filter system, reservoir, and floating valve in between to ensure the water does not begin to smell and that there is a consistent supply of water. If you have access to a yard, outflow from the laundry machine and dishwasher can be used to water the garden if you are using biodegradable soaps. Water from your kitchen sink can also be diverted into a mulch basin filter in the yard; this

can be made as a circular trench filled with wood chips, with a fruit tree planted in a mound in its center, sort of shaped like an inverse donut.

San Francisco-based nonprofit Greywater Action has lots of different examples for greywater reuse, rainwater harvesting, and composting toilets on their website, www.greywateraction.org. Santa Barbara-based Oasis Design also provides helpful resources on their website, www.oasisdesign.net, and in several books, such as *Create an Oasis with Greywater: Integrated Design for Water Conservation, Reuse, Rainwater Harvesting & Sustainable Landscaping* (Ludwig, 2015).

Return water to the hydrologic cycle

Another important water filtration practice is returning water to the hydrologic cycle whenever possible. Nature's big filtration loop is a lot more effective than any little filter loop we can build. And the hydrologic cycle already exists and is working all the time, regardless or in spite of what humans are doing.

Visitors to Floating University always ask, "Are you filtering your wastewater so you can drink it again?" In temperate climates where rain is plentiful and freshwater is not scarce, it doesn't make sense to try to filter our wastewater into drinking water. It makes more sense to get our drinking water by capturing rainwater, of which there is plenty, and to filter our wastewater so it is clean enough for nature to easily take back into its cycle. Then, when it returns to us in the form of rain, we can harvest it and turn it into drinking water.

If we work with nature, rather than against it, we can make things a lot easier for ourselves. We are a part of nature, after all. Working against ourselves all the time is exhausting.

Dishwashing Practice

Most of Floating University's greywater comes from washing dishes in our Spülküche and cooking food in the kitchen. Each day during the Open Weeks^[4] we cook lunch for 50 to 100 people. On average, we produce 40 liters of dark greywater from washing dishes and 100 liters of dark to light greywater from cooking and washing pots and pans.

Rather than categorizing water as clean or dirty, we interact with the spectrum of greywater.

We reuse

- the dirtiest water (dark greywater) to begin washing the dirtiest pots;
- less dirty water (medium greywater) to rinse the dishes when they are covered with food;
- more clean water (light greywater) to soap up the dishes and pots;
- and, finally, the cleanest water (drinking water) to rinse the dishes and pots.

3
The calculation is based on "Drinking water use in the household 2023" made by the Federal Association of the Energy and Water Industries (BDEW Bundesverband der Energie- und Wasserwirtschaft e.V.). Their calculation was made in percentages. In this book it is translated into liters, rounding to the nearest whole liter. The total of 121 liters per day is calculated with the water use amounts listed, plus 11 liters for small business uses.

BDEW Bundesverband der Energie- und Wasserwirtschaft e.V. "Trinkwasser-Verwendung im Haushalt 2023: Durchschnittswerte bezogen auf die Wasserabgabe an Haushalte und Kleingewerbe—Anteile."

4
The Open Weeks at Floating University Berlin in May, July, and September of 2018 invited the local and international public to explore the rainwater basin and the campus, as well as to participate in workshops, lectures, seminars, pool talks, concerts and performances. The Open Weeks were curated by Doro Halbrook. PDFs of the three Open Weeks are available on Floating University's archive: <https://floating-berlin.org/open-weeks-1>, <https://floating-berlin.org/open-weeks-2>, <https://floating-berlin.org/open-weeks-3>.

How to Spülküche

How to wash a dish in the Spülküche:

1 First, scrape the leftover food scraps into the compost bin in the first tower. Then scrub your dish with coffee grounds to remove oil.

We use coffee grounds because the oil is really difficult to filter. Plus, if the water in the rinse tower gets oily, then we are just scrubbing oil all over our dishes, rather than cleaning them. The coffee grounds also help remove more food residue. It is easier to filter the water when it doesn't have so much food in it, and it makes sense to compost as much food as possible and turn it back into soil.

2 Rinse the dish in the second tower. Dunk the dish in the water container to remove the coffee grounds (and maybe give it a little scrub with a brush).

This container of water gets pretty dirty with all the coffee grounds, but that is okay, because the dish isn't supposed to be clean yet. We use the dirty water to begin cleaning the dish when it is dirty, and the cleaner water at the end when it is nearly clean.

3 Soap up the dish in the third tower. The soap tower is a little taller than the second tower.

The soapy water stays pretty clean because we got most of the 'dirt' off in the first rinse. After sudsing the dish up, you can dip it back in the soapy water to get as much of the soap off as possible. This way, we keep the final rinse water as soap-free as possible.

4 Take the last step—literally—to rinse the dish. The fourth tower is the tallest, and you have to climb up a set of stairs to reach it.

5 Finally, set your dish on the drying rack tower.

This process can be done with many dishes at a time, or you can work with a group of people so each person does one step in the process. Generally, washing dishes in the Spülküche is more playful and convivial than conventional dishwashing, as we walk up and down the steps or pass the dishes along to our co-washers, old friends, or strangers with whom we might bond over suds.

How to refresh the Spülküche:

The water in the Spülküche needs to be changed when the soapy tower or top rinse tower is no longer clear. How often this needs to be done depends on use. If 50 people are washing their dishes in the Spülküche, generally it needs to be done after each meal. Refreshing the Spülküche doesn't mean refilling all the water towers; only the top rinse tower needs to be refilled with about 20 liters of fresh water. The water is changed in the other towers by downcycling it from tower to tower and into the filter system, as described below. This means we can wash the dinner dishes of 50-100 people by just adding 20 liters of fresh water into the system.

1 Pull the plug from the bottom rinse container (in tower two), which is filled with coffee-colored water. This water will flow through a pipe, then a sieve (to catch any food particles), and into bathtub six in the laboratory (sand and biofilm filter). Replace the plug.

2 Pull the plug from the container in tower three, which is filled with soapy water. This will flow into the now empty bottom rinse container in tower two. Replace the plug.

3 Empty the final rinse container in tower four into the container in tower three. Replace the plug.

4 Finally, fill the top rinse container in tower four with drinkable rainwater from the membrane filter.

*Sometimes it is helpful to rinse each container with a little more water to get rid of residual coffee grounds or food particles and to scrub away any residual oil lines on the sides of the containers.

The Spülküche at Floating University has been re-designed three times.

The first iteration of the Spülküche was a temporary construction created for use during Floating's construction phase. The cascade design was born out of necessity. During construction, we had to carry all of our water, so reusing water was an imperative. Sam Boche and I built the temporary Spülküche cascade out of plastic organizing containers stacked on top of each other to step up in height. The containers were fitted with spouts and drains so the cleaner water could be cycled down to the dirtier containers when the water needed to be changed, rather than changing all of the water at once.

This temporary system became the inspiration for the Spülküche infrastructure, a student design project of UdK, in the permanent Floating University campus. The UdK students, who also designed the offshore kitchen, built the Spülküche on wooden towers with slides, in keeping with their kitchen design principles. Their Spülküche was especially wonderful because it worked well but also looked good.

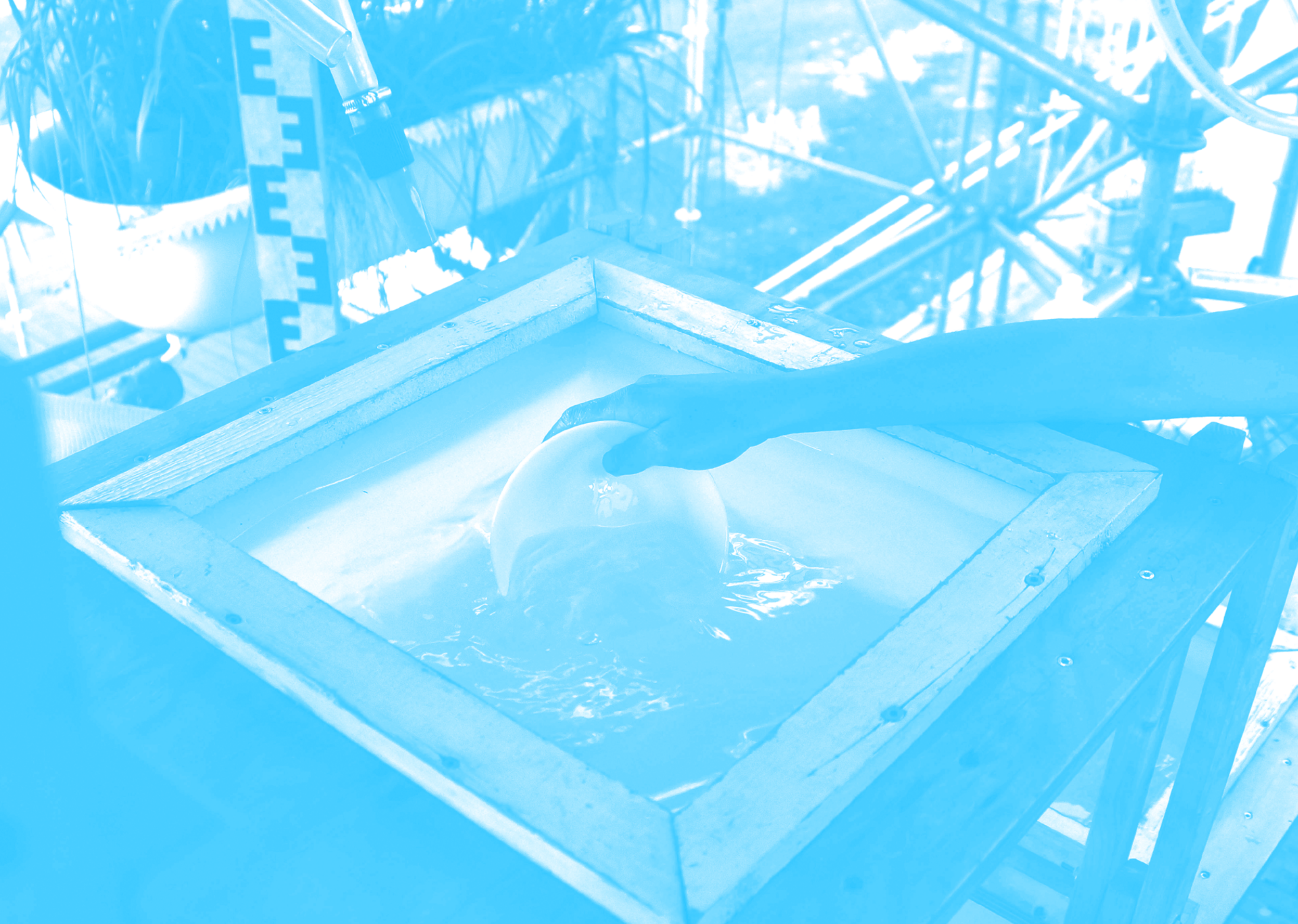
The students from HFBK's Design for the Living World trimmed the tall vertical wooden pieces from the Spülküche towers, which extended upwards above the water containers, to improve the functionality of the Spülküche. This allowed movement from one tower to the next to become more fluid and made the Spülküche more enjoyable to use.

The Spülküche is something that could conceivably be adapted to domestic use. Water from rinse tower two could be emptied into a normal kitchen sink drain, to be filtered conventionally by the city water utility, or into a mulch basin filter in the garden to return to groundwater and the hydrologic cycle, or connected to a moving bed reactor to be reused for sanitary water purposes in the house.



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These are social change theories of water that reimagine our relationship to water. They are artistic, cultural, and metaphysical interventions that transpired at Floating University.

infiltrations

Overview of Terms in This Section

- Natureculture in the Third Landscape
- Water Stewards vs. Consumers
- Participatory Public Space
- Infrastructure as a Working Field
- Practicing the Arts of Living on a Damaged Planet
- Thyme
- Chaosmosis
- Utopia Prison
- Water Bodies

natureculture in the third landscape

NATURECULTURE IN THE THIRD LANDSCAPE

The term “natureculture” was coined by Donna Haraway (2003) in *The Companion Species Manifesto: Dogs, People, and Significant Otherness*, in which she writes about the inextricable entanglement of the things we categorize as “nature” and those we deem to be “culture”—dogs and their “owners,” humans and viruses, cities and rivers, roads and “wilderness.” Haraway draws upon Marilyn Strathern as an ethnographer of nature-cultures, who “taught us why conceiving of ‘nature’ and ‘culture’ as either polar opposites or universal categories is foolish.”^[1] Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness*, 8. Floating itself: “On the site of Floating University, the rainwater collecting the former Tempelhof airfield, a diverse range of animals, plants, and algae have taken root and given birth to a unique landscape: a human-made environment reclaimed by nature where polluted water coexists with the relatively new presence of the University, forming a natureculture (Haraway) in a third landscape (Clément).”^[2]

Floating itself: “On the site of Floating University, the rainwater collecting the former Tempelhof airfield, a diverse range of animals, plants, and algae have taken root and given birth to a unique landscape: a human-made environment reclaimed by nature where polluted water coexists with the relatively new presence of the University, forming a natureculture (Haraway) in a third landscape (Clément).”^[2]

The term “third landscape,” coined by Gilles Clément (2004) in *Manifesto of the Third Landscape*, is “an undecided fragment of the planetary garden,”^[3] a territory “for the many species that cannot find a place elsewhere.”^[4] Clément, *Manifesto of the Third Landscape*, 4 & 9.

Third landscapes, Clément writes, are:

Refuges for diversity, made up of the sum of neglected lands, reserves and primary sets. A *neglected area* is the result of the abandonment of a previously exploited site. Its origin is manifold: agricultural, industrial, urban, touristic, etc. Neglected areas and wasteland are synonymous. The *reserve* is an unexploited place. Its existence is due to chance or to the difficulty of access that makes it impossible or costly to exploit. It appears by subtraction from the anthropised territory.

Reserves (*primary sets*) exist de facto but are also the result of administrative decisions. The undecided character of the Third Landscape corresponds to the evolution left to all biological beings that make up the territory in the absence of any human decision.^[5] Clément, *Manifesto of the Third Landscape*, 4.

Floating’s rainwater basin is a third landscape because it is a man-made infrastructure and polluted wasteland inhabited by many species that were not intended by the infrastructure’s designers to live there but are now unable to find a place elsewhere. This theory was born from Clément’s observation of the Limousin region in France and refers to the concept, articulated just before the French Revolution, of the third estate: “a space expressing neither power nor submission to power.”^[6]

Clément citing Sieyès, “Qu’est-ce que le tiers état? (What Is the Third State?),” 43–117.

Floating hosts programs themed on natureculture, including the multidisciplinary festival series Natureculture Pedagogies in 2022 and Natureculture Strategies in 2023; it is also a core theme of the Climate Care program at Floating, curated by Rosario Talevi and Gilly Karjevsky and the Contaminations program I curate myself.

water stewards vs consumers

WATER STEWARDS VS. CONSUMERS

How will life change as our relationship to water transforms and we shift from being consumers of water to stewards of water?

Living in Berlin, we consume water like we consume most resources in our daily lives: it gets delivered to us; we use it; we dispose of it. We use oil and gas, clothes, food, cars, and electricity in a similar way. Sometimes we pay people to deal with our refuse; sometimes we emit it directly into the ecosystem. Our lives depend on these resources, but we rarely know where they come from and where they go, and we rarely have any agency in these processes. Often, large, centralized corporate or government entities facilitate delivery and disposal of all of these everyday resources, including water. Floating asks: where does our water come

from, and where does it go? Can we be more involved in this process?

The Berlin water utility, Berliner Wasserbetriebe, pumps water from 700 wells located in the Berlin–Warsaw Glacial Valley’s freshwater stratum, a sand and gravel deposit which formed during the Ice Age 10,000 years ago, to the faucets of 3.65 million people. After the water goes down the drain, the water utility pumps it away to Berlin’s six wastewater sewage treatment plants and then discharges it into the River Spree and the River Havel, either directly or via their tributaries: the Erpe, the Panke, the Nordgraben, or the Teltow Canal. Berlin’s wastewater then flows down to Potsdam, whose water treatment plants add their discharge. And the process continues until the river meets the North Sea and then the Atlantic Ocean.

Even after treatment, the discharged wastewater typically contains 15,000 colony-forming units of *E. coli* per 100 milliliters of water.^[7] This is far higher than what the European Union determines as safe for swimming.^[8] *E. coli* is often used to assess the health of freshwater swimming areas. *E. coli* bacteria, which inhabits the intestinal tracts of warm-blooded animals and can arrive in water bodies in feces, is an important indicator because it is strongly correlated with the presence of pathogen-related diseases in water.^[9]

I learned this information from a Berliner Wasserbetriebe lab report that Erwin Nolde showed me in his laboratory. I asked him to share the citation with me and he suggested that I contact the Berliner Wasserbetriebe to get their most current figures. I contacted them but I did not receive a response.

Nitrogen (*Stickstoff*) and phosphorus (*Phosphor*) are essential nutrients for all life forms. However, elevated levels of these nutrients in water can cause eutrophication—abnormally high rates of photosynthesis, which can lead to algal blooms, which can lead to hypoxia (low oxygen in water) and block light for organisms living near the sediment layer.^[10]

Turbidity is another important parameter that can be affected by wastewater discharge. Turbidity occurs when small particles—like clay, silt, and organic particles (like phytoplankton, plant debris, or feces)—and

chemical precipitates (like iron and manganese) become suspended in the water and restrict the transmission of light, which may impact submerged plants and aquatic organisms. High turbidity levels can also affect the ability of fish gills to absorb dissolved oxygen. The level of “healthy” turbidity for an ecosystem depends on its context. Rapid, uncommon changes in turbidity can cause problems for ecosystems that are not adapted to those conditions. Rapid changes in turbidity can be an indication of substantial pollution events in surface water or groundwater, for example, the overflow of sewage into rivers triggered by storms.^[11]

World Health Organization, Water Quality and Health—Review of Turbidity: Information for regulators and water suppliers, 6.

Floating University is a place to explore ideas about water stewardship. The focus is not on the idea of being responsible for “our” water or having control over water but instead on the idea of stewardship as a process of being in relation with water, a relationship that is both utilitarian and empathetic. How can water stewards take an active role in collecting and caring for water?

