

The Garrison Institute Presents: The Common Good Podcast Transcript

Janine Benyus: Nature's Universal Patterns of Connection and Growth (Episode 6)

[00:00:50] **Jonathan FP Rose:** Welcome to the Garrison Institute, presents the Common Good. I'm Jonathan FP Rose, and in this episode I'm honored to be speaking with Janine Beez. Janine is a renowned biologist, author, and co-founder of the Biomimicry Institute. Her groundbreaking work introduced biomimicry as a transformative discipline that studies nature's models to inspire sustainable design and innovation.

[00:01:15] Through her books, especially Biomimicry Innovation, inspired by Nature and Global Advocacy, Bennis has shaped how businesses, scientists and communities approach design, moving from extraction to regeneration and from competition to collaboration. Her vision merges the wisdom of natural systems with modern science, encouraging human flourishing in harmony with the planet and all its creatures.

[00:01:40] Ben's work highlights how a deeper connection to the living world can catalyze spiritual and ethical action for the common good.

[00:02:04] Welcome, Janine. Hi, Jonathan. Thank you. It's good to be here. It is wonderful to have you and to continue our conversation. Yeah. So I wanna begin at the beginning and uh, I'd love to hear about your growing up and, and your insatiable desire to be in nature as you're growing up.

[00:02:24] **Janine Benyus:** Hmm. I was fortunate to. Have, you know, be a free range child as they call 'em now.

[00:02:32] And even though I was living in suburbia in New Jersey, I had this ravine behind my house. And then I had this wonderful meadow beyond that, and I spent literally every waking hour that I wasn't in school out there. My mom used to ring a bell at the end of the day to get me back in, and I'd have to travel quite a ways to get back.

[00:02:56] And then my father would take us out canoeing or sailing or hiking every weekend. So for me, New Jersey was full of all these micro wildernesses, but I got to really know the organisms. 'cause my play consisted of checking on each and every one of them. Each day I'd run down. I knew who was. You know, who was spinning a cocoon and who was nesting and how the birds were going.

[00:03:24] And I literally would visit them as if he would be visiting neighbors in a community. And you know, then I'd started to be a little scientist and I'd start to, you know, when I got home, I'd run downstairs and I had microscopes and I'd write up my notes from what I had observed that day. So it was a very intimate relationship with the natural world.

[00:03:45] Yeah. With the rest of the natural world.

[00:03:48] **Jonathan FP Rose:** And then you went off to college. Oh, but you had a story about that. You had a story about I think disruption.

[00:03:56] **Janine Benyus:** Well, yeah, and I think this is unfortunately a common one that often lights a fire in people to try to try to do something about helping to heal the. I had the, the ravine and then the field was this old New England field.

[00:04:12] I called it Sir Morton Rom Field. I had like an English house name for it. And, and um, and one day I saw these flags in it, sitting on little wires. And I was reading Sherlock Holmes at the time. I saw footprints that I had never seen, so I did plaster of Paris. I like, got the prints, brought it all back.

[00:04:33] I've got all these cigarette butts in a jar and I, my mother thought I was smoking. I brought it back to my, uh, basement and said, well, you know, what is this mystery? Like, what's happening here? And if I had flown over it, I would've seen it was the, uh, layout of the phase two of our subdivision. So I literally, for a summer, just sat in the, in the bushes and watched bulldozers, you know, take a, like, roll away everything.

[00:04:57] Just roll it up. Uh, with animals, you know, flying towards me and all of us watching from the bushes and then put up, you know, cul-de-sacs and dead worms as Amory Lovens calls them dead worm design of cul-de-sacs and asphalt. And her, and I thought to myself, if the people who are on these bulldozers knew what I knew about this community, they would do it differently.

[00:05:25] That was my. Theory back then. And then I, at that moment, I sort of vowed to those animals that were flying by me that I would tell their stories, and that's why I became a science writer, biology writer. I wanted to tell the story of life.

