

Paul Thies: Thank you for joining us for this next episode of Jacobs, If/Win podcast series. I'm your host Paul Thies and on this episode our topic of discussion was biomimicry, which is the science of using naturally and biologically occurring processes and organisms as paradigms [00:00:30] for the design and manufacturer of a variety of materials, products and built environment structures. To dive into this topic further, I spoke with Nicole Hagerman Miller, the managing director of Biomimicry 3.8, the world's leading bio-inspired consultancy as well as Monty Wilson, Jacobs vice president global market director for the built environment and Chris Allen, Jacobs senior consultant, sustainability and resiliency. Now Nicole, [00:01:00] to kind of get us started, I'd like to first ask you to tell us a little bit about what biomimicry is so we can kind of set the table for today's discussion?

Nicole Hagerman...: Sure. And thank you for hosting this today, Paul, it's great to be here and talking with Monty and Chris about this topic. So biomimicry is the conscious emulation of nature's genius is kind of how it's formally defined. So what do we mean by that? And ultimately it's really looking to nature and [00:01:30] 3.8 billion years of life on Earth to identify really time-tested strategies to solve today's challenges. And because we're mimicking nature with these time tested strategies, we're ultimately de-risking the animation process and we're delivering outcomes if done accurately are inherently resilient and regenerative.

For example, you've got the darkling beetle, which can get water that they need from dew and ocean fog, they live in the Nambian [00:02:00] desert, right? So they can get water from use their very own body surface. So researchers are studying these beetles as well as synthetic surfaces inspired by the beetles body to uncover the role that this, the structure of the beetles body can play as well as the chemistry and behavior it can play in capturing water from air, right? So these kind of fog nets and things of sort that are really inspired by this incredible phenomenon that happens in nature and [00:02:30] so ultimately what can we learn from how that beetle captures fog and creates water from air in terms of how we might design cooling systems in our buildings, for example.

Paul Thies: Hmm, interesting. So when I first was thinking about biomimicry and kind of looking into this, I was originally thinking about things like vehicles and tools and things like that, things that would emulate a physical body and that sort of thing. But then when it was looking further, it's like we're Jacobs exploring [00:03:00] this topic in terms of the built environment which is like large scale architectural projects and things like that. And so it got me really curious to, how are we doing that? And so Monty, what was it about biomimicry that made it a critical component for Jacobs vision, for the built environment?

Monty Wilson: Great question and probably a topic Paul, that I could talk about for a long time, this journey in [00:03:30] exploring that very question, how does biomimicry influence buildings, architecture, cities, the built environment has been one that we've been on for well over a decade now and Nicole and Janine Benez, the founder of B38 and Chris and I started that conversation to really look. As Nicole

just said, how do we emulate nature's genius? Not just around the design of a thing or a process that we see in nature every day, but how do we take that genius and apply it [00:04:00] to this conversation around holistic sustainability, triple bottom line based sustainability. So we talk about building performance and building systems and building skins, but then we zoom out and have to think about the interconnectedness of transportation systems and distribution of goods and water distribution systems and water recapture.

And it's all right there in the notion that biomimicry allows us to do two things really, I guess. Is one, that we [00:04:30] all have this inherent connection to nature at some level. So we're talking about sustainability beyond just a rating system or the notion of doing less harm, which is generally what most sustainability metrics have historically been set up to do, let's do less harm. So looking at nature really allows us to drive those best practices that, as Nicole said, been proven for such a long time into the design of our buildings and our places and [00:05:00] to take that notion of sustainability beyond just a metric, beyond a rating system and to truly be an integrated approach and a systematic approach to sustainability. So that's a part of why it's so exciting from the built environment perspective, but I'm also, and maybe we can talk about this a little later, I'm convinced that biomimicry is going to have a big impact on Jacobs as a entire enterprise. So that's even the bigger, potentially the bigger story.