For water stewards, the days of turning on the tap to have water magically appear and disappear—the 15 centimeter relationship with water—are gone. At Floating, the relationship with water is long and winding, like a river.



A neighbor, Vera, came to a visioning meeting about the future of Floating. She said that she hoped Floating could become a non-consumptive space, a place visitors could enjoy and care for collectively.

So many public spaces are sites of consumption: streets, parks, stores, schools, museums, train stations, airports. When we go to a public park, we don’t think about taking out the garbage, cutting the grass, or helping tend the flower garden. When we go to a museum, we don’t think about taking out the paper recycling when we toss our entrance tickets or

changing the lightbulbs that illuminate the exhibits or even talking with other guests to acknowledge that we are in a shared space. When we are in the street, all the trash around us belongs to someone else or something else—the city and its mostly invisible garbage infrastructures. The social architecture of these spaces mostly doesn't invite us to participate in the care and keeping of these places. Other people, often invisible, are paid to do those jobs. The architecture of many public spaces is embedded with implicit instructions about how we should relate to them, which makes it difficult for us to enter these spaces as anything other than consumers or users.

But a participatory public space can aim to inspire something more than a simple caretaking relationship—taking out the trash or washing the dishes. A participatory public space can inspire relationships where each participant can contribute their energy, ideas, and sensibilities. At Floating, a goal was to create a public space where everyone was invited to participate and where the collective life of everyone sharing the space and co-inhabiting the ecosystem would contribute to its evolution.

Anyone can apply to run a project or program at Floating (www.floating-berlin.org/cooperations). Visitors can participate in the activities of different working groups, like the Space Group, which builds and maintains structures on-site; or the Garden Group, which tends the greenhouse and the plant boxes. Other working groups include the Program Group, the Lobby Group, the Funding Group, the Neighborhood Group, the Hybrid Infrastructure Group, Water Earth Biodiversity, the Communications Group, and the Documentation Group. The Floating University Association (www.floating-berlin.org/association), known as Floating e.V., is another avenue for community participation. (“e.V.” is the German abbreviation for *eingetragener Verein* which can be translated as association or club.) All Floating's different working groups and their members make up the larger Floating e.V. The association is a self-organized group, where practitioners from a wide range of backgrounds meet to collaborate, co-create, and imaginatively work towards the future of Floating, the future of water, and the future of people's relationships with the city and nature in the city. Its

50-plus members manage and care for the experimental educational campus constructed within the rainwater basin. Collectively, we are reimagining how to live together in contemporary urban space.

infrastructure as INFRASTRUCTURE AS A WORKING FIELD a working field

Can we approach infrastructure as a working field rather than a fixed system?

Infrastructure is a complex network of fundamental systems and machines that are under us, over us, and around us. Often working as quietly as our beating hearts, this meshwork of housing, education, roads, electricity, water, and communication shapes the way people live. Created to enable us, protect us, or dominate us, we exist in these structures, which most of us experience as a fixed, untouchable system—designed, built, and controlled by largely invisible forces.

Infrastructures are not only invented for us, but also by us. Each individual builds their own personal infrastructure—a home, a family, a job, a personality—in order to live out their existence. From the macro to the micro, from the international to the personal, infrastructure is not actually a fixed set of systems, but a working field, an ongoing process rather than a finished product. Infrastructures shape, even control, the way we live, but we can shape our own infrastructures.

At Floating, the ongoing working process examines the basic systems and components we use in our daily lives and considers whether we can fabricate and care for them ourselves. This experience is a push and pull of infrastructure as malleable material, not fixed monolith. The water infrastructures at Floating are designed to be participatory, decentralized, and prefigurative. They act as prototypes for diverse forms of infrastructure in all areas, not just water. When we visit different countries, or What creates the algal “monster?” After the basin floods, algae feeds on the influx of fresh nutrients and forms a mat on top of the water. The

different places like Floating, it becomes clear that there are many ways to build critical infrastructure. At Floating we hope to inspire visitors to think of the infrastructures that surround them not as a fixed system but a working field, where there is room for their creativity and participation.

practicing the arts of living on a damaged planet

Floating University is a place for practicing the arts of living on a damaged planet. To live (not just survive) on a damaged planet is an art form (not a survival skill). When people first began constructing cities on rivers, you could swim in the rivers and even drink from them. Today, swimming in most urban waterways will probably make you sick, and drinking from them is out of the question.

Floating’s intimate and damaged ecosystem, the rainwater basin, is the form of nature we are creating on this planet now. More and more of the Earth’s ecosystems are becoming like this—Anthropocenian mutations. At Floating University, people are forming relationships with each other and with this ecosystem while generating answers to the question posed by the 2017 essay collection *Arts of Living on a Damaged Planet*: what are critical and creative tools for collaborative survival in a more-than-human Anthropocene?^[12] Or, as contributing author Donna Haraway encourages

us to inquire, what are the ongoing possibilities

for possibilities

to be ongoing?^[13]

At Floating we

are exploring how

we deal with our

biological legacies;^[14] “ghosts, or landscapes haunted by the violences of

modernity”,^[15] like the rainwater basin; and

“monsters, or interspecies and intraspecies

sociality,”^[16] like the city developers and the

algal mats.

¹² Paraphrase from book description for *Arts of Living on a Damaged Planet: Ghosts and Monsters of the Anthropocene*, edited by Tsing, Bubandt, Gan, and Swanson, on publisher’s website.

University of Minnesota Press, “Description: Arts of Living on a Damaged Planet: Ghosts and Monsters of the Anthropocene.”

¹³ Haraway, *Staying with the Trouble: Making Kin in the Chthulucene*, paraphrase.

¹⁴ Foster, Knight, and Franklin. “Landscape Patterns and Legacies Resulting from Large, Infrequent Forest Disturbances,” 497.

^{15 & 16} University of Minnesota Press, “Description: Arts of Living on a Damaged Planet: Ghosts and Monsters of the Anthropocene.”

algae uses up the oxygen in the water and blocks out light, suffocating organisms below. As the flood water drains out of the basin and recedes What creates the algal “monster?” After the basin floods, algae feed on the influx of fresh nutrients and forms a mat on top of the water. The algae use up the oxygen in the water and blocks out light, suffocating organisms below. As the floodwater drains out of the basin and recedes from the shores, the algal mats are left behind. The algal mats dry out, and the smell of rot drifts from the basin as they decay with the organisms that were trapped below them. This forms an almost paper-like material in the basin, a cracked, speckled, yellow-green skin. This is referred to as the cracklement, the relic of the algal mat and a new monster in its own right.

thyme

At Floating, time is experienced differently than in other places. It is easy to lose track of time at Floating, planning to drop in for just an hour, not leaving till after dark. Time seems to float away. Out of this experience emerged the concept of “thyme,” a re-envisioning of time as something that is not spent or saved, but savored. Thyme is a deep, slow way of experiencing time that is more about enjoyment than efficiency. When we lose track of time, we enter into thyme. We often talk of being “on time” or “in time.” When we are in thyme, we are fully immersed in the moment.

We live in a society of speed and time-saving devices. Time is something that can be spent, but thyme is grown. Time can be bought, but thyme is harvested. Time can be wasted, but thyme is composted. Floating invites an examination of social conceptions surrounding time. Floating extends an invitation to savor thyme rather than trying to conserve and preserve time.

At Floating, thyme is experienced in the floating moments when the sun begins to set and the world begins to glow. We enter a new thyme zone. People gather on the terrace, sitting with new friends and letting the day of workshops, talks, and performances soak in with the last warm rays of sun. The breeze wafts moist air off the rainwater basin and cools the summer day. The swifts fly overhead, circling in swarms,

and the nightingales sing through the dusk and into the darkness. Even when Floating is gone, hopefully thyme travel will remain possible.

chaosmosis

CHAOSMOSIS

Floating University is a dynamic space that is always changing, breaking, getting repaired, and hobbling along. Somehow it keeps going, and you are going along with it, carried by the current of a river, or sometimes, a riptide. When you step out of its bubble, the only thing that is certain is the next time you return it will be different. Your materials will not be where you left them; a new leak will be dripping; someone will have eaten the rest of the risotto; the electricity will be off and no one will be sure why or how to turn it back on; the trash bags will be missing. Floating is a chaotic space to work in, and the only way to stay afloat is to embrace the chaos and not struggle against it or try to control it.

Somehow, it is within this chaos that the magic of the place exists. Like the calm in the eye of a tornado. It is a chaosmosis of people and place, flowing in and out, making things better, making things worse, making things.

utopia prison

UTOPIA PRISON

A utopia prison is what Floating University feels like after you are there every day for two months straight.

Working in the basin, you have to deal with intense sun, wind that blows your stuff everywhere, mountains of trash (which you help create), a time hierarchy, and fake democracies. At the same time, you are surrounded by an oasis of trees, water, and silence in the middle of the city. It's intensely beautiful, yet polluted. The basin is as full with conflicts as it is with water.

It's a utopia—where you can experiment with prefigurative ecological infrastructures. You can dream them, build them, and live with them. You can practice the arts of living on a damaged planet.

It's a prison—where you come to build a mushroom filter and then instead find yourself fixing a bunch of other things that mysteriously became broken. The handmade infrastructure maxes out and begins to disintegrate when 10,000 people come to visit. Your to-do list grows to infinity.

It's a utopia—of biological water filters, illuminated inflatable roofs, a waterslide dishwashing system, toilets that you flush with hot pink watering cans.

It's a prison—of endless unwashed dishes; mountains of trash; leaky toilets; a relentless, indifferent wind; and floodwaters sweeping away anything that isn't nailed down.

It's a utopia prison—where you arrive to find a fluorescent pink, spray foam, tentacle canopy being constructed over a trampoline covered in soft, plush blankets, where you can lie down, suspended over the water, meditating on existence, and one month later you throw the toxic structure in the dumpster so it can sit in the landfill for the next 1,000 years (at least).

It's a utopia prison—where you can walk around in the polluted water in rubber boots, exploring the reeds and the wetland forest, watching families of ducks swim by, whose babies can't leave until they can fly.

It is easy to get caught in the riptide at Floating. There is so much to build, so many events to participate in, and so many wonderful people to encounter. It is the perfect place to get distracted by chance encounters and lose yourself completely in the utopia prison.

Oceans, seas, lakes, rivers, streams, canals, wetlands, ponds, puddles. More than 70 percent of the earth is covered in water. The human body is 60 percent water. Our brains are 70 percent water; our blood is over 80 percent water, and our lungs are 90 percent water. Water is the primary building block of our cells.

Just as water cycles on the earth, the human body also has a water cycle. When we drink water, it is absorbed through our intestines and circulates throughout the body. Water carries oxygen and nutrients to our cells. It lubricates our joints. It insulates the brain, spinal cord, and organs, acting as a shock absorber. Water is the body's main solvent. It dissolves minerals, vitamins, and nutrients. It metabolizes proteins and carbohydrates. Just like it does on earth, water transports, lubricates, and dissolves all living, dead, and abiotic things in the human body. Water flushes away waste materials and toxins through urine. Water and toxins also leave our body through perspiration.

The human body is not so separate from the earth and its water cycle. We are also organism-environments.^[17] At Floating, the pollution we leak into the basin will eventually circle back around into us. In this way, maybe Floating is a place for learning how humans and habitats share immune systems.

^[17] Watts, *Does it Matter?*, 36.

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2

ORAL
HISTORIES

I recorded oral histories with people who were involved with Floating University in its first summer. The people whose words you will read in the following pages include initiators of the project; architects who designed the structures; caretakers who made sure it didn't fall apart; environmental engineers who helped design and build the water filtration system; interns who kept everything running smoothly and did a lot of behind-the-scenes heavy lifting; teachers and students who made and took classes in the experimental campus; artists and curators who made public events, artworks, and spectacles in the site; and many others integral to the Floating University project. (I was also deeply involved with Floating in its first summer and beyond, and I worked closely with most of these people.)

Most of these oral histories were recorded on site in 2018 at Floating University in one-on-one conversational interviews. I asked each person the following questions:

- What is your relationship with Floating University?
- Could you tell a story about an experience you have had with water?
- What kind of practices do you have with water?
- Do you have anything to add?

After the interviews were transcribed, they were condensed and edited for clarity.

In the editing process, the questions I asked were removed, so only the interviewees' answers remain. It's important to understand that these texts are the result of speaking rather than writing, hence the term oral histories. One of them remains in the interview format, because it was a joint conversation between Rosario Talevi and Gilly Karjevsky, and it was better to preserve the back and forth between them than separate their conversation to maintain a consistent format.

My questions focused on relationships with water because relationships are too often overlooked when we think and talk about the planet's current and looming water challenges and crises. Instead, we focus on technology, looking for the solutions that will save us. But technology alone will not save us.

One of the Floating interviewees, Licia Soldavini, said: "To me, the river is like a process...standing in the river...I feel more part of the river because I'm immersed in it."^[1] A deeper connection with water leads us to think and act differently but also to design differently, to create technology that is more creative, more considerate, and more effective. Another interviewee, Alexis de Raphelis, told me: "The more you know something, the more you want to take care of it."^[2]

1 Licia Soldavini, interview with author, 2018.

2 Alexis de Raphelis, interview with author, 2018.

Jeanne Astrup-Chauvaux works at the intersection of art and architecture. In 2018, Jeanne was an intern for raumlabor architects and worked exclusively on Floating University. Since then she has been active in organizing and programming, including the three editions of the Climate Care Festival, at Floating University. She helped start the Floating e.V. Association and was a member of the board between 2021 and 2024. Outside of Floating she is a part of three collectives: Urban Fragment Observatory, spätispäti, and Collectif Trouble.

So it's my moment to completely change the story and say that I was the boss?

Well, no, I was not the boss. I started in 2018 as an intern for raumlabor architecture collective. My internship started a few months before the real opening of Floating University. So I was quite involved in all the planning, including planning the construction site and planning a bit of the program. But I didn't have so much decision-making power at that time.

From the day Floating University opened until the day it supposedly should have closed sometime in September, I was on site every day and took care of many different things, from having the site running in a smooth way to also looking at the environment, understanding the place we're in. At some point I also started making a fanzine about life on site.

After the first summer, I helped found the Floating e.V. Association, and I am still a member today. I am no longer an intern; I am a very active member in the association and in organizing the project. I have been involved in different kinds of things, including the redesign of the architecture, curation, communication, the hybrid infrastructure working group, and site care. I'm quite versatile in the project.

My relationship to water is a very respectful relationship. I respect water as something that both gives life and can take it away. I'm particularly interested in water in an urban landscape and what it means within cities. Where does it come from? Where does it go?

A particular story of water at Floating University is seeing the rhythm of the site changing—the level of the water in

the basin rising after rain or drying up slowly. Really witnessing everything that comes in a cycle: it would rain and everything on site would be kind of flushed out. The basin would fill up with water, and water would start flowing out of the outflow tunnel, flushing out what had been in the basin before. The water wouldn't be able to flush out at the pace it was coming in, so the new rainwater would fill up the basin and remain for a few days. In these few days, algae would bloom, and the entire basin became greener. Then slowly the water would leave the basin, by evaporating and flowing out of the outflow, until most of it was gone. The algae would remain on the dry concrete, then it would start cracking and rotting, and it would smell very bad.

The first year this happened probably every two weeks or so. Over the course of the first summer, so four months, I saw this happen around eight times. One time there was this really huge flood where the structures we built went underwater.

It was really intense, but also a really good memory.

The night before the flood, the weather was kind of suspicious. It was quite windy, and we were there quite late. The days are super long at Floating, with programs going into the evening. Then it started raining. For once, we left the site as it was, without cleaning up from the program, and just went out the gate.

I woke up the next morning at 7 a.m. because a friend of mine, Flore, who was cooking in the kitchen at Floating, sent me a picture of the basin, completely flooded. Like everything disappeared underwater. And she wrote, "What do you think? Should I still start

cooking?" I was shocked and I biked to Floating as quickly as I could.

When I arrived on site it became clear that no, we would not open. I think it's so rare that you cancel a day because of something like rain. We canceled everything that day, and we tried to save everything that was not waterproof. Lorenz and Sarah were there, along with other people who were supposed to do a workshop at Floating that day. Everybody was in their underpants and raincoats, pulling things out of the water that were floating around. We didn't wear rubber boots because the water was too high, and it would just flood into the boots. Except Florian, the chief architect, had on a wader suit for fly fishing; he was troubleshooting the most critical stuff. I was just barefoot walking in the water.

We built a raft with a sail, and we started sailing around the basin. It was really a very special moment. We even swam in the water, I remember. Now I feel bad because the water is super dirty, but oh well.

There were so many things floating in the water. I remember there were a lot of building materials floating around. There were some electronics we had to grab out of the water. And some things left out from the night before, like handmade wooden benches and tables. It was the first moment where we realized that things would float around, including some platforms that were super heavy. There were these big blue plastic barrels floating in the water. We pulled them out and used them to make the bottom of the raft.

Everything just got carried away by the water and accumulated next to the outflow, which was also where our workshop

was, where we stored a lot of materials. The water also moved all the algae and duckweed into the workshop. When the water went down, everything in the workshop was covered in duckweed.

At first we built the raft to collect things floating in the water, but then we enhanced it. We tried to install a Makita power drill as a motor and rudder, but it didn't really work out. We used a big flag made at Floating by the artist Raul Walch as a sail. Then we just had fun.

Floating is a place where something like this would happen, where you have the impulse to build and do something like this, and everybody just says, "yes." It's not something that people would have doubts about. That's in Floating; it's part of the place.

The experience with Floating University really completely changed my life. I think it really changed me as an architect. Maybe I'm not an architect anymore, thanks to this. I work with things that relate to architecture, but more in an artistic and activist way.

Witnessing Floating University as a space and project, but also the basin itself, really shifted something in me. Now I'm much more interested in caring for these kinds of existing spaces than in creating spaces on my own.

I am interested in acknowledging the complexity of such spaces, of having a wetland ecosystem in a very hostile urban environment and all the complexity that comes with it. This kind of acknowledgment can arrive when you stay in a place for a long time and truly understand how it works. I feel very linked to Floating in the sense that I feel like I really understand it, and I really care about it.

Usually as architects and planners, we don't really try to really understand these natural systems on a deep level—how they function, how fragile they are, but also how resilient they can be and how things adapt.