[00:05:41] **Jonathan FP Rose:** Hmm, and you've actually done an amazing job of that. Okay. So how did you come up with even the word biomimicry and the idea, because you were the first, I mean, you were very, very early in that.

[00:05:52] **Janine Benyus:** Yeah, I had written five other books, natural History books, and a lot of them were about how well organisms are adapted to their habitats. There was a series of, uh, US wide series about wildlife habitats that were organized by the habitats. So you walk into a Cattail Mart and this is what you'll see because this is who's adapted to living there.

[00:06:14] So this idea of adaptation to place became deeply embedded in me until I realized, oh, those are technologies and we are not very well adapted to our places right now, the way we're living on earth right now in western industrial culture. And then I just assumed that people who invented things. Would be looking to the natural world, you know, like solar cell manufacturers would be studying leaves.

[00:06:37] Turns out that's not true. And so I started searching for it in the stacks while I was writing another book. And every time I'd find an article, oh, here is, you know, at a SU, there's these scientists who are studying leaves to come up with thin film solar cells that are non-toxic. And I Xerox, that's how long ago?

[00:06:54] It was started in 1990. I'd xerox that paper and then I got a folder. And I had to name it. And I went to the Oxford Dictionary and I looked up bio in Greek means life, ESIS is to imitate. And I thought, eh, I mean, that's a mouthful. So I just said, I wrote biomimicry on the folder, literally. And then it became a drawer, a file drawer.

[00:07:18] And one day I walked by and there were four drawers, and I said, this is a field that has no name. And it should 'cause it's happening. But it was just in very, very, you had to be a nerd like me to find these papers at that time.

[00:07:31] **Jonathan FP Rose:** You know what's interesting is you described organisms adapting to their environment, but it's actually a multi-way relationship, and so the environment also adapts to the organisms.

[00:07:42] Because the organisms have influence, but it's a multi-way because it's not just a one-way organism environment. They're all the, and their

[00:07:51] **Janine Benyus:** environment is more than just the temperature and the rainfall. It's all the other organisms and they're all shaping each other,

[00:07:58] **Jonathan FP Rose:** right? And the nutrient flow between them and the entropy they're creating and all that stuff.

[00:08:03] So actually. I have a question that's could come out of that, but first let's just define biomimicry and give some examples a little bit more for our audience. So what are some things that have been designed in bio mimicking ways?

[00:08:17] **Janine Benyus:** Hmm. I have a vision right now in my head because I just got back from Sitka, Alaska, where our two year master students are, are having a one week immersion and we had.

[00:08:28] Such whale watching. It was unbelievable. Even the guide said they'd never seen anything. The the abundance, and that just fills you with joy. There were so many whales. You had to just keep spinning your head, you know, to see all the blows. And then all of a sudden this one whale just starts breaching and breaching.

[00:08:44] And so I can see her flippers. It's a humpback whale. So there are. Wind turbines, believe it or not, that are based on what are called these scalloped edges along the leading edge of a humpback whale's fin. Now, what happens is the humpback whale, they do this bubble feeding. You know, where they, they go down, way down deep.

[00:09:06] Together. And as they come up, they spiral and they blow bubbles and they create this curtain of bubbles that trap the curl. And then they all go down four or five of 'em and with their mouths open through that cylinder and they get all this curl with their, hmm. Anyway, they have to be super hydrodynamic.

[00:09:28] So the scalloped edges allow them to play and reduce drag dramatically. So if you were to put this, and they do, they're putting this on wind turbines on fans. I've seen them retrofitting airplane wings. If you put that shape, which plays with drag in a certain way on an airplane wing, it would reduce the drag by 32%.

[00:09:51] **Jonathan FP Rose:** Wow. So

[00:09:51] **Janine Benyus:** these sorts of beautiful, these beautiful things are right in our, we're surrounded by this genius. We're surrounded by these solutions. There's another one I love that is, um, it's a new company. Our institute does an accelerator, and so we get about 400 biomimetic companies coming to us every year.