Paul Thies: Well, and I think it's fascinating because you think about [00:05:30] how most urban centers and stuff have evolved over time. It's a lot of times it is based off of plans that have been laid down for trees, particularly in say like Europe or whatnot. And so they weren't necessarily thinking about what are the best practices that are going to mesh with the delicate balance of the environment and with life. And so now we're starting to think that way, and you're building [00:06:00] things not just for today, but for the long haul. They're going to carry on for years and years. So Chris, to bring into this and to give our listeners some context on biomimicry and action in the built environment space, I'd like to ask you about some of the Jacobs projects where biomimicry has played a role. And one of these examples that was shared with me was for a client in the city of Safi, Morocco... Hope I said that right. How [00:06:30] did Jacobs leverage biomimicry to enhance how the client viewed their project from a sustainability and local natural history perspective?

Chris Allen: Thanks, Paul. It's a really fascinating kind of case study of applying biomimicry in Morocco. In this case, the client is a big industrial producer of phosphorus products. And as you know, Morocco is one of the leading global producers of phosphate products and so had an older, industrial plant that was doing phosphate beneficiation [00:07:00] right on the coast. And the plant had gotten quite old and become quite inefficient. They had quite a growing pollution problem associated with that old plant and so when they called in Jacobs to think about master planning the new plant, we started looking at the site and very large scale site right on the coast of Morocco and trying to help them solve

pollution problems, local environmental impact problems. So one of the first things we wanted to know, well what's inherently on that site?

What's going on [00:07:30] the proposed site, what's happening there, ecologically environmentally, and what do we need to know? So we called in Biomimicry 3.8 and they came and did their study called the nature of place, which really looks at the natural history, looks at the ecological dynamics of that place and then translates that biology and ecological knowledge to designers. And that's really where a lot of the values created here because a lot of times designers don't typically have a background in ecology and environmental and from a design perspective. So [00:08:00] B38's nature place process goes to that site, extracts all the ecological wisdom and the value and says, "Hey designers, if you want to design something that's really fit to this place and that can perform well here over time, these are the things that you need to be looking at. Here's how the desert operates, here's how the coastal dynamics operate, here's how the organisms that have been here for thousands and thousands of years operate and we should be looking at these types of design principles when we're thinking about master planning this place."

So it kind of opens up not only the design [00:08:30] team, but also the client to a new way of thinking about that site and it's also called the genius of place. What's happening here for thousands of years that we need to look at and understand and evaluate before we start designing, because there's again, there's just a lot of wisdom and value there that can be extracted.

Paul Thies: And it's interesting and it's a little outside the scope of today's discussion, but I can't help but think that the work that y'all are doing and this kind of work in biomimicry and built environment is going to influence how future generations [00:09:00] of architects and engineers and people who plan and build built environments approach these, ask these questions and then look for answers, so. Now Monty, there was another Jacobs project, the Red Sea Reserve, which was a competition concept, master plan submittal for a special economic zone in Saudi Arabia. I'm going to ask you and Nicole both to weigh in on this a little bit, but starting with Monty, I understand it was a massive [00:09:30] project and that there are some terrific scalability opportunities that biomimicry can provide for resilient solutions. So starting with you Monty, could you tell us a little bit about that project?

Monty Wilson: It was a fascinating journey and as you said, Paul, the size of the project from a land area perspective was enormous. There was on the Red Sea coast, sort of in northwest Saudi Arabia, north [00:10:00] of Jeddah and the land area is roughly the size of Norway. It included active volcano and lots of other interesting ecological features, natural features down to the coast and then an island Archipelago, that's roughly the size of the US Virgin islands. So 63 or something like that in terms of numbers of actual pristine coral reefs and the number of islands in this island, Archipelego and the idea was to master plan this as a new [00:10:30] global tourism destination. And the client, who is the public

investment fund in Saudi, really put a brief out there that said, "Think bold, think big, think unlike anything else that exists anywhere in the world and we want this to be the model and example of sustainability."

So it became an easy call to make for us to reach out to the call team and say, "Look, this is what they're framing our ideas to go big here and really push [00:11:00] the envelope for the client, but also for ourselves." And that's really what we did to answer some of these tough questions. How do you develop a world leading resort in pristine Red Sea coral reefs, one of the last pristine coral reefs truly in the world. Not to mention all of the land-based development when you think about waste from resorts, moving people in goods and all of that back and forth to islands, how do you deal with transportation in that carbon footprint? So we really, we could have a podcast on its own [00:11:30] just talking about the amazing ideas that Nicole and Janine and that team brought to Jacobs and I think the partnership was just yet another example of what really is possible.