Licia Soldavini was the production manager at Floating University Berlin in 2018 and an instrumental part of the core team who initiated the project. She is an urban practitioner and educator.

I work at Floating University as the production manager, but I don't feel like a manager. The title doesn't really fit my personality or my perception of my position here, but this is a different topic.

I have a contradictory relationship with water. Growing up in Italy, I was always really moved by summer news reports showing entire villages without reserves being supplied with water by big tank trucks. I tried to make the best use of water, but at the same time, I really enjoy taking long showers, which is not very respectful, I have to admit.

One of my favorite things is to be in water in special places. For example, when I go hiking in the Alps with my father, sometimes we go very high and find glacial lakes. I swim for just 10 seconds, you know, in and out. My dad always worries that I might get a cold. And I'm frozen, but I also feel happy and energized. When we go home, my father tells my mother the story of me swimming in the ice-cold water. And he says, "Ah, I regret so much that I didn't swim myself." It's our ritual.

I also have a working relationship with water. In 2015–2016 I worked in an occupied factory in Montreuil in France where 160 men from Central Africa were living. The place is very dense, so the four showers were their only temporary private space. The shower was for them—like for me—one of the best moments in the day. Water is a refuge. That is why they were splurging on hot water, which was very problematic because the water bill was expensive and they didn't have a lot of money, and water was leaking everywhere. We tried to find a solution: we installed special shower heads that mix the water with oxygen, so it uses less water but you still have the same feeling.

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In 2014, I worked on the construction of a community kitchen for an informal settlement, the Coziñha Comunitária Terras da Costa, in Portugal. We disguised the installation of a drinking water fountain in the settlement as an art project to bypass the local bureaucracy. The community had been living there for several decades without direct access to drinkable water. They had to walk 800 meters (half a mile) to fill canisters and transport them to their homes to cook, wash themselves and clean, water the crops and so on. They would even run washing machines on water from canisters!

Another project I participated in in Portugal was called Casa do Vapor. It was in 2013 and with Constructlab. We weren't really allowed to build a water system to drain the kitchen sink, so we built something that looked like a green garden bed. We filled a plastic box with pine needles we collected in the woods, and then let the greywater from the kitchen go through the pine needle filter, trapping the dirt, grease, and food. Then the water would flow into a stone garden with other plants that were giving it a second round of filtering, and finally sink into the sand. At times it would be smelly, but it worked quite well. It was always disgusting to change the pine needles, but after the moment of disgust, I'd say, "Okay, this is the dirt I'm producing."

When Sam and I were working on these projects together, we often lived in a truck. (Sam is Licia's former partner and one of the builders who constructed Floating University in 2018 and managed the team of builders.) We had 60 liters of water in a canister in the truck. It's not much and sometimes we didn't know when we would be able to refill it.

We discovered that in every European country there is a different relationship to drinkable water in public spaces. It's not a given that you can access it.

In Germany, for example, you don't have publicly accessible drinking water at all. I don't know why there is not this culture of making water available for people. We would go to a cemetery to get water, like we did here at Floating University in the first weeks. Cemeteries have old pipes, still open to the public. But sometimes they are lead pipes, so they are not safe.

In Italy publicly accessible water is everywhere. There are drinking fountains in each city, even in luxury neighborhoods. They are usually very beautifully designed. They even have special names. In Milan they are called *vedovelle*, which compares the trickle of water to a widow's cry. Citizens fought against the privatization of drinking water, which ended with a referendum in 2011. Unfortunately it's not being honored by the government. People there embrace access to drinking water as part of their culture.

In the van, we sometimes didn't have a place to shower along the way. We would stop by a nice river, get naked and pour water over ourselves with pots. I think this is my favorite way of showering. Last time I did this was on the way to Portugal. I had just had an operation, and this was my first bath after the surgery, in this creek in Spain. The last shower I took was with Betadine in the hospital, and when I got in this creek, in a natural pool along the bank, I felt liberated.

I approach river bathing differently than the shower. Hot showers are some kind of routine hygiene and a way of relaxing after work. The river is more of a necessity, and it's not water consuming, because the river is flowing and you enter into it. You don't turn it on, it's already going. Rather than wanting to come out clean, I try not to make it dirty. I try not to use too much soap so it doesn't make a big foam in the river, or to not use soap at all. You have to wait for the right moment when the sun is high, so it's warm enough for your hair to dry and you're not completely frozen.

To me, the river is like a process. In that moment, it's like you are a rock. I take the water from a pot, but I am standing in the river. I fill the pot in the river, spread the water on my body, then the water goes into the river again and flows, just with little bits of my skin.

I feel more part of the river because I'm immersed in it. And I'm just deviating for a short moment the water flow. But I'm the thing.

Benni Foerster-Baldenius is an architect who initiated Floating University Berlin with Florian Stirnemann. Both Benni and Florian are partners in raumlabor architecture collective. Benni is a founding member of the Floating e.V. Association and on the association board. He continues to be active in the project.

My relationship with Floating University is quite intense. I'd been running pregnant with the idea for two years. Then we started realizing it, and since then I'm involved. I'm still trying to understand what it is, or what it was, or what it will be. I think I'm the chronicle maker.

One memorable experience I have with water was when I was five, and it was my grandma's seventieth birthday. We all went out to a restaurant in a park in Bremen called Wallanlagen. It's a former fortress. We all dressed up, and I had on my nicest denim overalls and a blue sailor's cap. After lunch we walked around the park, and I saw this nice lawn in a kind of valley, like a hole in the ground covered with lush grass. It looked so delicious that I wanted to walk on it, so I ran ahead and jumped down onto the lawn, but it turned out to be a pond covered with green algae. I immediately sank beneath the surface and vanished. I couldn't swim. The whole birthday party ran to the banks of the pond, and my dad jumped in after me—the water only went to his belly button—and pulled me out. All my nice clothes were green. The cap was gone. I only remember it because there are these nice photos of me in my overalls, standing beside this pond, soaking wet, covered in algae, crying.

After this, I never wanted to take a bath.

There's a practice with water I would like to copy. There's a guy who wrote a book—what was his name again? (Roger Deakin, *Waterlog: A Swimmer's Journey Through Britain*) Unfortunately, I think he's already died. He swam in all kinds of different waters in Britain, ponds and rivers and creeks and the ocean and so on. Of course, he's a super-good swimmer. I am not, but

I would like to be. Reading his stories and fantasizing about recreating them was a nice preparation for Floating University. Now whenever I come to a place where I think, "Oh, this is a nice site with water," I imagine what it would be like to swim in it.

I've started making tryouts. There was a castle garden, where, of course, it's completely forbidden to jump into the pond in front of the castle. I went there when it was raining, I was sure nobody was there, and I jumped into the water and swam around the castle.

How would it be to swim in the basin at Floating University? Pretty disappointing. It's not deep enough to swim, even though it gives the illusion that it is. There's a moment when there is just enough water so the water runs under the bridges, and there's this kind of mirror of water. And the moment you put your foot into the basin is a magic moment. I always try to make it very dramatic when I tell people to put on boots and then—step into the water. Because it is so surprising that it's solid. You're actually stepping onto the water. It's the Jesus feeling.

Florian Stirnemann is an architect who initiated Floating University Berlin with Benni Foerster-Baldenius. Both Florian and Benni are partners in raumlabor architecture collective. Florian was the main designer of the architecture at Floating in 2018. Florian is a founding member of the Floating e.V. Association and continues to be active in the project.

I am one of the initiators of Floating University, together with Benni Foerster-Baldenius.

There is this super crazy place where the water comes down from the mountain and makes deep crevices in the rocks. It is one of the most impressive, most violent places I know. This is in Lauterbrunnental in Switzerland, next to three famous mountains: Eiger, Mönch, and Jungfrau. It's called Trümmelbach Falls. When glaciers on these mountains melt in the summer, the water drains into this waterfall, which is actually a series of ten waterfalls. This is the place in Europe where the lowest point is something like 600 meters, and the highest point is 4,100 meters in elevation. The shift between the low and the high point is really super close. It's almost vertical. There is a cascade of waterfalls inside the mountain more or less. You can go up with a funicular. It is something between a cable railway and an elevator going in more of a diagonal direction. From where the funicular lets you off, you can go up some steps in between some cliffs and then walk down along the waterfalls. It's really, really, crazy noisy. You are more or less in a cave, so the sound of the water is ricocheting everywhere. You walk through tunnels and then there are gaps in the rocks where you can look out. All the water is arriving there. To see the power of this water, it's so crazy...and this form...what it generates inside the rocks. Usually water is seen as super peaceful, and people enjoy it, and have almost this yoga feeling, but if you are there, at Trümmelbach Falls, it's like hell. It's also super beautiful, but insanely intense. I went there when I was a child, and then ten years ago, and then four years ago was the most recent time. It makes you feel so small.

There are techniques to cut glass with water. I have seen this, but actually, you don't get it. You don't feel it. It's a machine with lines, drops, and some water, but you actually don't get what happens there. It's also incredibly strong, and you can cut everything with it, but you don't get it somehow—how powerful it is. The power is invisible. You don't even really see the water. But at Trümmelbach Falls, you can really feel the power of the water.

When you arrive, there is quite a nice restaurant in a hundred-year-old house with a lot of trees surrounding it. It's a very peaceful place. Then there is this river, with this incredibly cold, blue water, and it's super fast, but it's such a beautiful big picture. Of course, you don't want to swim in there. The water comes straight from the glacier, so it is probably four degrees or something, and it has this special color. Then you go in the lift up into this other world, this awesome hellscape, and you can't believe you're in the same place.

You get there, and you see this little lovely river, and then you go up there, and you end up in hell. To make this picture in the beginning that's beautiful, totally idyllic, and then to make this contrast. That was a design decision for sure. They were thinking about this. They could have made an entrance that looked like the entrance to hell, but no, they made it look like the entrance to a really lovely place. And that contrast really highlights the incredible difference between how we tend to think about water—peaceful, beautiful, soothing, life-giving—and what water can actually do—violently obliterate anything in its path.

Lorenz Kuschnig Lefort was the assistant designer of the architecture at Floating in 2018. Lorenz was instrumental in designing and constructing the overall structure of the spiral of bathtubs as well as their drainage system and in helping maintain the water system and the site in 2018. Lorenz is a founding member of the Floating e.V. Association and continues to be active in the project. He is an architect.

My role at Floating University was to work with Florian Stirnemann to develop the space here—to make the plans, apply for a building permit, figure out how to build it, organize the building site, and then build it. And then I became something more like a *Hausmeister* (custodian/site care supervisor), which means if people had trouble with the space, then it was my role to solve the problem and make people happy. Everything is more or less working the way we want it to work, at least in some way. In the beginning, I was also working with the students and helping them build what they wanted to build.

When I think about water, I always think about going paddling when I was a child with my parents. This was the thing we did. We did not ski like most Germans, but we did a lot of paddling on rivers during the holidays. We would paddle a boat and wild camp on rivers in Europe.

I remember sleeping in the boat, and you would feel this movement. You're really in the boat. You can't see out. And you just feel the water moving the boat. And you're definitely not on stable ground, but you feel really safe because you're totally enclosed.

But maybe the best part for me was the sound. The sound of the paddle going in the water, and the sound of the water. The sounds are so rich, but also so subtle, almost silent. No one is talking. It's just the sound of paddling, the paddle going in and out of the water, the little splashes and sighs. It really made me relax. It's been years, but now when I lie down and think back to those moments, it makes me really calm.

And, actually, it was water that brought me to Floating because the first time I met Benni and Christoph from raumlabor was in a pool. We built a pool, a hot tub, actually, in a small city in Germany. A hot tub that held 30 people. It was in a public space. People would wander by and were like, "Whoa, what is this? Why is the hot tub here?" It was in the middle of winter. Normally there is nothing going on in the winter in that small town.

In 2018, Sarah Bovelett worked at Floating University as an intern with raumlabor. Sarah remains active in Floating University to this day. She is no longer an intern, but a member of the board of Floating e.V. Association. She is also a founding member of the Floating e.V. Association.

I was an intern at raumlabor. But from the beginning, I was designated as the Floating University intern, and I actually did not spend any time at the raumlabor office, only when we built the bubble, the inflatable roof for the auditorium, for Floating University.

My title is the Queen of Hearts, and I think also the Girl for Everything could be my title because I feel like I don't really have a set task. I don't really think I have a specific function, but I've helped everybody else with their functions at some point or the other. So it was a very diverse kind of work that I did, ranging from driving around Berlin to organizing some parts of the program and working onsite matriculating people and explaining things to people—like how to empty the trash to joining workshops, a lot of different things.

Being in water is my biggest connection to water. Since I was little, swimming has been my favorite hobby. I started swimming when I was three. My siblings and I were always on the swim team. So for me my relationship with water first of all comes from sports. I've always enjoyed doing this sport and it's of course necessary to have water for that. I think because of that and because I learned how to swim really early, I've always enjoyed being in nature in water. So I've always enjoyed being at the beach and swimming all the time, no matter how cold it is. Also, anytime I see a lake or something, I always go in. Licia, the production manager at Floating, calls me “Fishly,” little fish, because I go swimming almost every day.

I think regarding polluted water, for me, it would be one of the worst things if I would be on a lake and could not swim.

Actually I was thinking about this question yesterday: would I prefer to swim in a 50-meter lap pool in my backyard or in a lake? That's a tough question—would I want a natural body of water or a fake swimming pool?—because I really love both of them a lot. I like the smell of chlorine. It's really connected to my childhood and days and weeks spent in the pool. I connect happy memories to being in pools, in bathing suits smelling like chlorine, but also to swimming in freshwater, like Lake Michigan, when I lived in the US, for example. But for me those are really two very different kinds of waters and kinds of feelings of being in water.

One memorable experience I had in a swimming pool was when this guy was diving underneath me and pushed himself up and knocked into my teeth with the back of his head. The water filled with blood, and I was crying because it hurt so much, and I was afraid of losing my teeth. That was the only time I can remember not being able to get myself out of the water; somebody else had to get me out of the water because I couldn't get to the edge of the pool; I was just screaming. The water was around my face and I thought it wasn't water but blood. That's the only memory I have of being scared in water. Afterwards I had to go to the dentist because my teeth were shifted.

The first time I saw Lake Michigan, I had been expecting a European-sized lake, where you could see the other side and the edges of the whole thing, the trees on the shore. And Lake Michigan had no end. On this first trip, we were on this really secluded rocky beach on the east coast of Lake Michigan. The water that day was a bit milky. Not milky, but how do you say it...cloudy. You could see through it, but it had this grayish color, and you could see the sand underneath. The rocks on the

beach turned into sand at some point, and you could swim underneath the cloudy layer and see everything. You could open your eyes and you could see that there was nothing. There was the sand and the water. There were no rocks or animals. I don't remember fish or anything. It was just so clear. And it was you, the water, and the ground.

And I felt so free. I felt this so strongly. I think it has something to do with the size of the lake and the non-saltiness of it. And also the cold temperature. You feel so alive. For me, being in a pool has a little bit of this freedom, but it doesn't have this huge openness and sense of infinity that I have in lakes or in the sea.

Since I have been a part of Floating, I've noticed some changes in my outlook on water. I am much more conscious about flushing and washing my hands, about the amount of water that I use. And I also really like that here we are flushing toilets not with drinking water, but with greywater and rainwater. Why, everywhere with so-called modern plumbing, are we flushing toilets with drinking water? In our homes, work places, even swimming pools? Why is this considered a good practice?

I think I don't know yet how I could apply these practices in my daily life, but I definitely would like to.

I've also become really aware of a lot of problems like overfishing, emptying the seas. It's of course connected. I realized that I feel a bit helpless because I don't know how to help, what to change in my life—if not eating fish would help, or if I have to fish my own fish in my own lake—I don't know. I am thinking about a lot of things because of my experience here at Floating University.

Benoît Verjat is a research designer. Together with Alexis de Raphelis, he co-founded the experimental filmmaking collective *excellando*. They were invited to Floating to create hybrid visual narration on site.

We were invited to Floating University to imagine ways to observe what is going on in the project and site. The question to us was how we would represent Floating in an image or film. We were interested in more than engineering a narrative about the project. In our work films are not the climax. We are interested in the situations movie making creates. Cinema is to us a performing art. We wanted to show how Floating is an ecology that creates an equitable space for all forms of practices and lives present there. We collectively created visual representations to participate in the experience rather than document it. Screening, editing, filming was an ongoing experiment and could be done in any order. In this perspective, images can then be very active and transformative. There's no constraint in the way the story is understood. It's open. A story can move and have its own way of moving and people can have their own ways of understanding it.

It's hard for me to respond with a whole theory about my relationship with water because to be honest, I don't think about water in a theoretical way. So I'll share a few anecdotes.

When I was a kid, around 11 years old, I would play in the sandbox with my cousin and make volcano simulations. We would pile up a mountain of sand in the middle of the sandbox and then put a garden hose inside the mountain, and turn on the water. As the water flowed, the sand mountain would grow like a volcano. The water was wetting the sand, but also displacing it, pushing it up. Then, the challenge was for each of us to build a wall on one side of the volcano to protect our city from the lava. Actually, the water was the lava, a very fast lava because water is much faster than lava. For me, there was always this

fear, because it was super-stressful to try to keep your wall from being eroded by the water. We played this game a lot, and eventually the water would fill up the whole sandbox.

Back then, we had no idea that the water came from the city or that it was problematic to use so much water. Nobody told us this. Now my nephew wants to play the volcano game with water, and we say, "No, don't do it. It's too wasteful." Also, I remember that my cousin, who was older, was in charge of the hose. Years later, I realized that he was not aiming the hose straight up, but in the direction of my wall. As a result, the erosion was always stronger on my side, and the volcano would always collapse on my side. When I understood what he was doing, I was really pissed off because my cousin was always saying, "Yeah, my wall is the strongest, and I really managed to protect my village, and blah, blah, blah."

But I really liked this tension between you and the water. You want to have the smartest idea about how to build the wall, so you really think about the shape, how high it should be, how strong, the trajectories the water might flow, and so on. But against any design you try, water always wins. It's always destroying. You can never truly overcome water.

