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HARRIET FITCH LITTLE: Welcome to *Design Now* from the Harvard Graduate School of Design, a new audio series that invites you into the school and introduces you to the expert faculty and students working within it, as well as some of the many interesting visitors who've spent time here. My name is Harriet Fitch Little. And in each episode, I'll be guiding you virtually door-to-door around the campus to hear insights from the experts.

Last year in her virtual commencement speech to students at the GSD-- that's the abbreviation I'll often use when talking about the school-- the writer and artist Jenny Odell described the work of design as an argument about how to see the world, about what to pay attention to and in what order. You might like to see this podcast series as a practical application of that enlightening idea. Each episode will be training the lens on a particular issue that designers across all disciplines and across theory and practice are paying close attention to.

For episode one, we're diving in at the deep end with what many in the faculty would consider the defining design issue of our time-- the existential threat posed by the climate crisis. We're going to hear from the people within the school who were thinking most holistically about climate change, people who are thinking in ways you might not even immediately recognize as design-oriented. The first voice you'll hear is that of Seth Denizen, who's on faculty as a lecturer in Landscape Architecture. Later in this episode, he'll talk us through his research on soil and sewage. But here, he begins by setting out to frame how he thinks we need to think differently about the world around us.

SETH DENIZEN: I think the way in which we represent the material world is deeply linked to the climate crisis. So think about the way in which we've sort of objectified the world, the process of objectification not just as a sort of scientific approach, but also just as this basic conceptual approach to how we draw boundaries in the world as a kind of representationalism in which we always appear as really external to the objects we represent. We're never mixed up with them in any way.

I mean, we might think of this as the problem of biography, right? So how much of the author gets mixed up with the object of the biography, even if the intention is to appear perfectly objective and external? And the same thing happens in science. I mean, how much of what we know about plants is simply a reflection of the economic imperatives of colonial botany?

So in order to really confront the challenge of climate change, we also have to confront our ways of representing the world and even the boundaries and the categories that have led us to experience the crisis of climate change in the way that we do. Climate change can appear really different depending on who is looking at it and whose subject-object fictions we find ourselves within.

HARRIET FITCH LITTLE: Now, there are, of course, cultures in which this division between the human body and the world that it moves through is less clearly delineated. But certainly for centuries, the Western model has been one of separation and domination. Martha Schwartz, who we're going to hear from next, is a practicing landscape architect and also a professor here at the GSD. She looks at this issue of framing as one of value. After Martha, we'll also hear some brief opening thoughts from Adriana David, a student at the GSD who has focused her research on food security and food sovereignty.

MARTHA SCHWARTZ: Humans never really understood the landscape as being a value other than what it could produce. It turns out that without understanding the value and the environmental benefits that the environment gives us, that puts us in the position we are right now, which is not a good position. We have to re-understand our relationship to nature.

ADRIANA DAVID: I think we live in a world where everything that surrounds us, we are trying to adapt to our needs as humans without considering that we live in a world that is not entirely human, that we're also nature and that all living organisms in the atmosphere and under the ground, in the soil pretty much everywhere. They're a part of this interconnected world. And if we keep thinking about how to adapt the world to our needs, this is how the system is broken.

HARRIET FITCH LITTLE: These are all ways of thinking that an academic setting makes space for and that applied practice doesn't always. There's the ability to step back and consider the angles from which we're approaching questions, as well as the questions themselves. Often, the most exciting frameworks are the result of combining disciplines. For assistant Professor David Moreno Mateos, who will hear from next, bringing landscape architecture together with his specialism of restoration ecology is a particularly important avenue for thinking about climate change.

DAVID MATEOS MORENO: Landscape architecture is one of the few professions which are actually dealing at a scale that the restoration should be done. Climate change is closely related to, for instance, land use change. So as we are losing forests, we are increasing the amount of carbon that is in the atmosphere. So climate change is not only coming from fossil fuels. It's also coming from deforestation.

And I think landscape architects have a great role. I think that discipline needs to change a little bit probably in the school, because most of the landscape architects are focused on very specific sites, specific regions, specifically mostly in the urban context. But I think that can change. I think landscape architects have a great opportunity to expand the scale at which they work. And that is where ecology comes into play, because ecology usually operates at a global scale.

HARRIET FITCH LITTLE: For David, these issues all begin right on the school's doorstep. One of the courses he's been teaching in recent years is on rewilding Harvard and trying to reconstruct a vision of the area's pre-colonial ecology. Now, restoration ecology is a line of inquiry that encourages us to think about how we could return damaged ecosystems to something approaching their natural state.