Paul Thies: And then Nicole, can you weigh in on the scalability aspects of biomimicry? Because not every project of course is going to be like this, this huge endeavor and some are going to be smaller, but what kind of scalability aspects could we see from here?

Nicole Hagerman...: One of [00:12:00] the things I love most about biomimicry is one, it can apply to any challenge and is industry agnostic. So whether you're at the front end of innovation, just thinking about it or you're you midway through or in a tailpipe solution, you can start to use it in a way to just kind of open that solution space. So to your question, the scalability, one thing that, particularly when we're talking about at the built in environment, one thing that we often talk about is that we can look at [00:12:30] it from the building the exterior, the interior, the operations of the building and really make an impact for applying that thinking to the site itself, which is fantastic in terms of creating a site that is moving towards regenerative performance. However, I think what's most exciting is that the ability to demonstrate this is what this site itself can do.

But if you get your neighbor [00:13:00] involved, if you get other corporations and have kind of closed loop systems and industrial symbiosis and you get the city involved and you get this kind of expansiveness and it is quite infectious, I will say in that once you start thinking this way, it's kind of like that moment where you're like, "It's so obvious. Why didn't we think of it like this before?" And so as you start kind of exposing people to these ideas and these concepts, [00:13:30] it's really quite attractive to start to think this way and the benefits become much more powerful at that scale, at that district scale, at that community scale. And so that's where there's real opportunity in kind of demonstrating what's possible and really making these kind of moves towards regenerative and I think to the project that Chris was talking about earlier, one thing that we've found that plays into the scalability is that, and Monty [00:14:00] hit on this a little bit, no one like hates nature.

Everyone pretty much has a positive association with nature typically through childhood or something. So there's an emotional, positive connection to it. So when you can bring that into the design process to say, "We are emulating this local species because this is what it does to this environment. This is how it benefits that environment." It actually becomes an engagement [00:14:30] tool and a tool that can really democratize a conversation, particularly in development which can be quite emotional in terms of land use design, all of these pieces. And so by bringing the biology into it, you immediately kind of democratize and remove the emotion from a human centered space into one that is, "Oh, wow. I can see how this Jack rabbit does countercurrent heat exchange and this is a local species [00:15:00] and, oh, wouldn't it be great if we emulated that in our heating and cooling systems here in this building?"

So there's multiple points in which it becomes really powerful tool in the design conversation in the front end and then as it starts to become applied and implemented and that story is told in terms of the impact, how it then scales out to outside the four walls of the building and in the community level as well.

Paul Thies: And I could see how [00:15:30] the enthusiasm can be infectious and then that's where there's really a drive to try to find real solutions. And it's, kind of like what you're saying, it's not really that there's a vested interest in doing it a certain way because this is how our organization does it, but rather it's that consensual respect that people would have for a natural process or the beauty they're in. And it's like, "Oh, let's emulate that. That's really cool [00:16:00] how that works," and then it kind of takes, like you said, it takes some of the emotion out of it or that self-interest and it becomes more about solving what's the best part possible solution.

Chris Allen: I'll throw in another angle here too, Paul is in that innovation requires us to think differently. And so by approaching these problems with the biomimicry lens, you begin to envision or conceptualize the problem in a completely different light. And just by taking [00:16:30] teams off of their typical track of doing things and saying, "Hey, there's another way to think about this problem, this opportunity and look at it through this lens." One, it changes the vantage point, which kind of creates the open space for innovation and then two, it's just a huge creativity engine because all these ideas for potential solutions that we're not there before suddenly are on the table and people get excited about that and thinking differently and the cross-disciplinary collaboration when you have landscape architects and engineers talking to biologists, [00:17:00] talking to community engagement people, the velocity of ideas just goes through the roof and it's pretty exciting.

Paul Thies: So my next question, and it's kind of this is very much related, we'll kind of step back for a moment because we're right now we're talking about when organizations kind of know about the beauty and the benefits of biomimicry and they're they're all in, so. But Chris, let's start with you and then Nicole, I'll ask you to also weigh in on this, but [00:17:30] let's talk about the role biomimicry

plays and how corporations make decision about their assets and the future of the business. What has led them to embrace biomimicry to begin with and how do you see them reacting to the solutions?