My second story about water is even more the story of a failure. I am around 14 years old. I was camping, and I wanted to make a dishwasher, you know, a Spülküche, because I was a bit lazy doing the dishes.

So I took a plastic bag and punched some small holes at the bottom of the plastic bag, and I put all the metal camping dishes and utensils inside and put the

bag in the river. I could feel the flow of the water and the plates rolling with the flow, and I thought, it's working well. In my mind I was like, okay, the water is infinite; I can leave it for the afternoon. My friends were mocking me a bit, and then they were like, "Oh yeah, maybe it works." So we left the dishes in the river, and we went and did something else. And then the plastic bag breaks, because of the water flow, and also because there were forks and knives inside. When the bag broke, the dishes and utensils were scattered into this small river and carried along for maybe 500 meters. They ended up everywhere. My friends were so upset with me because we had to scramble around collecting our dishes. It was really a big failure. I think the design was good. I just needed a good net or something. Maybe a potato bag. But then my friends did not want to try it again. I had no second chance. It was over.

When I was traveling in India, I experienced some different practices with water than I experienced growing up in France. The rivers in India are quite polluted. They are used for many practices. So you have people washing their clothes, you have people washing themselves, and you also have people putting dead bodies inside the water, in the same place, doing a ritual. The whole body, or sometimes the ashes. Witnessing this was a powerful experience.

Also in India I remember—wow, it was a shock—we were in Bangalore, in the southeast of India. They were having such a severe dry season that there was no fresh water at all. The whole water system in the city was full of sea water. You turned on the tap, and salt water came out. We were relying only on plastic bottles for drinking.

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Really, it was crazy. I remember I was quite young at the time, only 18. It was really a shock because growing up in France I had never experienced anything like that. Even taking a shower wasn't peaceful. You had salt on your body all the time, and the water smelled. The people who lived there told me that the city didn't inform anyone about it. They were living in this situation without information, without a choice.

Since I started spending time at Floating, I began to try out different practices with water. When I am coming to Floating, I sometimes stop along the way on a bridge over one of the canals or the river. Four or five times, I spent an hour on the bridge, just standing in front of the water, watching it flow. Seeing this moment as an observation, without any intention. I put my focus on the water. I began to feel the water in here, inside of me. I had the phantom feeling of the water in my body. Of course, it is imagination, but the relationship between what I was trying to focus on, the water, and what I was feeling was really strong. There was no distinction between what I thought and the water feeling.

Alexis de Raphelis is an artist and member of the experimental filmmaking collective excellando. Alexis and his collaborator, Benoît Verjat, were invited to Floating to document what was happening in the project, using new modes of narration and hybrid visualization.

My family has a house by the sea in the south of France. As a child, I spent every summer and spring holiday there, with aunts, uncles, cousins—the whole family. I've always had trouble sleeping, so I would wake up very early in the morning and go to the sea. I would swim out as far as I could, to a line of yellow buoys marking where the boats could pass, about 300 meters from the shore. Then I would hold my breath and dive until I could touch the sand below, about 5 to 10 meters down. The buoys were connected with a chain to a tire on the ocean floor. I would grab the chain and use it to pull myself down so I could descend faster. When I reached the sand, I would hold on to the chain so I could stay at the bottom for a minute or two, then I would let go of the chain and float back up to the surface.

There was a caretaker who lived at the house year-round, and he was like family to me, like another uncle. Kino wasn't a sailor, but he was a sea person, and he would take me diving to find urchins, fish, and octopus.

Once, when I was 12, he took me diving with scuba masks. He was around 50. I think because I was younger I could dive deeper than him, but this time he wanted to stay with me—maybe to prove to me, and to himself, that he could still keep up, or maybe to show me that he was there for me, that he could protect me, like a father.

So we were diving down, and every five meters we would pause and pinch our noses, you know, to equalize the pressure. But Kino descended a bit too quickly, and suddenly there was blood all over the inside of his mask. I could see that he was panicking, so I grabbed him, and we swam back up to the surface. He took his mask off, and there was blood everywhere—around his eyes, in

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his eyebrows. It was very strange for me because it was terrible to see this person I loved in so much pain, looking like his face had exploded, but it was also an incredible, almost perfect moment in my young life. This place, and the sea surrounding us, was the best place to be at this moment in my life. It's hard to explain. In that moment, I understood the idea of pressure. I understood the immense power of the sea, of water. And I felt, maybe for the first time, the edges and limits of my human powers. I got my first glimpse of mortality in the sea. It was frightening but also beautiful, awe-inspiring. I was young and strong, but the water was so much stronger.

A lot of people say, "Oh, being in water is really natural because you first exist in water. You want to re-find this feeling." But for me it is not this. In water, I began to find limits with my body. That's my feeling of water—it's how the water can show me my limit. You can really play with your life in the water. If you go too deep, and you have a problem, it's just finished. One time, it's over.

It's difficult to answer the question about my relationship with Floating because I have an idea, but a kind of paralyzed idea. I used to say that at Floating we are stuck in the room of raumlabor, like Peter Pan syndrome.

I think I will imitate Shakespeare, try to lie with truth, tell the story more than the reality. For me, Floating could be a really great circus, but in the end, it's not a good circus. It's a spectacle society. I am not interested in my relationship with Floating University. For me it's about the relationships with people here.

I'm really happy that you, Katherine, and people like you are in this place because without you, what is this place? It is just a bar. It's just a bar with people dancing. That's why I really want to, for example, grow the tomato seeds from Floating's greenhouse in Cosne, the town where I live in France, and save the seeds. And maybe when you come back to Cosne in twenty years, there will be tomatoes from Floating's greenhouse in the garden. And there will be a good system of water, a good community for a long time, a good kanteen, good ceramics, a good life.

It's always the same. When you arrive at a place like Floating...you arrive and then you leave. And so are you richer? With what? From who? For what? I don't know.

José Ordóñez is an environmental engineer and the head of Research and Development at MARTIN Systems GmbH, a Berlin-based environmental technology company for water and wastewater treatment.

I work for MARTIN, a membrane supplier in Germany. We worked together at Floating University to develop a household filter and a rainwater system to treat water and make it drinkable.

Everyone has always been in a relationship with water. In my case, I come from a country that has a lot of water. In the past, it was the country with the second or third-largest supply of freshwater. Now it's far lower in this list. I've been in a relationship with water since I was a child. Where I used to live in Cali, Colombia, there were seven rivers. One of them, the Pance River, is very well known, even now. On Sundays, my father used to work from 6:00 a.m. to 2:00 p.m. Sometimes, they changed his hours. When he didn't have to work, he came home, and we went to the Pance River.

Cali is 1000 meters above the sea. When we went to the river to swim or hang out in the mountains, we would be 1200 to 1500 meters above sea level. The river comes from a nature reserve in the mountains. It's very beautiful. The water is crystalline, like in the Alps. It is so clear you can see the stones covering the bottom of the river. The stones were green, gray, white, some brown. Very beautiful. In some parts, there are small pools where you can swim, sheltered from the current, so the current does not take you away. The current is quite fast, maybe 20 km per hour. The land around the river is covered in vegetation; there are big trees, hiking trails, and lots of animals, including bears. The river is 50 to 80 cm deep in the rainy season, which is perfect for children to play in. In the dry season, it's maybe 30 or 40 cm deep. We used to go and swim in the river and make dinner there as well. Some families go and cook a big pot of soup over a wood

fire. They bring the ingredients for the soup—the chicken and potatoes, onion, and so on—and use water from the river.

The river has suffered because of deforestation. There are sometimes floods during rainy seasons, and during the dry season, there is so little water that people can't swim. It's a dead river in the dry season. The city of Cali discharges much of its sewage into another one of the seven rivers, which is also the river that supplies all of the city's drinking water. This river is dying, but few people care.

In Germany, people use approximately 120 to 150 liters of water per day, but in Colombia people use as much as 300 to 500 liters per day. Many people use drinking water to water their gardens. They might wash their cars once or twice a week. When you clean the house, you don't use a mop, you use a hose with water. The houses are designed so you can put water on the floor and wash everything out of the house. Water is used like a broom. In Germany there are strict regulations about treating wastewater. In countries like Colombia, restrictions are still very weak.

And yet, I remember that when my mother was washing clothes, she would recycle the water from the washing machine. We used to help her collect the water from the rinse cycle in big buckets, and we would use this water to clean the house. We would use this water for the first step in the cleaning, and then we would use drinking water to finish the cleaning.

I work with MARTIN, a membrane producer in Germany with ultrafiltration models. The company's biggest business is wastewater treatment with membrane

bioreactor technology (MBR). This is used for cruise ships. In Germany, it is compulsory that every tourist ship that goes to the Rhine or Elbe, all these big rivers, has a wastewater treatment plant inside. The company also makes membrane modules for MBR in wastewater treatment of industry and municipalities.

A small part of our business is developing drinking water treatment with similar membrane modules. Here in the company, I am the expert on drinking water. I give technical support to improve these drinking water systems so that using membrane modules is as easy as possible.

One of the modules is the Mini-Cube. It's accessible to individuals, as opposed to the giant MBR systems for companies and municipalities. Most of the Mini-Cube membranes go to developing countries. We work with NGOs and Universities doing social or research projects in the global south, like Nepal, Bangladesh, India, and Haiti, for example. Some of the membranes are for research and development projects, and some of them are for natural disasters and catastrophes. Our membrane modules can be used to easily create simple, effective drinking water systems.

Erwin Nolde is an engineer and founder and director of Berlin-based Nolde and Partners: Innovative Water Concepts GmbH, which invents, builds, and maintains wastewater recycling plants. Erwin Nolde and Holger Sack designed the moving bed reactor at Floating University.

I am an environmental engineer. I was happy to get to work with all the different people who are involved in Floating University—students, artists, engineers, and others. In society and policy, we are now more focused on energy, but water is as important as energy. We like to work in the water sector to close energy and water cycles in an efficient and environmentally friendly way. Our goal at Floating was to create a technology that could be used by anybody. The next step in the future of this technology is to make an open source handbook so everybody can do it.

Our society is developing more and more technology to deal with water, which enables us to remove a lot of things from the water. But at the same time, we are producing more and more new stuff—chemicals, industrial byproducts, agricultural runoff—that goes into the water, all of which is totally new for the environment. We don't know what risks these new substances pose for our bodies of water and our water supply. We are producing a lot of waste that remains in our “cleaned” wastewater. For example, if we look back, let's say a hundred years ago, we had a lot of different fish in Berlin, and everybody was eating fish from Berlin. We still have the same amount of water in the city, but it's more and more polluted. And every summer a lot of fish die in the river after heavy rainfalls. This happens year after year. And there's no reason to do this now, with the technology and means we have as a society and civilization.

Our main goal is to avoid wastewater, then reduce wastewater, then recycle wastewater to return it to nature. For example, the Spülküche at Floating University was made very well because it does not produce much wastewater. It produces as little as possible.

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I like fish. But, fish from Berlin? No one ever eats fish from Berlin in a restaurant. Fish caught in Berlin are not in the market, because the quality wouldn't be good enough and nobody would ask for it.

I remember when I was young, maybe five or seven years old, I was sitting on the banks of a small river. It's maybe one meter across. It was fascinating that the water flow never stopped. It's coming, it's coming, and I asked myself, where does it come from? I wanted to try to find the well. It was fascinating to hear the noise, to see how the water ran, the forms it made, and so on. This still fascinates me, even now. A few years ago, I was in Jordan and I could sit for hours in a hot spring where the water comes out of the earth.

But now, primarily, my relationship to water is understanding that water, especially wastewater, is a resource. This is what we do in our office, Nolde und Partner: Innovative Water Concepts. From our point of view, wastewater is a resource for recycling, for renewing freshwater. It's a resource for energy and it is a resource for nutrients. If you look into the details of wastewater management and recycling, you will find many problems, and we find solutions for those problems, and this invention of solutions will never end. We are optimizing step by step, and we will never stop. At the moment I can say that our treatment plants work very well. One treatment plant that is quite successful is a moving bed reactor at Block 6 in Mitte, Berlin. We have been cleaning the water for 200 apartments for more than 15 years, at a higher quality and lower cost than the Berlin water utility.

When we design and build water treatment plants, the first goal is that our solutions should never pose a hygienic risk for the people who use them. The

other thing is that people don't want to have a loss of comfort. Now people are using drinking water for toilet flushing. I think this is a pity. We could use compost toilets. But at the moment, this technology is not available for multistory buildings in an acceptable way. The Berlin water utility offers water 24 hours a day, 365 days a year, and usually their system works. We have to be as reliable as their system. We also have to show that we are better for the environment. That means to use fewer chemicals for the process, or, better yet, none, to use less energy than the Berlin water utility's systems, to have lower emissions. When we start creating a new system, a critical point is often that people want to lower costs. When we are offering systems, sometimes people ask us, "what is the payback time?" They want to have payback times of three years. I think this is not the way nature deals with things. We need a little more time, maybe seven or ten years. Looking at the cost, it is not expensive. A water treatment plant where several people are connected is cheaper than an iPhone. An iPhone maybe has a lifetime of two or three years in practice. A water recycling plant often has a lifetime of 20 or 30 years.

I like natural systems. For example, reedbeds. But, we have had some, I wouldn't say bad experiences, but we have had different experiences with reeds when we wanted to work with them for recycling water because reeds evapotranspire a lot of water.

If we are going to work with reed beds to recycle wastewater, then we will see that maybe in summer we have no output because all the water is transpired. For nature it is not bad if we have more evapotranspiration, but if we want to recycle the water to reuse it and nothing comes out, this doesn't work.

We are mainly interested in biological water treatment systems that, for example, work with bacteria or plants to recycle water. In the beginning there is a sieve to remove some particles and avoid damaging the plant. Then we work with multi-step biological treatment plans, like moving bed reactors. That means in every step we have different bacteria that are optimized to eat something different. One eats fat, the other eats sugar, the other eats detergent, and at the last step they're eating what is left.

On the technical side, the critical point is that all these things should need as little maintenance as possible, and as little running costs as possible. This is the point we are working on now, along with improving the technology. We are on the point where water recycling is cheaper than freshwater. We are at the point where there is no hygienic risk, and the water quality is better than the water that emerges from traditional treatment plants run by water utilities. People are comfortable, and there are no problems with smell, turbidity, and so on. The test results from Floating University show that the moving bed reactor we built there works.

Maybe for the future, engineers should work together with artists to make these things nicer. The treatment plants we make are usually hidden in the cellar or underground. But if we can make treatment plants that look nice, for example, it could be in the entrance of a house, and everyone is proud to have one.

I remember when our kids were young I installed a wastewater recycling plant or a greywater recycling plant in our bathroom. It was also a moving bed reactor, but it was totally transparent. Everybody could see the foam cubes floating and moving around. Then I added some

plastic fish. And it was so nice for the children. Every visitor who came to our house had to see the treatment plant. The kids took them in by the hand, to show them the treatment plant with the fish, which are always moving. Nobody was talking about wastewater. They were talking about the nice treatment plant.

We have experimented with a variety of water treatment plants, including natural and artificial systems. In the past we tried working with membranes. But after some months of experience, we had a lot of problems with clogging in the membranes and the energy demand was too high. So we stopped this working with membranes. To clean the membranes you need a lot of chemicals. I was not happy about how much chemicals we needed, even in the beginning before we can start the treatment process itself. It was liters of chlorine. But now we are working together with some students, helping them in their master's thesis, and I decided to give membranes a second chance. We are open to every technology. Our new experiment with membranes has been working for nine months, but nine months of experience is not enough. We have to see that it'll run with less maintenance in three or five years. Then we will decide if we will continue with membranes or not.

Holger Sack is a process engineer (Verfahrenstechniker) and works with Erwin Nolde at Nolde and Partners, Innovative Water Concepts GmbH. Holger and Erwin designed the moving bed reactor at Floating University and built it during a series of public workshops.

I helped build the water recycling system at Floating University.

I have always been fascinated with water. I always loved water. How it flows, how it feels, and how it looks. The first time I really recognized this was seeing my uncle's aquarium. I had never seen an aquarium before. My parents say I sat there the whole day. They placed me in front of the aquarium when we arrived and took me away when we left. This was the starting point of my connection with water.

The aquarium was giant, or at least that is how I remember it, but now I bet it wasn't. Inside the aquarium, there was a small plastic sailing ship where one of the fish was hiding all the time. I tried to see him when he came out a little bit. There were plants and fish like guppies, which are quite small and have very colorful, big tails—red, orange, blue. I don't know how old I was, but I wasn't at school yet, so under six.

From that moment, I wanted an aquarium, but my parents always said I wasn't old enough. When I turned 14, I was allowed to use my own money to buy my first aquarium. And I had to maintain it, so I had to figure out what I was doing. What I learned quite early is that it's not good to make things too clean.

Inside the filter there are bacteria that clean the water, quite like in the water filtration system at Floating University. If you remove all the bacteria, you run into problems. Problems with algae, and in the worst case, dead fish. You need the bacteria that grows in the aquarium. It's a biofilter exactly like Floating's water filtration system. The bacteria translates poisonous organic and inorganic matter into less poisonous stuff. The fish produce ammonia, which

can become ammonium, which is very poisonous. The bacteria metabolize the ammonia into nitrite and nitrate. Nitrate is the least poisonous. The bacteria deals with the more poisonous stuff quite fast and produces this less poisonous stuff, which we can't remove by bacteria. This is why we have to exchange the water from time to time. This is why you exchange the water regularly even when it looks clean. This is where my passion for water and keeping it healthy started, and I still feel this passion today.

Marjetica Potrč is an artist and architect from Ljubljana, Slovenia. She was a professor of social practice at the University of Fine Arts/HFBK in Hamburg, where she taught Design for the Living World, a cross-disciplinary class on participatory practices, which she brought to Floating University.

During springtime and summer 2018, I was working together with my students at Floating University Berlin. When we were invited, my students in the Design for the Living World course at HFBK University of Arts in Hamburg decided to engage in a long term project with Floating University Berlin. We came to Floating University for one week in April and two weeks in June, and I knew that my students were planning to return.