But for Martha Schwartz, who we heard from briefly earlier, the solution to humanity's greatest problems must be found within its greatest metropolises. After all, only a privileged minority might tackle the climate crisis by going off the grid on self-sufficient parcels of land. As Martha explains, it's our cities that urgently need to be retooled.

MARTHA SCHWARTZ: What would happen if we were to take all the streets in Boston-- let's put it in 2050. What does Boston look like? What are the climate change projections? What are the issues that we have?

And given that, how do we use the public realm landscape of the city, which is the biggest infrastructure a city has, how can we reshape it to really address the issues that the city is going to be facing, including new technologies that are starting to come on board, like automated vehicles. And what is that going to look like? What opportunities do we have?

So the conclusion is that if we use city streets in a way that really added benefits, we could plant linear forests in streets. And forests are different than street trees. And you have to kind of go back to understanding how trees work, which most people don't understand. And that is that trees communicate through their root systems.

And they communicate through fungus. It's mycorrhizal fungus. You really can't see them. But there are millions and millions of miles of almost unseeable fungal strands. And the fungus actually is able to create enough water to bring up to the trees, because they increase the surface area where water can be absorbed.

And the trees provide sugars to the fungus so that it has energy. So it bores through rock. So the fungus sends up different kinds of minerals, like magnesium, which is central to photosynthesis and leaves. And the fungus brings up water, minerals to the trees. The trees brings down sugar.

So there's a completely sympathetic relationship to these trees and the fungus. So without that, with having a tree stuck in a pit or in an area that can't reach other trees, they live a lot less long. They create far less environmental benefits, such as bringing down carbon dioxide, other greenhouse gases, and collecting aerosols, taking out pollution, creating biodiversity, allowing the water to soak back into the soils and down into the Earth to replenish your aquifers, and also cooling down cities, which there is really no other solution to just plant more trees in streets, which go everywhere and deal with the issue of climate inequities, and could distribute the cooling effect throughout the cities.

One of the things that most people don't understand about climate change is the fact that we've been putting carbon dioxide up into the atmosphere for like 100 years. Mostly, most of it came in the past 30 years. But we have something like 1,500 gigatons of carbon dioxide up in the atmosphere. And a gigaton is a billion tons. So it's 1 trillion, 500 billion tons of carbon dioxide up into the atmosphere.

And carbon lasts a very long time in the atmosphere. So it could take hundreds and hundreds and hundreds of years for it to somehow reintegrate back into the systems of the Earth. But unfortunately, even the Earth and the oceans and the trees, they have a limit to how much carbon dioxide they can take down. So there's a stop point. They can't take down everything. And also, if we were to stop emissions today, the Earth would continue to heat up.

I wanted to put mitigation into the pedagogy of the GSD, because pretty much the attention has been on resiliency and adaptation. And all of those are needed. But mitigation is going to the root of the problem, which is carbon dioxide. And unless we understood that issue and the scale of the issue, we would not be able to really even start to address the solutions or what we can do.

Architecture puts the carbon up. We bring the carbon down. Why? Because we're dealing with the Earth. And it turns out the soils bring down carbon dioxide and sequester them, and the plants and the trees and the grasses, everything that is green, the phytoplankton, everything that has taken out carbon dioxide.

So I started to be thinking about landscape at a scale, a scalar idea. And that even under the topic geoengineering, there is this natural carbon dioxide removal that if done at a scale is considered geoengineering, because it could affect the climate. If we planted more trees, if we took off all the hardscape in cities, if we were to rethink our approach to agriculture and do regenerative agriculture, there are so many landscape-based practices that if we were to do at scale, we could make fantastic positive impact on climate change.

HARRIET FITCH LITTLE: This idea that cities need to be a part of the solution is also something that Seth Denizen comes back to. In Mexico City and the surrounding Mezquital Valley, he's been working on a project called the Right to Sewage. Almost 200,000 acres of land in the valley have been successfully irrigated with the untreated sewage of Mexico City. Without it, this huge swathe of agricultural land would be a desert. But there are complex consequences to fertilizing agricultural ground with human waste water, as he now explains.