Chris Allen:

Well, it's still relatively new to most corporations, but there's a handful of companies that have really begun to embrace it. And from my perspective, there are the leading companies that are looking for the front end of innovation [00:18:00] when it comes to sustainability and to Monty's point, some companies are ready to get into that space of going beyond doing less bad and getting into real positive impacts, really making tangible, verifiable, regenerative impacts for their employees, for their communities, for their customers. I think it's those communities that are looking to biomimicry and other modalities to say, "We can change the framing of sustainability from less bad to positive impact."

And that's really been [00:18:30] the brilliance of B38 to say, "We can all not just say positive, we can begin to measure it and verify it and we have science to back that." And I think the companies that are ready for that kind of conversation, ready to implement are the ones that B38 and Jacobs are working with together to kind of say, "Well, this is how we would implement it." And I think the journey really started with the pioneering company interface and I'll invite Nicole to kind of talk about that and maybe, as a beginning case study and then maybe we could talk about forward a little bit, [00:19:00] Nicole?

Nicole Hagerman...:

Well, I think first to your direct question, Paul, I think one reason companies really embrace this is that first and foremost it's science based. We're looking to biology, we're inspired by that, we're creating strategies that are science based. So I think that resonates with a lot, particularly those in the engineering space, because it does have that grounding. And then I think the, to Chris's point, because we're bringing an entire new set [00:19:30] of strategies, an entire new way of thinking to the table, I think what's happening now, particularly in corporate environments is that companies recognize, as Chris said, they can no longer do less bad. Off the table, you have to be thinking in that space of regenerative and positive and understanding the value of nature, that so much of the revenue that is generated is contingent [00:20:00] upon all of Earth's systems working well.

And so that natural capital and the stranded assets that would exist if we didn't actually design in a regenerative way. So I think holistically companies are starting to get that, that "Oh, we have to act in a regenerative way if we want to survive as a business." Ray Anderson of Interface said it quite well, "Show me the business model of not being sustainable. You're eventually [00:20:30] going to not succeed if you're not acting in this regenerative way."

And I think we're coming to the point now where there's more science, there's more information, there's more data about the value that nature plays in our businesses directly to the revenue of our businesses. So it's in our best interest

to protect that, to create life friendly design. So I think that it's much more of a business conversation that we can or there's much more data that we can bring to having a very [00:21:00] financial conversation around why this is important and not just like a cool thing do or something that's kind of like a fun design project, but like, "No, this is actually essential to how we operate our business."

For Interface, they've been a longstanding client of biomimicry and they've embedded biomimicry in their thinking. And we have this saying, "What would nature do?" So at every kind of challenged junction [00:21:30] in the company, it's like, "Okay, well what would nature do here?" That's embedded in their ethos. And so for them, when they were reaching their 2020 sustainability goals, about five years prior to that we were sitting around a table and asking the question of what's next. And the question became of, well we're reaching our carbon goals, we're reaching our waste goals, we've kind of come to net zero [00:22:00] and what's beyond zero? Because one, and Janine Benez says this really well, "There's nothing super inspiring about reaching zero." It's like this going to the bottom.

So what's beyond that? And that's really kind of what started this conversation of what does it look like to act in a way that is positive? How do we set positive goals? And there was about that time, 2015, there was this conversation of what [00:22:30] does net positive look like? There was a, just starting to surface as that conversation and for us, it really became about, well how do you define positive? And Janine, our founder had this really kind of aha moment where she was flying over our community as she was returning back home and she saw the forest and the city as kind of two separate things. You could see the clear boundary and it became this conversation of, well what if the forest [00:23:00] and the city were functionally indistinguishable? And what we mean by that is what if the city was performing at the same rate that the forest next door in terms of the amount of carbon that was being sequestered, the amount of air that was being filtered, the amount of soil that was being generated, the amount of biodiversity that was being created?

What if our city and the same way that the forest next door and what we've evolved and develop from that is we can actually quantify how our forests [00:23:30] are performing in that same way we can measure the carbon, we can measure the soil, we can measure the biodiversity. So what if that becomes our definition of positive and that becomes a standard of which we design to. And so it was a pilot project with Interface called Factory as a Forest that the factory function like the forest next door. And that was our first time in really applying this methodology of creating performance standards on par with the ecosystem next door, creating design [00:24:00] interventions that helped us move towards that. And from that pilot, Interface is just an incredible thought leader who's willing to put their neck out there to try things.