There was a lot of exchange between us and other students at Floating University. Design for the Living World students engaged with the site in a variety of ways. The Greenhouse group constructed fifty boxes for tomato plants and installed them on the scaffolding structure, which was the main entrance to the site. They planted thirty-five varieties of tomatoes and designed and installed the irrigation system. Some students took responsibility for the dish washing station, which they redesigned so it was not only performative but also practical. Others were involved with growing mushrooms, which, in addition to being edible, also filter water. They planted them in bathtubs installed in the water tower. One group of students expanded on the concept of the third landscape, i.e. they supported and added to the biodiversity on the site and speculated on how and when nature would take over the human-made structures. Throughout their stay at Floating University we organized agora discussions in which the subject matter was provided by the participants and culminated with the *Thyme* newspaper. One of the brainstorming highlights was no doubt the Lexicon session with Gilly Karjevsky. Other experiments included the Soundflag and the much-loved Deep Listening experience.

I love to work on water projects. My first really important water project happened in 2003 in Caracas, Venezuela, where I, together with architect Liyat Esakov, worked with the local community in La Vega barrio, an informal part of the city without access to the municipal water grid. With the help of local construction workers, we constructed a dry toilet that doesn't need water to operate in the area of the informal city which had no access to running water. I'm telling you this because everyone is always asking me about the dry toilet—they think about an object, but we always said, “No, no, you are wrong. It's not about the dry toilet as an object. This is about lack of water.” It was very important to me that we reframed the question. Along the way we learned that it's much more difficult to change our behavior than to construct an object, such as a dry toilet, do you understand? Because in the dry toilet you use the toilet in a different way. So the real challenge was not to build a toilet, but to change behavior.

I'm also grateful for two public art projects focused on water filtration that I worked on with Ooze, my friends who are architects based in Rotterdam. One is *Between the Waters: The Emscher Community Garden*, which was an Emscherkunst project in 2010. The other one was *Of Soil and Water: King's Cross Pond Club* in London in 2015–2016. An important value of those projects was community involvement in the creation of a closer, more egalitarian relationship with water. People became part of the water cycle. That's super important.

In *Between the Waters*, we constructed an infrastructure line between two rivers, the Emscher River—which was at that time the most polluted river in Germany—and the Rhine-Herne Canal.

The polluted water from Emscher river was pumped up to an infrastructure line where two toilets and a rainwater-harvesting rooftop joined in; the combined water was filtered through a constructed wetland. At the beginning of the infrastructure line, above the Emscher River, were the toilets. On the other end of the line, above the Rhine-Herne Canal, were drinking water fountains. So visitors used the toilets on one end, and drank the filtered water on the other end of the infrastructure line. This experience changed everything. Which means in short that it's not enough to just talk. If you just talk, you change very little. But if you change the way you do things, this is a big change in your life. When you become part of the water cycle you understand your relationship with water is existential.

Of Soil and Water: Kings Cross Pond Club, offered a similar experience. It was a micro-ecological environment with a natural swimming pond at its center. The project was located on the construction site of King's Cross Central development project in London for two years and became popular with the wild swimming community who swam there year-round. The pond was cleaned with halophyte filter plants. We had an equation of 163 people per day that could swim in the pond. The plants would balance that amount of people.

The project showed the power of nature to regenerate itself while offering an urgent future imagination of the interdependence between people and nature. After two years it became clear that the project would close. A strong community was formed to protect it. They created the Save KX Pond Campaign to keep the pond open. The project challenged the idea that the value of a piece of land is equal to its real estate value. By the end of the project, the value of

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soil and water was exactly what was advocated for by the community who had formed around the swimming pond.

I like water in my life. I like to walk by the sea. I like to listen to the sound of water. Growing up, every summer I spent one month by the sea, in a small town in the Istrian Peninsula of Slovenia. There is sometimes a strong wind, called bora, which is also an important element for me, this water and wind. The wind from the mountains comes down to the sea. It can be dangerous for sailors.

We try to structure our lives and make sense of everything. But we are also nature. Around 60 percent of our bodies are water. So I think we have this kind of important subconscious relationship with water.

I was with a friend on a sailing boat, and we were pumping water from the water tanks on the boat to clean the dishes. Then we suddenly realized we used an enormous amount of water from the tanks. I usually just learn about water use by reading about it or someone talks about it, giving some sort of figure, which feels abstract. But when I was in a position to actually realize how much water we used, it was really sort of shocking. And then I understood also when people tell you the dishwashing machine uses very little water. But of course my question is, can we, without the machines, use less water? Because pre-modern generations, they knew, they respected their relationship with water and the use of water. People who live in dry places, they understand their relationship with water. I think it's very important that in our very consumerist society, we should learn how to degrow our overconsumption of water.

We live in the age of the Anthropocene. Now you understand that you are part of nature because you influence the natural processes on the planet. Your relationship with nature changes. You become a caretaker of a river, not an owner of a river. I believe that we need to transition from a society of owners to a society of caretakers.

The rainwater filtration project at Floating University where we collaborated with you, Katherine, is an example of this kind of new relationship with nature that we're creating in the Anthropocene.

What was very striking when we came to the basin was to see the amount of reed plants. We heard they started to grow there only a few years ago, somewhere between 2012 and 2015, and now maybe they occupy one third of the pond. When my students and I started to design a filtration system with carbon, we noticed how the reed plants growing in the basin were cleaning the highly polluted water by themselves. We found in the middle of the reeds a “natural” pool that was clean. So this gives you the example of how a wetland cleans the water. Reeds have been doing it since the beginning of our time, and when we are not here anymore, they will be successful cleaning water without us.

Markus Bader is an architect and partner in raumlabor architecture collective. He was a Floating Professor at Floating University. He is a founding member of the Floating e.V. Association. Markus continues to be active in the project.

Markus and Anna Kokalanova situated their course Designing around the Kitchen Table at Floating University. The course was for architecture students at UdK University of the Arts Berlin, as part of the UdK Space Production Studio. The students designed and built the kitchen's interior architecture, and continually reshaped it by testing and improving it. The 1:1 design process became a constant experiment and hands-on laboratory. The kitchen became not only a place of cooking but also a space to reflect on water use while building kitchen wastewater infrastructures, a space to question the system behind the production of food, a space to produce and share knowledge in public. Every Wednesday the kitchen hosted a discursive dinner, a thematic meal where each course was accompanied by a guest lecture. The kitchen became a place for designing a better city from the kitchen table.

I was a teacher at Floating University. I taught the course Designing around the Kitchen Table. It was a course for architecture students from UdK, the University of the Arts. That's a technical description. I was also a colleague, as a raumlaborian. I am somebody who enjoyed having this amazing place in the city to combine opportunities. I thought that was something that, from a raumlabor perspective, was very rare, that you can combine your possibilities in an easy way. I thought the openness was extremely nice. But most of all, I think Floating was a super friendly place. It's a collaborative environment. It's a place of chance or accidental meeting; not everything is coordinated, orchestrated, organized, but things happen.

What is my relationship with water? That's a very simple question. I'm actually sitting next to a water bottle. It's the water bottle I carry to the office every day because the studio building is a building where water is, let's say, not an easy resource. It's not like everywhere else we tend to be in Berlin, where you just open the tap and you have a fantastic quality of water. It is an early-20th century building, and the pipes are not that good. So the water quality is not that good. The summer always makes me aware that we take many of our common infrastructures, which water is a part of, for granted.

There is a project I made called *Fountain House*, which addresses an illusion made by taps and plumbed infrastructure. They make the water we access through them appear nature-like. In German we say natürlich. But it's not natural. We take it for granted as though it is natural to open the tap and have an enormous amount of kilometers of pipes bringing the water to this moment and

then you close the tap and have another kilometers of pipes carrying it away. It's probably one of the most important invisible infrastructures that support us because without water, there is no life. It's as simple as that.

In my everyday life I have several practices with water. The first contact is pouring water into the coffee maker. Then pouring boiling water over ginger. Then brushing teeth and going in the shower. This is a pretty regular daily routine. This morning I was also swimming in a surprisingly warm public pool in Spreewaldbad. I'm always surprised that you cannot see very well underwater. We think water is something clear. You don't have a good sight underwater. You are still in the mist. Those are elements of my everyday practices with water. When I travel, I like to go to public pools.

In Montreal, where *Fountain House* happened, I discovered that their public pools are free to enter. In most major cities in Europe you have to pay to swim in public pools. The first time I went to a public pool in Montreal, there was a nice little booth at the entrance and a person inside. I was ready to pay. The person inside wasn't expecting this. It took us a moment to figure out what the misunderstanding was, and eventually I found out that he was there to lend me a lock for the lockers. How friendly and hospitable, in this way infrastructure is really welcoming. In Montreal water in homes is also free. There is no metering. I thought this was super interesting, to experience infrastructures that are so generously and openly available. It made me realize that I'm so used to payment as a boundary restricting access to water. I think Montreal's attitude towards water is amazing. I was told there was a debate in Montreal

about whether they should meter as everybody else does, and the majority was apparently against metering.

The idea of accessibility, or let's say appreciating infrastructures as a common good and not seeing it as a commodity, as something that you need to stretch to have access to or that you can be held away from, that's a key experience for me, and it came to me through water.

Anna Kokalanova is an architect and was a Floating professor at Floating University. She is a founding member of the Floating e.V. Association. Her practice extends beyond the field of traditional architecture and includes urban design, spatial practice mentoring, and fluentbody facilitation.

Anna Kokalanova and Markus Bader situated their course Designing around the Kitchen Table at Floating University. See Markus's oral history for more on their course.

I was a teacher at Floating University. I was part of a group from UdK University of Arts Berlin. We came in the middle of April, and we joined the construction for a couple of weeks. Then, after Floating University opened, we continued being part of Floating University on a regular basis. When I speak to someone who doesn't have anything to do with Floating University I always say I am an associate. Not a team member, exactly. An associate.

The course Markus and I led at Floating University was with around 15 students. The course questioned how people may live in the future—starting from the kitchen. We actually held our class meetings in the kitchen at Floating University. It was more than architectural design class, we also constructed the interior of the kitchen, held public events, and researched theories and practices related to kitchens, cooking, and communality.

I was born in Sofia, Bulgaria. We lived in an old house in the city center. We didn't have warm running water inside, so when we were small, we would wash ourselves in buckets every day in the evening.

Once I even peed in the bucket. I didn't tell my mom. She was like a superhero with the dirty water. She wanted to reuse the bathing water for washing something else, like clothes. So this was the daily ritual. In the evening, my sister and I would be in the kitchen, the warmest room, naked in the buckets. My mom would heat the water on the stove. It was a coal stove, not wood. The stove was for heating the room, for cooking food, and for heating water. It was always on in the winter and it always had hot water on it.

The buckets were small, so you could just sit with your ass or put one part of your body in the water at a time. Water would go everywhere, all over the kitchen. But this was nice. This was a really nice thing that I remember from my childhood.

Once a week we would go to a public bath. I kind of didn't like the public bath as a child. We had to sort of fight to play. But looking back, it was a hamam, a very normal hamam. You would pay fifty euros for that now. But when I was a kid, it was very normal to go there. This was in the 1990s.

There were times when there was not enough water, or no water from the tap at all. In the nineties, we would go for days without water or electricity because the city's infrastructure was collapsing. It wasn't that there wasn't enough water, not the resource itself, but it was how resources were managed that was collapsing. So we would store water in containers and buckets. On the street there was a whole economy of people selling everything you would need in order to prepare for these outages because they would announce them ahead of time, so you knew, okay, for the next four days there will be no water.

One thing I will always remember about water at Floating University is that there was no sink in the kitchen. No drain. There was a drain we could use near the Spülküche, but it was so annoying to bring the water in containers from the kitchen to the drain. It was annoying, but it was so great because it changed everything. It was difficult to flush water down the drain. It was not comfortable. It created an uncomfortable relationship with wastewater.

Paula Malherbe teaches and practices kundalini yoga, the yoga of awareness. At Floating University she led a yoga class themed on water and moving water in the body during *Water, what's her ritual?* This was a day of water rituals convened by Katherine Ball, Benoît Verjat, and Alexis de Raphelis. To Paula, kundalini is an all-encompassing method that expands one's consciousness and gives a greater understanding of yourself and the world.

I got to know Floating University through Katherine Ball because she was coming to my kundalini yoga classes. I didn't know of its existence up until that point. So it was a very, very nice experience, to know that Berlin has these little pockets of creativity, little wonderlands, that were not in my awareness. I was having lunch there in a community spirit with other yogis, which was pretty awesome. And then, the second event was giving a class, a yoga class related to water at Floating University. Two very, very wonderful experiences.

One incident with water happened to me when I was very young. I was 16. And you know, at 16 you can be rather silly and stupid. I was on holiday visiting friends, and I was with a particular friend on the beach walking along the beach in South Africa. These young guys approached us and said, "Oh, why don't you come sailing with us? We've got two Hobie Cats, and we need one more person on one, and one on the other. Cause we can't sail alone or on our own. Are you interested?"

"Ja, absolutely, we will go for it." So I went with one guy on a smaller Hobie, and my friend went on a slightly bigger one with two guys. It was the Indian Ocean. All very exciting. Never done this in my life before. The Indian Ocean is very rife with sharks due to the warm temperature of the ocean. Luckily I did not encounter any sharks, but it is always there in the back of your mind.

As we are going out, we're getting farther and farther away from the coastline. And there's a lot of ships, tankers on the horizon that are coming closer and closer, or rather we were sailing further and further out away from the shore. There must have been a gust of wind, or large swell and we capsized.

The sail lay on its side on the water, and the guy was calm. He said, “Okay, this is what we do. So you stand on the hull and you grab the rope and you pull the sail up.” Which was fine. And then the next thing we knew, for some reason, the sail dropped again, but this time the sail dipped down. So it was completely submerged in the water. So how do you get that back up?

And now the guy started to completely panic. He was freaking out, and I'm thinking, “Hmm, he's lost the plot. If I don't take control, we're gonna die. We are gonna drown.” And so, it's that story of where do you get that, you know, you hear of some mothers lifting vehicles off their children, it's that adrenaline rush. And so that was my experience. We managed to pull the sail up. That was a very powerful experience for me, tapping into my own power and the source of energy. That stayed with me.

I have these moments where I just become something else. Now you're just totally in charge. In that moment you become invincible. You are a tiny little thing in this vast ocean of all kinds of fearful possibilities, yet, there's these pockets, these moments in time when you become a god or a goddess.

If you look at the fear aspect, which is deeply linked to the kidneys and the bladder, it's all linked to the water system and how I overcame that fear. I just became fully empowered in that particular incident.

Within the yogic tradition, the water element is linked to the second chakra. That's your sexuality and creativity. Water is one of the five elements in traditional Chinese medicine. Each element corresponds with different organs, biological functions, emotions, seasons,

directions of energy and meridians, which are channels of energy. It's also symbolized by the yin and yang symbol. So it's about balance. Whenever this is out of sync or out of flow, it impacts the body. It's specifically connected to the bladder and the kidneys. If you tend to be a fear-based person or you go into fear or paranoia about everything, you could feel it in the kidneys, they go out of harmony.

What I've noticed in certain personality types, the fearful types, they tend to be very rigid, very rigid in their outlook on life, even just in their physical posture—how they move and walk through life. Very intolerant. The mental manifestation or the mental psyche becomes a physical manifestation. So it's really, really important to connect to the flow. In yoga we are always connecting to the flow of energy, flow of breath, et cetera. It's important for energy to be able to flow, just like it's important for water to be able to flow.

I love to use the analogy of stagnant water. What happens to stagnant water? It becomes toxic and smelly and just really pretty awful. We don't want that in the system. If we start to recognize that, we can change it.

Yoga works with water in the body. Certain yoga kriyas and exercises move water inside the body. For example, if you take cat-cow, you flex the spine backwards and forwards or up and down. When you arch the back down and the head up, you bring in the kidneys, you kind of compress them, you move the organs in a certain way that's pressing on the kidneys. Or if you're rolling backwards and forwards on your spine, that's a wonderful massage on the kidneys. So you are physically moving the organs and the water inside

of them. It's not just a mental process. It's actually physically moving the water in your organs. Hip lifts as well. When we bend the knees and lift the hips up, it's the same. Whenever you're arching, concave, convex, you're moving the water in your organs. It works on the liver as well. When you arch the back up, you're squeezing. You can feel it, you're squeezing, and you're actually compressing your liver.

When we talk about the body being 60 percent more or less of water, we tend to think of the body as a whole, just that 60 percent. But every organ has a certain percentage of water, not one is the same. Everything—every organ—in the body has an electromagnetic field. Every organ in the body has a specific aura. We don't just have one aura.

I watched this wonderful little video. It was a Native American woman talking about the power of water and the spirit that lives in water and how she communicates with the spirit of water. She was talking about the memory of water and how ancient water is. So you've got all this ancient memory stored in water. And you have this loop of water—it rains and falls to the earth, and then the water rises up again through condensation, through evaporation. You have this continual cycle. The quantity of water on planet Earth actually apparently never changes. It just redistributes itself all over the earth. Because where else can it go? It can't leave planet Earth, in our awareness anyway. So, water and its memory are moving in a constant loop.

It's vast. It's so vast. It's a solid, it's a liquid, it's a gas. It's amazing how water moves.

Rosario Talevi is an architect, curator, editor, and educator interested in critical spatial practice and transformative pedagogies. She is a founding association member at Floating University Berlin and was on the board of Floating University from 2019–2022, where she continues today to curate the Urban Practice program and Climate Care, a festival engaged with theory and practice at the intersection of climate challenges, ethics of care, and environmental humanities. She is a founding member of Soft Agency.

Gilly Karjevsky is a curator of critical spatial practice. She teaches and curates programs at the intersection of ecology, ethics of care and radical collectivity. She is a founding association member at Floating University Berlin, where she curates Climate Care, a festival for theory and practice on a nature-culture learning site, the Urban Practice residency program, and a participatory lexicon process.

This interview was taken during a car ride. Rosario was driving and Gilly, Licia Soldavini and I were passengers. We were on the way to the funeral of Amelie Schindler who was instrumental in starting Floating University and tragically died of leukemia in 2018.

Katherine Ball: Could you talk about your relationship with Floating University?

Gilly Karjevsky: I was part of Floating University acting as artist-in-residence looking for the language of practice emerging from that site and leading a lexicon process together with students, visitors and locals.