SETH DENIZEN: If we're going to make a proposal for what wastewater urbanism looks like, on the one hand, we need to ask what it should look like in the context of a specific place. So in our context, Mexico City and the Mezquital Valley agricultural system. But we also need to ask what it looks like globally. So for us, any proposal for wastewater urbanism, no matter where it is, requires an understanding of urban processes as inherently agricultural processes and agricultural processes as inherently urban ones, because they're essentially closing the loop between the production of organic matter and the recycling of that organic matter in a process of conservation of water in dry areas.

It also requires taking a relational approach to matter in the sense that we're really trying to follow the flow not of organisms so much as atoms. So we're interested more in, for instance, things like nitrogen and phosphorus and lead than we are in any particular crop, like lettuce or alfalfa. And on the other side of that, we're also interested in the relationship between those atoms and urban processes.

So, for example, where does lead come from in a city? Where does arsenic come from in the Mezquital Valley? How is nitrogen lost to the atmosphere as a greenhouse gas or stored in the soil where it can be taken up by plants?

I mean, these are the sort of atoms that are flowing through urban and rural systems, cycling back and forth, some kind of moving back and forth quite locally, some taking really global trajectories. And to really make a serious proposal for wastewater urbanism as a sort of landscape means trying to think with that movement, between the flow and the movement of atoms that are essential to agriculture and also material complexity of the urban environment. I mean, I think this is why it's become such an interdisciplinary project in that in order to understand those flows as landscape architects, we actually have to rely on gas chromatography.

I mean, basically there's no other way to figure out how these elements are moving through our landscapes than through understanding the gas chromatography of our wastewater or of our soil. And in order to understand that, we really need interpreters. And ideally, those interpreters then also become collaborators.

And in the way that maybe normally as landscape architects we're sort of focused on connecting landscapes to organisms, to species, and in understanding those species in their sort of ecological and cultural value and also in their landscape histories and things like that, in this project the organisms have sort of faded into the background. Some of them have become quite prominent, like pathogens. But really, the movement of atoms, the basic matter of wastewater urbanism has really come to the fore in a real way.

And I think that's the sort of challenge of this particular landscape project. The challenge is to shift the focus and the emphasis of our landscape work from organisms to the flow of matter more generally, and yet still somehow maintain a sense of the specificity of the place where we work and in the way that it assigns cultural and political values to that matter and those organisms, and also in the very specific way that it imagines its own environmental future.

HARRIET FITCH LITTLE: This emphasis on following particular atoms through the system might seem abstract. But it relates to one of the most significant side effects of wastewater reuse as a solution. GSD lecturer Montserrat Bonvehi Rosich, who worked alongside Seth on this project in Mexico, explains the challenge in more practical detail.

MONTSERRAT BONVEHI ROSICH: We think that the wastewater agriculture is here to stay. It's climate change, but with the increasing population and then the amount of waste and the drought areas in the planet, we will all need to look at better at the water that we use and reusing it as much as possible. There is historically places in which they have used wastewater to do agriculture. In the surroundings of Berlin, they did that. But I think in less than two decades they had to stop, because the vegetables were taking part of the pollutants of the soil. And they were no longer were able to produce.

But what happens, Mezquital has this incredible soil that actually have the capacity to attract, trap, and really contain heavy metals. So heavy metals are part of the main problem in terms of these particles that move and can enter to the vegetables, to the plant. And then when you harvest, you have components of that.

But that is part of the success of Mezquital Valley. It's basically that even if you have them floating in the water, as soon as they are infiltrated in the soil, they get kind of trapped and encapsulated. And this also it's possible because of the great amount of organic matter that it's in the water.

We also think that the cities should do a better use of their water. This means that this huge amount of water, 60 cubic meters per second that is sent from the Mexico City to the Mezquital, we think that needs to be reduced. So it's important to understand that all the big agricultural footprint that the Mezquital has now maybe will need to kind of shrink.

And this is an opportunity also to start rethinking, what is really the Mezquital? Because we think that the Mezquital, if you go and you see the aerial view, you see this incredible valley, patterns of fields, all green, but used to be a desert, and used to be a desert inhabited by the Otomis. And the Otomis were a population that understood the landscape deeply. There is all these studies that say that the Otomis, with no water, were capable of producing almost more proteins than other communities that were using irrigation. So they had this deep understanding of what was able to produce and which was the best way to kind of harvest and choreograph decisions.