And so we piloted this and then we talked about it and we said, "This is what we've learned, this is what we found." And out of that, we had the opportunity

to kind of share that example at sustainable brands and Ford heard our presentation and was really interested to learn more and to see [00:24:30] how they could apply that to their manufacturing facilities. And so that embarked a two year conversation with Ford around that and simultaneously, Jacobs has this incredible partnership with Ford as well and so as we started talking with their sustainability teams around the work that we are doing, the value for us, we can bring that thinking in the methodology, but what Jacobs brings to the table is the tools [00:25:00] for design and implementation. And so for us collectively as a team to say to Ford, "Here's this thinking, here's this framework, here's this kind of performance bar that we're aiming towards. Here's the biology that can help us solve for it."

And then Jacobs with the design team and the engineering and operations and implementation, we could really go to Ford with an all-star team, if you will, to say like "From end to end, this is what it looks like to implement." And [00:25:30] so we've really been piloting with Ford over the last year, applying this thinking to four different sites and really have a great partner with Ford and thinking through this in real time in terms of what this looks like and how it can be applied. So it's been a really fun journey. I think we're all, we're learning very much as we go. I don't think anyone from B38 or Jacobs would say, "Here's the magic bullet to solving regenerative plug and play," but just having those partnerships to really [00:26:00] explore that thinking and apply the thinking has been pretty exciting I think for our teams.

Paul Thies: No, I think that's fascinating and Monty, I can't help but think that there are organizations, probably quite a few, because as the attention and focus on sustainability and doing no harm and, doing good, I think all of that energy is there, but they may not know where do you get [00:26:30] started? How do you get down? It's like okay, we have all these plants or whatever around the world and how do we start, how do we change that? But I can't help but think that they're probably, there's a real need out there for people to understand. And now part of it too, biomimicry is influencing Jacobs as well and how we do things and how we approach and solve problems. Can you share a little bit about that approach and where we're seeing those benefits [00:27:00] the most?

Monty Wilson: Happy to, Paul. I think you just made a point that I think is really appropriate here because there are multiple ways to introduce this concept into a team, into an organization and typically you'll find the designers or those that are leaning into the sustainability sphere maybe are the ones that are going to get connected first. I've kind of described it before, which is probably not good in the time of a pandemic, because you kind of get a little infected with this thing and you can't help but [00:27:30] want to know more. And the first time you get that exposure, you're intrigued, but the second time then you're kind of hooked and then beyond that, you've got to know more and figure out how you can really apply it. And so we had our teams that both Nicole and Chris are talking about doing cool work around the world that we're really passionate about it.

But one of my favorite stories about how this is really taken off within the organization is right as we were going through the integration with Jacobs and the CH [00:28:00] two team, Bob [Regata's 00:28:02] leadership group was meeting and Louis White and the team that was setting up that agenda reached out and said, "Well, what about Janine Benes coming to help this team as sort of the keynote guest speaker for this small 30 person leadership meeting? We're integrating two organizations. There've got to be some lessons from their work on how organisms combine and come together." And so that was the basis for Janine sitting in front of Bob and Donald and the leadership team [00:28:30] of that group to talk about biomimicry, not from the design of a thing or a building, but the design of an organization. And it really cemented within that group the possibilities.

Then of course, a year or so later in Vancouver Janine was the keynote in front of 400 Jacobs leaders, really expanding on the idea of how biomimicry could really impact a diverse organization like ours. And that's what we're finally seeing today with this partnership [00:29:00] and the work that's going on. We've got training cohorts that met last week that are meeting this week. So we're spreading this news, if you will, throughout the organization that can have an impact, like I said, at the beginning, within the built environment, but in really every aspect of our company, both from an internal and of course how we serve our clients and serve our communities.

Paul Thies: Oh, that's fascinating. Chris, do you want to kind of get your insights as well from where you're sitting? How are you seeing it playing out [00:29:30] within Jacobs and what are some of the things you're hearing and seeing from your peers?