Rosario Talevi: I was involved in Floating University through a research project called Making Futures, and I spent my summer there. I really enjoyed it.

KB Can you talk about your relationship with water by telling a story about an experience you’ve had with water?

RT One nice memory about water, we used to go to the south of Argentina and Chile with my parents in a big, transformed SUV my father had souped-up, and we would do three days of wild camping and one day of hotel. During those three days of camping, we would always heat water in big pots to wash ourselves.

One summer we went to a very beautiful hot spring, a natural hot spring with no infrastructure. The hot spring was surrounded by mountains. It’s a part of the Andes where you have a lot of vegetation because it’s not that high. You have

these very old forests where you have a lot of moss, and it’s kind of humid. It was summer, so everything was very lush and green. They have these special trees called araucarias. Monkey puzzle trees are in this genus.

The water was dark because the pools were very rocky, and a lot of moss covered those rocks. The water smelled like sulfur. We used to play a game: we had to go stay in the pool with the really, really hot water, like 42 degrees Celsius (108 degrees Fahrenheit), and then run to a stream of water that was just a couple of meters away from there. It was not a river; it was a very cold stream coming down the mountain. We used to lay our bodies flat on one side, then the other side, and then go back to the hot, hot pool.

GK Did you get a breathing sensation out of your skin, the way you get it when you're out of the sauna?

RT Yeah, yeah. Yeah.

GK I grew up in Israel, so I always had access to the beach, to the Mediterranean. Going to the seaside was very natural for me. I've been doing it since I was a baby. Learning to swim in the ocean and float in the ocean was always part of my life. It wasn't weird when swimming and floating and being in water was a central part of my dreams when I was a younger person. But it was very weird that I had this repeating dream of finding myself in pools on tops of mountains. Overlooking a mountain landscape, but being in a pool while doing that. And it was even weirder when I saw a picture of that landscape exactly.

Turns out it's a place in Oaxaca, Mexico, where water is retained in pools on top of a mountain chain. It is definitely now on my next-to travel list. It was a very weird thing to see, to realize that a place you dreamed of many times in your life actually exists. There's something super exciting and magical about knowing that it's a real place, but there's also something kind of a bit stressful about it as well. I think it's a very powerful place.	RT I have one funny ritual I learned from a shaman in Buenos Aires, where I am from. We were talking about dreaming consciously, how to induce that kind of dreaming or how to be more sensitive during the sleep so you can get information from your dreams. The technique goes like this: before you go to sleep, you drink one and a half liters of water, put a big bowl of water next to your bed, and set an intention or ask a question. Then you have these funny dreams full of different meanings, and of course you wake up in the middle of the night to go to the bathroom. And then you have to have a notepad and a pen next to your bed so you can really write down whatever you remember from your dream and then continue. You get weird dreams.	RT Twenty minutes. GK (drinks water) It tastes funny. RT Yeah, because I put something in it, another practice with water. GK What did you put in it? Like MDMA? RT Yes. MDMA. (laughs) No, zeolite. GK What is that? RT It's a rock. GK Maybe I shouldn't have drunk it. I am going to get cracked out. RT (laughs) It's a rock that has the capacity to attract heavy metals. So if you drink it, it will kind of encapsulate the metals.	them in a bucket with water and then go through the streets and throw them at cars, throw them at bikes, throw them at each other. There is one weekend in Argentina that is Carnival, when this is allowed. So much fun.
In my dreams, the water was very bright blue because it's a shallow pool. It was always a series of pools going around the top of the mountain chain. The landscape of the mountain was very abstract. I just saw the lines of the landscape. I didn't really see the details.	GK So did you do it? Did it work for you?	GK What is that?	KB You're smiling.
I went in the pool in the dream. I wasn't just seeing the landscape from the outside. I was really immersed. That was why it was such a shock to me to see a real place that has such a similar landscape because they were really an experience, those dreams. I remember them very vividly.	RT Yeah, it really worked for me. Now I'm thinking I have many rituals with water. I have all these people who tell me things to do with water—because I don't have any planets in water or in earth; my whole astrological chart is fire and air, so it's very hard for me to ground. An astrologist once told me to add a little salt to a bucket and put my feet in it. To release. It's an energetic thing that is not esoteric. It's very pragmatic. We are made of electrons, currents and energy, and when you put your feet in the water, your energy gets released through the soles of your feet.	GK (drinks other water) This tastes better. Licia Soldavini: It's like drinking a magnet. It's like magnetizing all the magnets against it. RT What other practices do I have? I also take baths with ginger—I grate ginger root into the water. I learned that when I was pregnant and I had muscle pain and I couldn't take any medication, or at least I didn't want to. I learned that from my yoga teacher.	RT Yeah, because I was thinking I didn't have memories with water. Now they're coming.
I had many of these dreams, but I don't have them anymore. I used to have epic dreams of traveling and going through landscapes, abandoned castles and buildings on top of mountains. A lot of swimming, a lot of nature. I rarely remember my dreams now. But when I was younger I loved sleeping because I would wake up, and it felt like I'd been traveling.	GK How long are you supposed to put your feet in for?	GK I feel like your whole life is one ritual, like an ongoing shamanic ritual.	GK I think everybody has memories with water. It's like memories with food or memories with sleep, or memories with family.
KB What kind of practices or rituals with water do you have in your daily life, now or in the past?	KB How long are you supposed to put your feet in for?	RT Oh, now I see another really nice memory of my childhood with water, which was Carnival. We used to make these water bombs and put	Another water memory—I was at my grandparents' place, and I heard the laundry dripping water on the neighbor's plastic roof. I was so fascinated by the sound that I took a glass with water, and I was dripping intentionally on that plastic rooftop to hear the sound more and more. I did it for like half an hour, and the neighbor came upstairs screaming and furious. I got in so much trouble just for being fascinated with the sound of the drip of the water. I never did that ever again. RT Gilly, what are your rituals with water? GK I take long showers, actually. But in India I definitely learned the advantages of the bucket shower. You don't need more than a quarter bucket to clean yourself. There's no need. Yeah. I don't think I have many rituals. I'm really into learning to hydrate more because I don't drink enough. I think it's more like reminding myself every day that I

need to have a ritual with water.
You taught me to put coins in water,
Rosario.

RT Ah, yeah, that's true.

GK I love that. I keep that up, but it's
not bringing me money, my friend.
(laughs)

RT But there is not a lack.

GK There's not a lack, no.

RT That one. Yeah. It's a Chinese rit-
ual I was taught by a friend, which
is to, in a bowl, put water and you
put coins and this would attract
abundance, money, or work, or
whatever.

GK It's a little bit like throwing coins
in the fountain.

RT Yeah, but the secret is that you
need to keep this bowl very clean
and always with water.

↑

3

TEST
RESULTS

How polluted is the water in the rainwater basin? In October and November of 2021, we conducted a series of tests on water, sediment, plants, and concrete in the rainwater basin. This section explains the test results—what they mean and why they are significant. It looks at important water quality parameters and situates them in the context of the rainwater basin. The full test results are downloadable at www.adocs.de/f/results and available in the digital version of this book.



Methods

Unless otherwise noted, all samples were collected in October and November 2021 in the rainwater basin and analyzed by GBA Lab in Berlin. The samples taken on October 20, 2021 were taken during a participatory public workshop that I led with the support of Floating e.V. member Ute Lindenbeck. I collected the samples taken on October 26, November 1, and November 3, 2021.

The testing process was advised by Stefan Bruns and Nina Röttgers of Polyplan-Kreikenbaum Gruppe GmbH, an environmental engineering firm that specializes in natural swimming pools and lake restoration, and Dr. Shimon Anisfeld, a professor at Yale University who specializes in water resource management.

A total of six water samples, testing for pH, *Escherichia coli* (*E. coli*), *Enterococcus*, nitrogen, phosphorus, and turbidity, were taken within a five-meter range of the rainwater basin's inflow tunnel and outflow tunnel on October 20, October 25, and November 1, 2021. One water sample for metals and pesticides was taken at the center of the basin on October 26, 2021.^[1]

On November 3, 2021, two water samples were taken from Liepnitzsee, a lake in Berlin-Brandenburg of “excellent” swimming quality (rated under the EU Bathing Water Quality Standards).^[2] to provide a comparison to the rainwater basin.

Two sediment samples, testing for pH, total organic carbon, nitrogen, phosphorus, metals, particle size distribution, and pesticides, were taken within a five-meter range of the rainwater basin's inflow tunnel and outflow tunnel on October 26, 2021.

Another sediment analysis was run by Martina Kolarek, a soil scientist and member of Floating e.V. Martina took two sediment samples in the basin, to test for pH, humus, metals, PCBs, and polycyclic aromatic hydrocarbons, on November 22, 2021. These samples were analyzed at GEFTA Lab in Berlin. A map of the locations of these tests, the results, and Martina's interpretation of the results are available on Floating University's website.^[3] In the datasheets from GEFTA Lab, these samples are marked as Sm1 and Sm2. In the Results and Interpretation, for the sediment analysis only the measured values from these samples are listed because it is certain that the tests run at GEFTA Lab correspond with the German Federal Soil Protection and Contaminated Sites Ordinance BBodSchV.^[4] (The measured values are not listed from the tests run at GBA Lab.) A concrete sample was taken from a concrete core from the east side of the basin that was drilled out during construction in March 2021. It was analyzed on November 1, 2021, for pH, metals, asbestos, human-made material fibers, and pesticides.

A plant sample was collected on October 26, 2021 and analyzed for pH, metals, and pesticides. The plant sample was a composite sample of randomly selected reed leaves on the west side of the basin, enough to fill up a two-liter bucket.

Limits/reference criteria were derived from the EU Directives for Bathing Water (2006/7/EC), Drinking Water (2020/2184), and Environmental Quality (2008/105/EC); German Federal Ordinances for Drinking Water (TrinkwV), and Soil Protection and Contaminated Sites (BBodSchV); German Research Institute for Landscape Development and Building (FLL); and US EPA.

Additionally, in September 2018 the Berlin water utility, Berliner Wasserbetriebe, tested the water in the rainwater basin. Berliner Wasserbetriebe also tested the water after it had traveled through Floating's filtration systems. Unfortunately, because of unreliable collection methods, these tests did not provide any conclusive evidence about the rainwater basin or the effectiveness of our water filtration systems.

- 1 Water samples were composite samples taken at one meter intervals over five total meters—a five-meter-long rope, marked with ribbon at one meter intervals, was put in the basin. Then a sanitized cup was dipped in the water at each one-meter mark then poured into a sanitized bucket. The sampling bottles provided by GBA Lab were filled with water from this bucket. The samples were then put in a cooler and directly transported to GBA Lab.
- 2 European Environment Agency, “State of Bathing Waters. Entry for Liepnitzsee, Lanke, Waldbad.”
- 3 Results from a set of sediment samples taken by Martina Kolarek and analyzed at GEFTA Laboratory. Kolarek, “Soil Analysis in Floating University 2021.”
- 4 German Federal Ministry of Justice and Consumer Protection (Bundesministerium der Justiz und für Verbraucherschutz), Federal Soil Protection and Contaminated Sites Ordinance (Bundes-Bodenschutzgesetz - BBodSchV).

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- German Federal Ministry of Justice and Consumer Protection (Bundesministerium der Justiz und für Verbraucherschutz). Federal Soil Protection and Contaminated Sites Ordinance (Bundes-Bodenschutz- und Altlastenverordnung) (Bundes-Bodenschutzgesetz - BBodSchV). 2021 (BGBl. I p. 2598, 2716). https://www.gesetze-im-internet.de/bodschv_2023/BBodSchV.pdf
- Kolarek, Martina. “Soil Analysis in Floating University 2021.” Floating University Berlin. Last modified November 2021. <https://floating-berlin.org/programmes/web/ergebnisse-bodenanalyse-results-soil-analysis/>

CFU = colony-forming unit
mL = milliliters
µg = micrograms
L = liters
mg = milligrams
kg = kilograms
Ts = Total solids
FNU = formazin attenuation unit
NTU = nephelometric turbidity unit
pH = potential of hydrogen

Water Tests Results and Interpretation

- 1 European Union, Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality, 46.
- 2 Since bacterial levels exceeded the detection maximums in the laboratory, we do not know the maximum levels of bacteria in the rainwater basin. Further tests using a higher detection maximum would need to be performed to determine this.
- 3 European Union, Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality, 46.
- 4 European Union, Directive 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption, 3.
- 5 United States Environmental Protection Agency, “National Recommended Water Quality Criteria—Aquatic Life Criteria Table.”
- 6 European Union, Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, 23.
- 7 Results from a set of sediment samples taken by Martina Kolarek and analyzed at GEFTA Laboratory.

Kolarek, “Soil Analysis in Floating University 2021.”
- 8 German Federal Ministry of Justice and Consumer Protection (Bundesministerium der Justiz und für Verbraucherschutz), Federal Soil Protection and Contaminated Sites Ordinance (Bundes-Bodenschutzgesetz – BBodSchV), 26, 28.
- 9 German Federal Ministry of Justice and Consumer Protection (Bundesministerium der Justiz und für Verbraucherschutz), Federal Soil Protection and Contaminated Sites Ordinance (Bundes-Bodenschutzgesetz – BBodSchV), 26.
- 10 I was unable to find a limit for lead in plant leaves unrelated to human ingestion of plants set by the EU or German government. Even though the reeds tested are not edible by humans and no agricultural plants are grown in the basinwater, this limit can be used as a consideration for the animals and invertebrates eating the plants in the basin, and also for the wellbeing of the plants themselves.

European Union, Commission Regulation (EC) No 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs, 19.

Based on the tests made in the rainwater basin in October and November 2021, the most concerning parameters in the basinwater are *E. coli* and enterococci bacteria, lead, zinc, phosphorus, trash, and turbidity. In the sediment, the most concerning parameters are lead, cadmium, zinc, and polycyclic aromatic hydrocarbons. In the plants, the most concerning parameter is lead.

The water in the basin is not drinking or swimming quality, per European Union regulations. It’s polluted, but it’s not radioactive—there’s still hope that the water quality could be improved. Floating’s main motivation for improving the water quality in the basin is to improve the habitat for the many species that live in the basin, instead of making a fashionable, bohemian swimming pool for Berliners. Although many animals and plants continue to survive in the polluted basinwater, poor water quality degrades aquatic ecosystems and negatively impacts living organisms. Surviving is not necessarily thriving.

Descriptions of the most concerning parameters are as follows:

E. coli bacteria in the basinwater ranged from 165 to >2.240 CFU/100 mL. This exceeds limits for swimming water (<1000 CFU/100 mL) in a natural water body, artificial pool, or natural swimming pool, according to the EU Bathing Directive.^{[1] [2]}

Enterococcus bacteria in the Basinwater ranged from 47 to >200 CFU/100 mL. This exceeds limits for swimming water (<200 CFU/100 mL) in a natural water body, artificial pool, or natural swimming pool of excellent quality, according to the EU Bathing Directive.^[3]

Lead (*Blei*) in the basinwater was measured at 5.6 µg/L. This exceeds limits for drinking water (<5 µg/L) according to the EU Drinking Water Directive,^[4] aquatic life (<2.5 µg/L) according to the EPA Water Quality Criteria for Aquatic Life,^[5] and environmental quality (<1.2 µg/L annual average, <14 µg/L maximum) according to the EU Environmental Water Quality Directive.^[6] There is no maximum listed for swimming under the EU Bathing Directive.

Lead in the sediment ranged from 153 to 228 mg/kg Ts.^[7] This exceeds the limits for children’s play areas (<200 mg/kg) at the basin inflow according to the German Federal Soil Protection and Contaminated Sites Ordinance BBodSchV.^[8] It does not exceed the limits for residential areas (<400 mg/kg), parks (<1000 mg/kg), industrial lands (<2000 mg/kg), or grasslands (<1200 mg/kg).^[9]

Lead in the reed plants growing in the basin was measured at 4.3 mg/kg. This exceeds the limits for leaf vegetables (<0.10 mg/kg) according to EU Commission Regulation 1881/2006, which sets maximum levels for certain contaminants in foodstuffs.^[10]

- 11 Aschberger, Olsson, and Munn, *European Union Risk Assessment Report, Zinc metal, Part I, Environment*, 39–40.
- 12 Results from a set of sediment samples taken by Martina Kolarek and analyzed at GEFTA Laboratory. Kolarek, “Soil Analysis in Floating University 2021.”
- 13 European Commission, Joint Research Center, *Institute for Health and Consumer Protection. EU Risk Assessment Report: Zinc*. Natural background values of zinc in sediment, 39–40.
- 14 Bodar, *RIVM Letter Report 11235/2007: Environmental Risk Limits for Zinc*, 4.
- 15 German Research Institute for Landscape Development and Building (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V. (FLL)), *Recommendations for Planning, Construction, Servicing and Operation of Outdoor Swimming Pools with Biological Water Purification*.
- 16 German Federal Ministry of Justice and Consumer Protection (Bundesministerium der Justiz und für Verbraucherschutz), Ordinance on the quality of water intended for human consumption (Trinkwasserverordnung – TrinkwV), 60.
- 17 German Research Institute for Landscape Development and Building (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V. (FLL)), *Recommendations for Planning, Construction, Servicing and Operation of Outdoor Swimming Pools with Biological Water Purification*.
- 18 While clear water bodies have low turbidity, some water bodies have high turbidity and are still healthy ecosystems. The appropriate level of turbidity for ecosystem health depends on the type of aquatic ecosystem the basin is or desires to be.
- 19 Results from a set of sediment samples taken by Martina Kolarek and analyzed at GEFTA Laboratory. Kolarek, “Soil Analysis in Floating University 2021.”
- 20 German Federal Ministry of Justice and Consumer Protection (Bundesministerium der Justiz und für Verbraucherschutz), Federal Soil Protection and Contaminated Sites Ordinance (Bundes-Bodenschutzgesetz – BBodSchV), 26–27.