HARRIET FITCH LITTLE: In that clip we just heard, Montserrat mentions the Otomi, an Indigenous population of the Mezquital Valley, and the fact that they seemingly had the ability to make the desert yield food without huge systems of irrigation. Adriana David, who we heard from briefly earlier, is interested in overlapping issues from the perspective of food sovereignty, which is a model that advocates for people to have control over the way food is produced, traded, and consumed. She has also often worked in Mexico City, with a focus on tracing the roots of urban food instability.

ADRIANA DAVID: First of all, food sovereignty is different from food security because it takes care of the sources. It thinks about where the food comes from, how the supply chain works, who was hired to grow that food, where it is stored, how it is sold instead of just having the food on the table. What I like about food sovereignty is that it touches many ideas of solidarity, of political autonomy, of dignity. Also it's about storytelling, which I think is beautiful.

I think it's one of the most important parts of reconnecting with our food. I want to create awareness. And I want people to understand the great damage industrial agriculture is doing today to nature, to our health, to labor, to agrobiodiversity, which is actually the key to a resilient future on this land.

HARRIET FITCH LITTLE: To finish, we're going to return to the architecture of city spaces and the perspective of Martha Schwartz. The first thing she wants to point out here, and it's something we've seen come up throughout this episode, is that no single solution to the climate crisis can be applied in isolation, in the same way that no single issue caused by climate change can be isolated.

MARTHA SCHWARTZ: There needs to be somehow a flushing out of the 20th century modernism ideas that you put the buildings in and then you figure out where you're going to put some trees. That almost has to reverse, because every city is going to need to produce their own food. Every country by 2050 has to be self-sufficient. So countries are not going to be so game to be sending off their food if they can't provide for their citizens.

So we have to make sure that we can grow fruits and vegetables inside of our cities. We have to have access to clean water. We have to make sure that we can get those inside the cities.

We have to make sure we can deal with urban heat island effect, which is an incredibly difficult and dangerous situation. What can we do with that? Nobody knows, except you could plant trees in your streets that are more than just being pretty. You can really plant these linear forests.

We need more people coming up with these ideas for how we build our cities. What about materials? We need materials that are higher albedo. We need materials on the ground plane that allow water to percolate. Why? To feed the trees.

And the trees create all these benefits. But not only that, we're drinking out our aquifers. Why? Because we thought we would always have water in our aquifers. That was a mistake. We don't. And it takes a long time to replenish.

But they need to be refilled. And we have to build our cities to be able to do that. And we have to build for social equity and climate equity. There are so many things that we need. We just cannot go on business as usual.

And then the last thing is that we have to reshape our culture, because if everybody lived like we live, like I live, probably like you live, like a lot of people live, we would need four and a half Earths to provide the materials for our consumption. So how are we going to do that? Geoengineering won't help that. We have to change our ways, our way of thinking, maybe our economic systems. Yeah, we absolutely need to do that.

I think it's really important to have a bigger picture, to be able to have enough information that you can speculate with some amount of confidence. I'm able to explain to my clients what they're probably looking at in 20 years or 30 years. The first thing I asked is, well, how long do you envision this project living? Some people want to flip it. Others, it's an investment. Others, it's a cultural situation.

So it's like OK, well, if you're going to flip it, I don't really have much to tell you other than just flip the damn thing, because you're not going to spend any money. You're not going to invest in it. And people who don't know what's going on are going to buy it. But I think the most interesting ones, the ones I really care about, are exercising what we know is landscape architects and planners and designers to really both educate the clients and tell them that actually, we can do something that could make a big difference, and teach you about it, give you ways of really looking at it yourself so that you can prepare for the future.

These go beyond-- they go beyond landscape architecture, right? So what am I talking about? What is this landscape architect talking about? Well, I think that they're all relevant. And the more that we have a basic understanding of what our new Earth is looking like, we can't go forward. We have to understand these things.

HARRIET FITCH LITTLE: Thank you for joining me for this brief tour around some of the fascinating and varied ways in which people at the Harvard Graduate School of Design are addressing the climate crisis right now. There will likely be areas where you think, and rightly so, that we've only really scratched the surface. To help you dive deeper, the show notes of this episode contain links to research from everyone you heard from today.

Thanks to Seth Denizen, Martha Schwartz, Adriana David, David Moreno Mateos, and Montserrat Bonvehi Rosich for sharing their thoughts and their time. This podcast was produced and edited by Maggie Janik and hosted by Harriet Fitch Little. To learn more about the Harvard Graduate School of Design, visit us at GSD.harvard.edu and follow us on social media @HarvardGSD.