Chris Allen: A lot of excitement, Paul. I've probably done 10 or 12 internal presentations to different communities of practice over the last year, I would say. And because I'm the liaison with Biomimicry 3.8, I'm kind of called on to give the elevator speech or the paragraph or the proposal or something like that. And it's really ramping up as biomimicry increase, kind of becoming [00:30:00] known within the company. It's spreading and people are excited about it and especially young folks within Jacobs. Beginning of their career, just find it so fascinating, excited. And for me, it's a delight to be able to share this with people within Jacobs because I'm so passionate about it and when I see other people get excited about it, we get excited together and the conversations just take off. And so I think it's going really well.

And as Monty mentioned, we have a cohort of 16 folks that are now going through a training. [00:30:30] We had our first session and this is really, they're kind of chosen within the company to be what we're calling the communicators catalyst and connectors within the organization that kind of help bring the ethos, the different aspects of biomimicry into the company so they can kind of infuse both the culture and then also we'll be able to deliver it efficiently to our clients on projects. So I think it's going really well, I'm super excited about it and

I really appreciate you putting together this podcast so that more people [00:31:00] can learn about it too.

Paul Thies: Well, I'm glad to do it. And a team of folks that I get to work with and they actually had approached me and said, "Hey, what do you think about biomimicry as a topic?" And I said, "Love it. It looks really interesting and really fascinated to learn more." Nicole, let me ask you just kind of as our close, on this topic, so as somebody outside of Jacobs, you work with other companies to try to help them [00:31:30] embrace the biomimicry ethos, as Chris has said, and what are you seeing? What are some of the lessons learned in your experience partnering with Jacobs? What's Jacobs doing that you see that other organizations could learn from and what are those lessons that you think are really relevant in this discussion?

Nicole Hagerman...: One thing that's been really fun to watch [00:32:00] is as Monty alluded to, is that it's not something that is looked at as a quick win for a design. It's something that is really taken holistically across the application level at the leadership level. And I think one thing that's really telling, we had as Chris and Monty both alluded to, this training our first session was last week. And when we [00:32:30] talk about biomimicry, we talk about how B38 does biomimicry is that there's really three elements. There's the emulate, which is copping a design strategy like the beetle example that I gave earlier. So it's emulating what you learn from the beetle into an actual design, but then there's the ethos. We're doing this because creating life friendly design is the right thing to do.

It's how we leave our planet better than how we arrived. And third is [00:33:00] the reconnect. You have a passion to reconnect with nature and that's your inspiration. So that's how we call the three doors of biomimicry. You can enter through one of those doors and what was really kind of exciting to see in our first workshop, we asked that question of what door do you think Jacobs is entering through? And you would think that [00:33:30] 80%, if more would say emulate. We're just trying to copy the strategies from nature to create better design solutions for our clients. But in fact, it was, I think it was almost 40% of the people chose that Jacobs door was the ethos. That were doing this work because it's the right strategy.

It's the right thing to do from a kind of ethics and ethos perspective. And I think that's really telling in terms of what [00:34:00] the leadership at Jacobs is doing around the plan beyond strategy and really getting this embedded into the sustainability strategy of Jacobs and thinking holistically, thinking systemically about the role that Jacobs plays in the future of design, the future of the company. So from an outside looking in, I think to see that answer within this even sample group be as high as it is, and to see [00:34:30] that the interest is beyond just a single project or a single quick win, really demonstrates from the top leadership that this is something that is taken serious at its most holistic level, which is where it's most powerful.

Paul Thies: No, it is fascinating because it really will infuse the forward direction of how the company tackles challenges and underpins that approach [00:35:00] for innovative solutions, but that are also so in harmony with the natural environment. And so it is kind of inspirational to see that at play, so. Well, Monty, Nicole and Chris, I want to thank all of y'all for a fascinating discussion today. I think there's a lot to learn about biomimicry and it's really fascinating to learn how this is influencing how we solve some of the world's biggest challenges and the imprint that we leave [00:35:30] on our environment. So I want to thank all three of you for your time today, thank you.

Chris Allen: Thanks, Paul.

Monty Wilson: Thank you, Paul.

Nicole Hagerman...: [crosstalk 00:35:37] Welcome, thanks for having us.