Zinc (*Zink*) in the basinwater was measured at 110 $\mu\text{g/L}$. This exceeds the background value for natural water bodies (3–12 $\mu\text{g/L}$), according to the EU Risk Assessment Report on Zinc.^[11]

Zinc in the sediment ranged from 1310 to 1530 mg/kg Ts.^[12] In the German Federal Soil Protection and Contaminated Sites Ordinance BBodSchV, there is no limit for zinc listed for arable land, children’s play areas, residential areas, parks, industrial lands, or grasslands. The amount of zinc in the basin’s sediment is higher than levels typically found in unpolluted, natural lakes (<140 mg/kg), according to the EU Risk Assessment Report on Zinc.^[13] It is also higher than limits for the health of organisms that live in sediment (<190 mg/kg), according to the Netherlands National Institute for Public Health and the Environment RIVM Letter Report 11235/2007.^[14]

Phosphorus (*Phosphor*) in the basinwater ranged from 0.15 to 0.66 mg/L in the basin. This exceeds the limits for natural swimming pools (<0.01 mg/L) according to the German Research Institute for Landscape Development and Building (FLL).^[15] Phosphorus is a nutrient that can encourage algae to grow.

Turbidity (*Trübung*) in the basinwater ranged from 15 to 20 FNU. This exceeds limits for drinking water (<1 NTU) according to the German Federal Drinking Water Ordinance (TrinkwV)^[16] and natural swimming pools (<5 NTU) according to the German Research Institute for Landscape Development and Building (FLL).^[17] One FNU is equivalent to one NTU. However, it does not necessarily exceed limits for environment/ecosystem health.^[18]

Trash is consistently observed in the rainwater basin. Commonly seen trash includes: cigarette butts, miscellaneous plastic waste (especially candy bar wrappers and other food packaging), tampons, and sanitary pads.

Polycyclic aromatic hydrocarbons (PAH) (*Polycyclische aromatische Kohlenwasserstoffe*) (*PAK*) in the sediment ranged from 9.19 mg/kg TS to 15.60 mg/kg TS.^[19] Benzo(a)pyrene, a PAH that represents the effect of PAH mixtures in the sediment ranged from 0.6 to 1.24 mg/kg Ts. This exceeds to the limits for benzo(a)pyrene in children’s play areas (<0.5 mg/kg), residential areas (<1 mg/kg), and parks (<1 mg/kg) according to the German Federal Soil Protection and Contaminated Sites Ordinance (BBodSchV).^[20] PAH are carcinogenic organic compounds that come from fossil fuels and persist for long periods of time in the environment.

All other parameters tested were below the limits set by regulatory bodies including the German federal government, European Union, and European Commission, as best as could be understood, verified, and applied to the basin’s context as a wetland ecosystem and natureculture learning site.

Additional analysis and explanations of what parameters we tested and why

Trash

Trash in aquatic ecosystems is a concern because animals can become entangled in garbage. Certain types of trash, like cigarette butts, contain toxic compounds harmful to aquatic organisms. Trash also can break down into microplastics, which are of growing concern. A microplastic is less than 5 mm; a nanoplastic is less than 1 μ m. At this small scale, microplastics are suspended in the water column and not efficiently removed by water treatment. Their impacts are poorly understood, but they have been found in drinking water and in natural water bodies.

pH

Natural water bodies are usually close to neutral, pH 7. A low pH (acidic) or high pH (basic) can kill aquatic organisms. An unstable pH with rapid, unpredictable fluctuations can also harm organisms. A pH of 5 to 9 is recommended for water quality for human health.^[21] A pH of 6 to 8.5 is recommended for natural swimming pools by the German Research Institute for Landscape Development and Building (FLL).^[22]

The rainwater basin’s pH is typically between 7.2 to 7.6. Its range of fluctuation was between 6.8 to 8.1.

Turbidity

Turbidity is the measurement of how clear or cloudy water is. Turbidity occurs when small particles, like clay, silt, organic particles (like phytoplankton and plant debris), and chemical precipitates (like iron and manganese) become suspended in the water and restrict the transmission of light. High turbidity levels can impact submerged plants and aquatic organisms that need light and impede the ability of fish gills to absorb dissolved oxygen. Viruses or bacteria can become attached to suspended particles, which can shield them during UV sterilization of water.^[23]

The level of “healthy” turbidity for an ecosystem depends on context, and on the historical level(s) to which the ecosystem has evolved and adapted to. Some water bodies have high turbidity and are still healthy ecosystems. For example, mangrove areas have high turbidity, which is needed to protect juvenile fish from predators; it is an integral part of the ecosystem.

Rapid, uncommon changes in turbidity can cause problems for ecosystems that are not adapted to those conditions. Rapid changes in turbidity can be an indication of substantial pollution events in surface water or groundwater (e.g., triggered by storms, thaws, fires, or spills, which may be coupled with human activities that disturb land, such as construction, mining, and agriculture).^[24]

21 United States Environmental Protection Agency, “National Recommended Water Quality Criteria—Human Health Criteria Table.”

22 German Research Institute for Landscape Development and Building (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V. (FLL)), *Recommendations for Planning, Construction, Servicing and Operation of Outdoor Swimming Pools with Biological Water Purification*.

23 World Health Organization, *Water quality and health—review of turbidity: information for regulators and water suppliers*, 7.

24 World Health Organization, *Water quality and health—review of turbidity: information for regulators and water suppliers*, 6.

- 25 Anisfeld, *Water Resources*, 28.
- 26 Anisfeld, *Water Resources*, 29.
- 27 Results from a set of sediment samples taken by Martina Kolarek and analyzed at GEFTA Laboratory.
- Kolarek, “Soil Analysis in Floating University 2021.”
- 28 Moebius-Clune *et al.*, *Comprehensive Assessment of Soil Health—The Cornell Framework*, 117.

Turbidity in the rainwater basin comes from sediment entering the basin with stormwater runoff. Another factor contributing to turbidity in the basin is the relatively small amount of water in the shallow basin in comparison to the high quantity of sediment and organic matter.

Turbidity can change over time and is not ideally measured in the lab a day later, as was the case with our laboratory tests. Given the data we do have regarding the basin’s turbidity level, it is too high for drinking or swimming water per EU regulations. However, it might be a very appropriate turbidity level for a wetland ecosystem. In order to make the determination, we would need more research to determine a healthy turbidity level for the basin, as well as more accurate, on-site turbidity testing, which we did not have the equipment or means to perform.

Nutrients

Nitrogen and phosphorus are essential nutrients for all life forms. However, elevated nutrients can cause eutrophication—abnormally high rates of photosynthesis—which can lead to algal blooms, which can lead to hypoxia (low oxygen in water) and block light for benthic organisms living near the sediment layer. Phosphorus is commonly the limiting nutrient in freshwater ecosystems, while nitrogen is commonly the limiting nutrient for saltwater ecosystems.^[25]

Bacterial indicators

E. coli are often used to assess the health of freshwater swimming areas, while intestinal enterococci are often used to assess saltwater swimming areas. *E. coli* bacteria are an important bacterial indicator because they are strongly correlated with the presence of pathogen-related diseases in water.^[26] They inhabit the intestinal tracts of warm-blooded animals and can arrive in water bodies in feces.

Metals

Some metals are toxic and some are essential micronutrients. Iron, zinc, and manganese are essential nutrients at relatively low concentrations, but they are all toxic at high concentrations. Lead, mercury, and cadmium are nonessential metals and are toxic at low concentrations. They are commonly called “heavy metals” because they have high density. “Metalloids” like arsenic have intermediate properties between metals and nonmetals. Metals tend to accumulate in sediment.

Pesticides, Herbicides, Insecticides

The rainwater basin was tested for 42 pesticides. All were below the detection limit of 0.05 µg/L, which is below the standard criteria available for these pesticides. However, EU water quality standards only specify limits for four of the pesticides that we tested for.

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Sediment Analysis

Sediment is a record of the basin’s history of contamination. Due to the metal and polycyclic aromatic hydrocarbon pollution in the basin, the sediment is not suitable for agricultural crops or gardening; it also exceeds some limits set for children’s play areas. The sediment test results classified it as a silt loam or fine sandy loam, due to its particle size distribution of sand, silt, and clay. This means it has more sand and silt than clay. Therefore it releases nutrients and toxins rather than holding on to them, as clay would. The pH of the sediment is near neutral, ranging from 6.45 to 6.69.^[27] Nutrients are most bioavailable for plants in the range of 6.2 to 6.8.^[28]

Concrete Analysis

In tests of the concrete in the basin, the levels of metals in the concrete were found to be far lower than the levels of metals in the sediment. There were no asbestos or human-made material fibers detected in the concrete. This means that if the concrete is removed, there should not be a concern about toxins being released from the concrete.

Conclusion

The Floating e.V. Association, an organization of over 60 members, currently manages Floating University as a natureculture learning site. Floating e.V.'s mission, in solidarity with the history of the site and with the lineage of alternative narratives for urban development, is “to open, maintain, and take care of this unique site while bringing non-disciplinary, radical, and collaborative programs to the public.” Under the stewardship of Floating e.V. Association, Floating University continues to create a space that fosters experiential learning and navigates the complex entanglements of the world in order to invent new ways of living.

Floating e.V. Association is organized in working groups that focus on specific tasks and topics—from maintenance, infrastructure development, and gardening to connecting with neighbors.

In the fall of 2018, the original campus structure was dismantled, along with the water filtration systems documented in this book.

Just as water continuously flows and changes, so too did we evolve. New campus structures, including a pared-down iteration of the original filtration system, were built in 2019 and 2021. Since Floating is constantly being built, deconstructed, and rebuilt, my hope is that new and innovative water filtration systems will continue to be constructed at Floating.

In 2020, I reached out to Polyplan-Kreikenbaum Gruppe GmbH, the premier environmental engineering firm in Germany for lake restoration and natural swimming pools. I asked them to collaborate with us on a filtration design to continually filter the basin rainwater. I wanted something more robust and all-encompassing than the aspirational anarchy of a spiral of hanging bathtubs.

Polyplan agreed to work with Floating, and we secured funding from a Postcode Lotto Foundation grant. We began our collaboration with a series of tests on the existing elements of the basin: water, sediment, plants, and concrete. This was to diagnose and measure the pollution in order to inform the goals of the filter design. (You can read the results of these tests in the “Water Tests” section of this book.) Following the results, we organized a series of design meetings between Polyplan and Floating e.V. Association and invited the neighborhood to participate.

We created a filtration design to mimic the natural processes of natural bodies of water—to treat the basin as an ecosystem and habitat unto itself. The design of the new filtration system would transform the rainwater basin from a toilet bowl that fills up with the airport's polluted water and flushes it down the drain of the Spree River to a wetland habitat that filters the polluted water, makes it reusable, and infiltrates the water into the ground. The “infiltration basin” that would be created by the new filtration system is designed to 1. filter the basinwater, 2. improve the water quality and wetland habitat, 3. create a chlorine-free swimming pool for human use, 4. provide filtered stormwater for the irrigation of nearby neighborhoods, parks, and graveyards, and 5. infiltrate water into the ground to replenish groundwater supplies. This is why it's called an infiltration basin, because it does more than filter the water, it also allows the water to infiltrate, or seep, into the ground. The existing outflow tunnel would provide relief only during torrential downpours that take place on average once every ten years.

The vision is to transform the rainwater basin in collaboration with Floating University's programs, which would participate in the process of construction, deconstruction, planting, and maintaining the newly created infiltration basin. Floating University's



current programs include Learnscapes, Kids Uni, Space for Practice, Neighborhood Network, Climate Care, (Re-)Gaining Ecological Futures, Open Soil Days, Fluid Toxicity, Contaminations, and Cooperations—a program that hosts and coproduces events and projects at Floating with other collectives, individuals, organizations, and institutions.

The transformation of the current rainwater basin into an infiltration basin would not only improve wetland habitat and water resources in Berlin, it would also save the city €500,000 a year, which is the annual cost of transporting the unfiltered, polluted basinwater into the canals and ultimately into the Spree River.

The steps of this infiltration process include:

- ① Removing sediment from the existing inflow tunnel with a sand trap.
- ② Circulating the basinwater through submerged layers of filters that consist of oolite 8/11 mm (10 cm layer), M207 PhosFerrum (30 cm), oolite 2/5 (30 cm), and 30 cm oolite 8/11 (30 cm). Oolite is made of small, egg-shaped rock grains (typically limestone) with a high surface area. They are naturally occurring and used in natural swimming pools and aquariums to support beneficial bacterial growth, which are biofilters for the water. M207 PhosFerrum is a lime granulate coated with an iron-based filter material used as a biofilter in natural swimming pools. It counteracts the formulation of algae and filters out turbid substances to ensure high visibility and clear water quality.^[1]
- ③ Circulating the filtered water through an adjacent swimming pond. This pond will serve as a reservoir, providing water for the needs of Floating University and surrounding neighborhoods, parks, and graveyards.

④ Infiltrating the water into the ground in a series of bays. The first infiltration bay will always be full of water, the second bay will have intermittent water, and the last bay may dry up in months of low rain. The bays provide three different habitats and accommodate low to high flows of water. Reed wetlands grow in each infiltration bay.

⑥ Infiltrating water on a permeable concrete surface that sits below a building that includes classrooms and studios for arts, dance, residences, and bathrooms.

⑤ During rare floods, divert unfiltered water through the existing outflow tunnel.

As of 2025, three working groups at Floating—the Space Group, Hybrid Infrastructures, and the Lobby Group—are working to move the basin’s transformation forward. However, the road toward implementation is not straight, but winding, forking, and then coming back together, like the way water flows in a river. Space, Hybrid, and Polyplan are working towards building a prototype large enough to swim in, in hopes of garnering public support and securing funding. Tempelhof Projekt, Floating’s landlord, is working with a large engineering firm and developing their own plan for redesigning the rainwater basin, which could include its transformation into an infiltration basin, and the Lobby Group is currently meeting with Tempelhof Projekt to discuss how Floating e.V. and Polyplan can and will collaborate with Tempelhof and their engineers in order to move the basin’s transformation forward.

The rainwater basin is a complex biological legacy particular to the Anthropocene; it’s filled with a century of airport and urban pollutants, yet still provides an inner-city habitat—a hybrid of urban infrastructural demands and the adaptive life cycles of diverse wild organisms. Here we can wade in the contaminated waters of our past, repair our present, and forge a stewardship model for future urban aquatic habitat.

Two students from HFBK University of Fine Arts in Hamburg, Felix Egle and Dennis Nedbal, came to Floating as part of a class called Design for a Living World. They immediately recognized the basin as an urban void—a gap in the city structure that self-organizes into an ecosystem of its own. The reeds grow without human assistance, drinking and cleaning the water while inviting other species into their ecosystem. Birds, bacteria and pollinators arrive and contribute to the sounds and sights and life of the scene. We see a similar phenomenon of self-organization in the processes of the moving bed reactor, the water filter that transformed Floating’s dirty dishwashing water into water for irrigating the tomatoes in the greenhouse. Made of six plastic columns, filled with water, air bubbles, and bacteria, each column provides a different habitat for bacteria. You don’t have to insert bacteria in the moving bed reactor columns. Each column organizes itself into a unique community of bacteria that breaks down pollution and nutrients in the water.

I wonder how we can live in a way that supports wild organisms to self-organize within our urban centers, where our role as humans is not about controlling and instructing, but about trying to help organisms self-organize. I wonder how we can both exert and relent control over our city planning and daily practices. Is this a dilemma particular to this stage of humanity, where we have drastically interrupted the Earth’s equilibrium, and we are searching for ways to set her back in balance? How can we dream of utopia while keeping our feet on the ground, or in the water, as it may be? I wonder how, in relation to the natural systems and infrastructures that surround and sustain us, we can behave more like water, flowing always in the path of least resistance—and at the same time working with resistance. Can we use obstacles to propel us out of straight lines and into unexpected directions?

My first memory of water comes from the summer of 1989. I was five years old and we were living in my great-grandfather’s cottage on Higgins Lake in northern Michigan. The lake is bigger than the town I would eventually grow up in, Grosse Pointe, yet narrow enough to swim across if you were a good swimmer. That summer, Higgins Lake was my backyard, where I perfected my cannonball and scared off the fish. And though I didn’t realize it until many years later, the cottage we lived in was a fundamental piece of my family history.

My great-grandfather, Karl Kurz, immigrated from Weikersheim, Germany in the early 1900s to Michigan, the Great Lakes state. The state is surrounded by five vast lakes: Lake Michigan, Lake Superior, Lake Huron, Lake Erie, and Lake Ontario. Collectively, these lakes compose the largest source of above-ground freshwater in the world.

In 1913 Karl found work in Detroit as a blacksmith in Ford’s assembly line at the Highland Park Factory. He forged parts for America’s first mass-produced car: the Model T. At 1,000 completed Model T’s built a day, the Highland Park factory far surpassed all other automobile production records.

With this steady source of income, and his independent work as a house builder, he supported himself and his wife, my great-grandmother Katherine, and their two children Hilda and Eddie.

In 1933 Karl and Katherine dipped into their hard-earned savings and opened a German restaurant and bar down the street from the Highland Park Factory. They named it the Dakota Inn Rathskeller. It quickly grew popular with the factory workers who walked there for lunch or following their shifts.

¹ Manske Group, “Sichtklares Wasser mit M207 (Clear water with M207),” 15.

Shortly after the U.S. entered World War II, FBI agents investigated the Dakota Inn Rathskeller for potential ties to the Nazi party. These tensions with the U.S. government and society affected the entire German immigrant population. During the war, many German immigrants lost their livelihoods and their incomes. As Karl and Katherine kept the Rathskeller on its feet, they took to employing German customers and relatives who had lost their jobs.

But for Karl, the writing was on the wall; in case things took a turn for the worse, he wanted a getaway up North. It so happened that a muralist who painted the restaurant walls owned such a property, and was looking to sell. In 1939 Karl purchased the one-acre property on Higgins Lake with an old two-room cabin. He immediately decided to renovate and to do so he employed his German friends, family, and acquaintances who were down on their luck. Whenever people came to visit, Karl always had work for them to do. His friends soon realized that when Karl said “vacation,” he meant “construction.”

Using nothing but bare hands and a few wheelbarrows, they dredged melon-sized stones out of Higgins Lake and slogged them up to the cabin. Setting them together with cement, they built a second story, stone fireplaces, a cabana (a small shelter on the shore), a large stone table, a stone garage, a stone tool shed, and a raised garden made with the stones. They hauled so many stones out of the water that soon their rocky shoreline beach became a sand beach.

It was in this idyllic setting that I remember the day I found a home in water.

I was out riding my bicycle with my older brother when he told me to follow him up a big hill. Cranking my little legs with all my might, my training wheels rattling

beneath me, I did my best to keep up. When I reached the top he was sitting on his seat, waiting for me.

“Okay, now we’re going down,” he said.

He let go of his brakes and pushed off, yelping as he sailed down the hill. Without hesitation, I followed. Gravity seized me and the asphalt flowed smoothly beneath my tires, trees blurred by. My little tires and plastic training wheels rushed me down as fast as they could. Momentum pushed them to their limits. The adrenaline swallowed me as if in a dream.

“Turn!” my brother yelled, “Turn!”

I cranked my head, looking back over my shoulder and saw him veer left onto the road to the cottage. I realized he thought I knew this was part of the plan. But I didn’t. I careened straight ahead, out of control, clinging to my handlebars. I flew through the end of the road and over the rocky shore. There, right in front of me, was the vast crystal-clear, sky-blue lake. And I rode right in.

I remember laying there in the water, my head just beneath the surface, my back to the shore and my belly facing out into the lake. My first instinct was to pull my head up and breathe. But I didn’t. I stayed underwater. I realized I was okay, that I could just lay there, watching particles of sand and light and seaweed sway gently with the current. I felt my body sway, too. My body was so much inside the water, I was part of the water. I lost my sense of time, and since then, I’ve never gotten it back.

Then someone grabbed me by the t-shirt and pulled me out. My mom. I flailed around like a fish out of the water, panicking as if I’d just realized I’d forgotten my floaties at home. She carried me out of the water and plopped me in

the child seat above her rear bicycle tire and pedaled us back to the cottage. We pulled into the dirt driveway and I looked at the cottage’s stone walls. The stones were like technicolor cantaloupes in hues of blue, red, orange, brown, green, and white. They curved out from the cement like little bellies.

My mom carried me inside and draped a big towel over me. It hung from my wet hair past my shoulders and down to the floor. And everything felt fine. I hadn’t been scared. My mom wasn’t angry at me or at my brother. No one asked me what it was like or what I was doing in the water. It just happened. It was an experience all my own, no one telling me what I should do or how I should feel. I had simply missed a turn in the plot and found myself in the water, as if that was where I was meant to be all along.

My mom went about her grown-up business and I roamed the cottage wearing the towel over my head like a ghost, only instead of haunting people, I stumbled over the furniture.

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Graphic Designer's Note

by Felix Egle



I am glad Katherine collected the content of this book and I am happy to be part of the process as a graphic designer. This book is important to me as it gathers a very relevant, very specific, and very unique research and intervention endeavor—Floating University Berlin. I had the chance to observe Floating in different stages of the process, from conception to implementation to the Lexicon week (thank you Gilly!) before the end of the first season. I am glad to get the chance to work on this project, to help sum up the thoughts and ideas and filter structures of Floating. And I hope (and feel like) we can provide an inspiring and thought evoking proposal on how to tackle a massive challenge of our time—urban water treatment and inspiring ecosystem design concepts.

I came to Floating in May 2018, when I was a student at HFBK Hamburg with Marjetica Potrč's studio course Design For the Living World. On site we carried scaffolding pieces onto the semi-empty basin floor, and some of us started building wooden boxes to grow tomatoes. Later in the summer, we spent two weeks sleeping on site in hammocks. We continued to build, and we also played games (association game turned out to be my favorite) and shared ideas, concepts, and resources.

I remember doing a presentation on Joan Littlewood and Cedric Price's *Fun Palace*, as Floating reminded me of this modular educational institution. We researched the Void as site for opportunity. Dennis Nedbal and I built a piezo-based soundflag that was supposed to turn wind into sound and speech while Xin Cheng was harvesting paper from algae floating on top of the contaminated waters. Towards the end of the summer, we published a rapid publication, titled *Thyme*, with Katherine that collected pieces of research and concepts we felt like sharing.

Later that year, I returned to Floating once more, with Jesko Fezer's Studio for Experimental Design. We facilitated "Parading for Commoning" together, with Brave New Alps discussing urban commons and collective meaning-making in a typographic parade. I was also very happy to encounter Gilly, who was doing the Lexicon project and the Silent Conversation workshops, developing neologisms based on situated, site-specific, applied, and embodied knowledge. I was pleased to join the Lexicon team for the final Lexicon week, when this book began to take shape.

The Water Runs Through Us is a very dedicated documentation of an explorative, artistic research process. At Lexicon week, we discussed a book that would be a manual, that one could carry copies of when attending a conference on environmental engineering, but also an object we would like to find in niche bookshops that are concerned with third landscapes and the postcapitalist ruins. Our baseline motivation was to connect some dots, preserve some amazing moments for the future, and record some of the research being spatialized on site that summer. We wanted to give others an open-source resource to inspire them to do the same. So, please: Go. Do the same. Take the structures and systems described in these pages and give them new forms and applications. Change their shape, scale, and context. Urban water needs your help.

The basin is a redemption site that suffers from former aircraft fuel and rubber plus "general" urban debris. Amongst the urban waters that flow on this planet, it is relatively lightweight, not amongst the biggest or the most important or even the most polluted. But the basin is toxic and does not easily support life without dedicated care and treatment. Tender attention and careful mechanics of engagement are needed. There are far bigger, far more complex urban waters on this planet that human engagement turned into putrid, waste-carrying, jelly-ish cloaca. And still it is the same water. The same substance that carries the oxygen and minerals in all of our bloodstreams, cleans each cell and delivers fresh energy.

The visual framework of this book was inspired by a scaffolding structure. The grid supports all types of contents. Ranging from the engineering of water types to personal voices and practices, we tried to deliver a medium that relates all those and is also joyful to look at. It was joyful to make.

This book is unique in content, composition, and form. The 4C+2C production correlates with filtration concepts, turning muddy brown into fresher blue.

Finally, but foremost, I want to express my respect for Katherine's unique approach merging engineering, ecosystem management research, art, and performative practices. This book would not have happened without a lot of her energy being compressed into files, docs and feedback loops. It took a lot of thyme and work to make this happen, let's make it grow now!



Artist/Author's Note

by Katherine Ball



I grew up in Michigan, a state that is divided and surrounded by four of the five Great Lakes. In order to travel by car from Michigan to any major US city outside of the state, you have to drive around at least one Great Lake. On the way, you'll also pass plenty of rivers and smaller lakes.

Growing up, there was a lake at the end of our street, Lake St. Clair. There was also a public pool right beside the lake. If I wasn't swimming in Lake St. Clair, I would swim in the pool. In the winter, when the lake froze over, I would play ice hockey on it and ski in the surrounding hills. Nearly every day of my childhood, I went out to find some way to play with water, liquid or frozen.

For my undergraduate degree, I studied in Madison, Wisconsin, a town situated on an isthmus, a strip of land between bodies of water. I was always walking or biking in between Lake Mendota and Lake Monona. In the winter, I would walk across their frozen expanses and admire those with the daring and know-how to zip around on ice sailboats.

Although Wisconsin has upwards of 15,000 lakes, Minnesota, the state to the north and west of Wisconsin, dubbed itself the "Land of 10,000 Lakes." I spent time there, too, swimming in the urban lakes of Minneapolis and taking canoe trips in the pristine Boundary Waters that divide Minnesota's northern border from Canada's southern border, going days on end without encountering another human. No buildings or stores there, just what our Western civilization and its politics of difference has termed "wilderness."

In 2011, I spent a summer making art projects on Indianapolis Island, which is an igloo-like sculpture and experimental living space created by artist Andrea Zittel on a terribly polluted 35-acre lake on the campus of the Indianapolis Museum of Art. I lived in the middle of the lake, in the floating igloo, and went to work with the intention of "cleaning"

the lake with handmade mushroom filters. I used a rowboat to take me back and forth between the land and the igloo. At the end of the summer, I was leaving Indianapolis Island, rowing to shore with all of my belongings, when it began to rain. I yelled, "Come on! I am trying to help you out!" It stopped raining. This isn't to say that I have power over rain, or that water owes me anything for my efforts, but this is something that happened. Actually, if there is a power dynamic between water and me, it would be the inverse, where water has power over me. If anything, it was a moment that made me open to the possibility that I could communicate with water.

From 2014 to 2015, I lived in another unusual water world, this time in Copenhagen, Denmark, in a house my friends built on a vacant strip of land next to some railroad tracks in the Nørrebro neighborhood. It was a project open to the public called Container City, and, like Floating, had no running water. There was no rainwater basin, just a single rainwater collection tank attached to the roof for washing dishes. I peed and pooped in a bucket and composted it in the yard. I got my drinking water from drinking fountains at local parks, and I showered at the art school I was attending nearby. When it got cold enough, the water in the collection tank would freeze. A few times, someone left the faucet to the tank open, and all the water drained out.

In the summer of 2018, I was at Floating, and the days were long. I remember closing down Floating one evening as night began to darken the sky. Benni was there with me. I was on the middle floor, in the Spülküche, washing orphaned dishes and cleaning the Spülküche itself. Benni was on the floor below, cleaning up trash. I remember the dishwasher splashing on my clothes and shoes, between the floorboards and through to the floor below. I yelled down at Benni, "How am I going to be a princess if I am covered in dirty water all the time?"





Since Floating, I have spent time working at Timelab, in Gent, Belgium. There, I created a more technical and meticulous filtration system that converts rain-water collected from the art center roof into two types of water: drinking water and sanitary water for washing hands, laundry, showering, and flushing toilets. Both types of water are pumped through the entire building. The drinkable rain-water is available in the main exhibition hall. A PDF explaining how the system works can be downloaded here:

Rainwater Filtration System
Description – Timelab – 2023



→ adocs.de/f/rain

As I finish the writing of this book, I still have illustrations to create, and time is running short. The process of writing this book made me realize that, with my pace of work and the energy and cat herding it requires, I wasn't able to participate in the daily rituals of Floating, its ongoing organizing, or its further development nearly as much as I would have liked. Writing about Floating meant that I had much less time and energy to be at Floating, as an artist and as a human. Grasping this irony made me half-chuckle and half-cry. It also helped me realize how far I am from being a professional writer and why professional writers and professors are most commonly the ones who publish books. My hat's off to Beth Marino, the editor who helped me carry this manuscript to fruition. And thank you, also, to her little brother, Teddy Marino, for his helpful touches here and there.

When I began working on this book project, I didn't know that I was going to be constantly making choices between this book and my art, and I didn't realize the toll all of this would take on my body. I also realized that I am becoming less interested in sedentary applications of art. More than ever, I am passionate about working with my body as a medium and instrument for expression.

Jeanne Astrup-Chauvaux, a raumlabor intern at Floating in 2018 and founding member of the Floating e.V. Association, reflected that her experience at Floating may have pulled her out of her profession as an architect and into a hybrid role as an artist and architect. I want to continue to create hybrid art in the expanded field that Floating invited, but I don't think I will be interested in creating expository written records of those creations.

But I will forever be grateful that this book helped me find closure with Floating. I have always situated too much of my identity in my work. For too long, I measured my value by my art and by research. Throughout my time at Floating and beyond, I struggled with self-worth. I found evidence of this struggle when reading the transcript of my interview with Marjetica Potrč, a professor, artist, and architect I admire greatly.

Marjetica Potrč:
About Floating University Berlin, I don't think they can ever get a person like you were so dedicated to the site, and also this is why—

Katherine Ball:
But maybe I drove them crazy

MP: No, this is what I'm telling you. An ordinary person would go in and do something and go out, but you really cared. This is why you were able to bring the moving bed reactor. This is why my students were so motivated. It's all because of you. All these tasks, like cooking straw for mushrooms. My students took it very seriously. It was really, really good.

KB: Thank you.

MP: So I don't think you can ever be replaced with another person. I also understand that they don't have a clue what will happen.

KB: I think I was a bit intense for raumlabor, and I think at one point they really were annoyed with me.

MP: Why?

KB: Because I just was so present. I think it's difficult because it's kind of a control issue, but it's really their baby, this project.

MP: But you made it more than construction. You made it alive.

KB: But I don't know if they know this.

MP: Of course they know. They're not stupid. They've done many projects in their life.

KB: But I also kind of felt like without Lorenz [Kuschnig Lefort], nothing would have happened, you know what I mean? I just put some stuff in some bathtubs. I got the moving bed reactor in the membrane filter there, for sure. And I got some other things to happen, but, for example, raumlabor already has this great idea for making an onsen at Floating next year. And this, you know, it will be beautiful. They can do it on their own.

This conversation really touched my heart. It helped me begin to acknowledge what I, and so many other people, contributed to make Floating University a unique project, one that continues to evolve and inspire today.

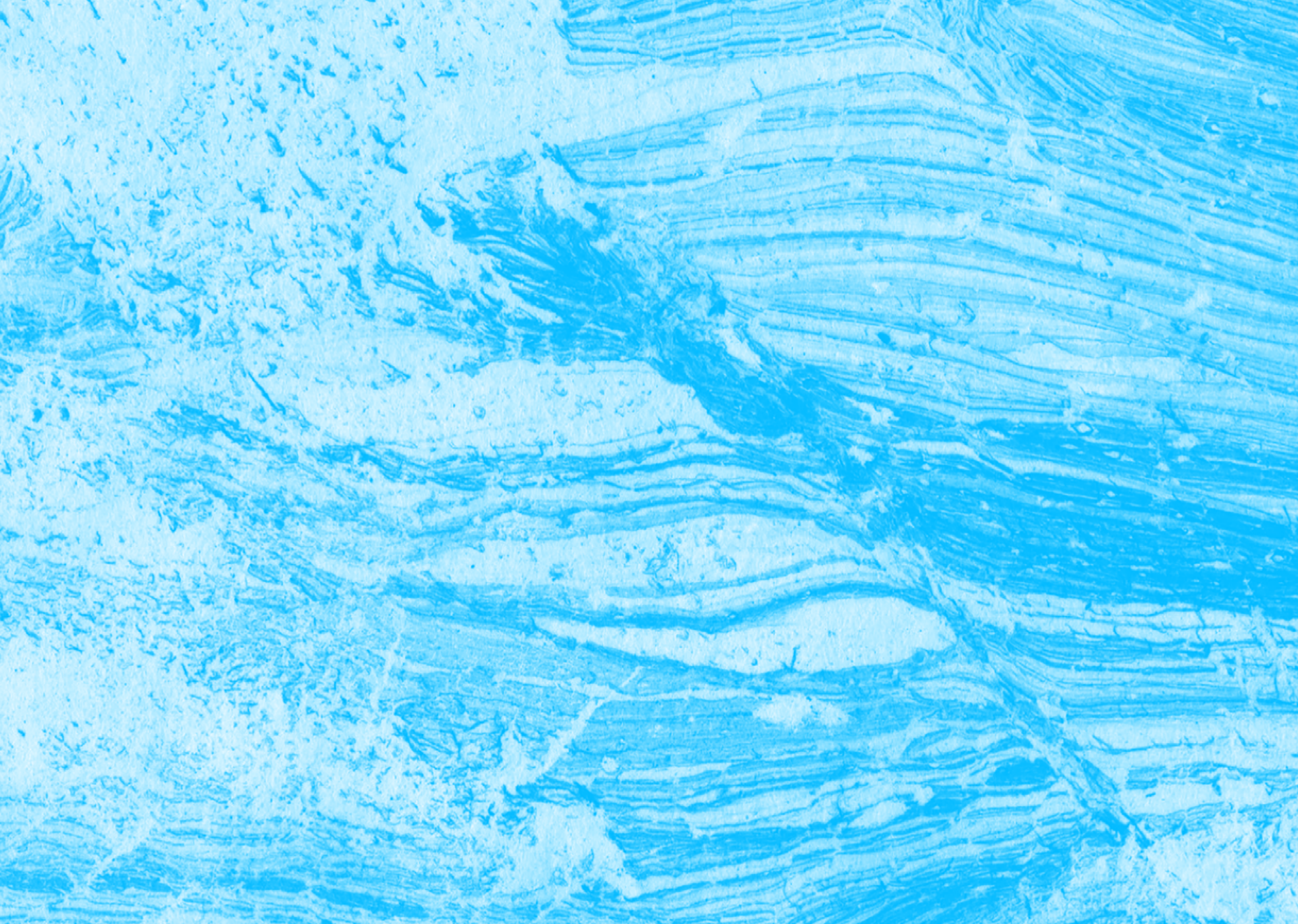


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The Water Runs Through Us flows through water filtration strategies and infrastructures, oral histories and manuals, rainwater, basinwater, blackwater, and many grades of grey-water—all of which emerged from the water filtration systems and water practices developed at Floating University in Berlin.

The Water Runs Through Us invites readers to look beyond the invisible systems that deliver seemingly endless fresh water on demand, to look under the sewer covers, inside the hidden pipes, through the gleaming white toilets, within the garden hoses and sprinklers that mist emerald lawns with drinking-quality water, beneath the habits and expectations that rule our unseen, unexamined relationships with the magical, quicksilver substance that defines, sustains, terrifies, and delights life on earth.

At Floating University, experimental water systems are constructed at every possible avenue. Water cascades down the laboratory stairs and spirals through a series of biological filters, then journeys into the kitchen, bathroom, auditorium, and greenhouse.

But Floating University is no utopia. Its campus is located in a concrete basin that collects the stormwater runoff from the former Tempelhof Airport. The basin is as filled with human conflicts as it is with polluted water. Still, inside this working part of Berlin's sewer system, reeds grow, birds migrate, frogs and foxes abound, algae thrives, insects crawl and buzz. This rainwater basin is a biological legacy—polluted with the remnants, relics, and runoff of nearly one hundred years of post-industrial humanity—and a contemporary inner-city oasis for all sorts of life.

Katherine Ball is a founding member of the Floating e.V. Association and acted as the water filtration and infiltration artist-in-residence at Floating University Berlin in 2018. Katherine has a Master of Fine Arts in Social Practice from Portland State University and a Master of Environmental Management from Yale University. They are the author of *Not Broken Yet: Life in the Mojave Desert* and *Utopia Walks Away: Infrastructure in Copenhagen, Denmark*, and their artwork is in the collection of the Museum of Modern Art in New York.



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