[00:10:10] So this young man from India came over to the States and studied plant chemistry and he realized that plants talk to each other. You know, now we know through the mycorrhizal web there's a fungal intermediary in the wood wide web, and we also know that they put out volatile organic compounds, chemicals into the air.

[00:10:28] So when one gets, say a, an insect eats up leaf, that plant will respond by releasing these compounds, warning the other plants around it to beef up their defenses against that kind of insect, to not be so palatable to the insect and that parent plants do it to their fruit. So he went back to India. He realized India is the second largest fruit and vegetable producer in the world, and he realized that only 40% of those fruits and vegetables are getting from the farm to the village because they're on unrefrigerated railroad cars.

[00:11:02] So what he did was he mimicked, and you also realized that fruits and vegetables are alive for a while after they're picked. A lot of people don't know that, so they're able to respond, but they're away from their parent plant and they're no longer getting the chemicals. Let's say beef up and all rot is, is, you know, microbes taking over, right?

[00:11:21] And so he puts in these sachets of these chemicals, biodegradable chemicals, that basically tell the fruits and vegetables to beef up their defenses. And now it's like 50 to 70% longer. They're able to live without getting tossed, basically when the train comes to town. And that's a huge thing. 'cause food waste is such a big contributor to climate change.

[00:11:46] These farmers are now getting paid for their, for their yields, that kind of thing. There's, and there's, there's so many Jonathan from, and also on the systems level,

[00:11:57] **Jonathan FP Rose:** whole cities. So that's fantastic. I actually wanna talk more about the systems level, because what's interesting is, so I'm gonna take these in levels.

[00:12:05] So the story of the making the windmills or airplane wings or, and I've also heard about biomimicry, uh, boat propellers. Yeah. Those are taking lessons from nature and applying them to fixed objects and designing the objects to be more efficient. Now what you've described with the volatile chemicals is something more dynamic.

[00:12:27] Yeah, it's a poss. It's actually looking at the, not just the design of nature, but the processes of nature. And by the way, my understanding is plants can put out. Dozens and dozens of different chemicals, like they can signal different insects. They're like, it's a real language. It's not just one blunt instrument, but you're now taking that language and that language is stimulating a systemic response and autoimmune response versus just a blunt fixed object.

[00:12:57] Okay. Now you said you're gonna go up on another level of systems level, so I'd love to hear that.

[00:13:03] **Janine Benyus:** Yeah, so the first was formed the, the second was process. You're right. And then at a systems level, we have a consultancy that we, and we work with clients who usually, we have done product design for years and process design for years and years.

[00:13:18] And finally we started to work with architects, people in your profession and urban planners. Landscape architects and they said, what? How, how would a city mimic an ecosystem? Because at the end of the day, that's what we really wanna do. We wanna fit in here. Right? And you fit in to, to I, to these communities.

[00:13:36] I've watched lots of organisms when I was young, learn to naturalize and learn to fit in. You do that by benefiting the other organisms that are there.

[00:13:45] **Jonathan FP Rose:** Amen.

[00:13:46] **Janine Benyus:** You become a beneficial. Species if you wanna become a welcome species.

[00:13:51] **Jonathan FP Rose:** Mm.

[00:13:51] **Janine Benyus:** Yeah. It's a difference between that and an invasive species. A naturalized species contributes.

[00:13:58] So that was one of the things. If we were gonna come into an, uh, a watershed and build something, whether it be a building in its site or a district or a city, you would want that city to not to look like the forest next door, the wildland next door not necessarily look like it. But function like it, perform like it, give back, like it, and that's one of the biggest things that ecosystems do.

[00:14:24] They become healthy enough to be abundant, to actually give benefits beyond their borders. So what we wound up doing was we found a big ecological modeling company that had worked with the Nature Conservancy to develop a big model that allows us to go in and measure. We go to the closest intact ecosystem.

[00:14:44] It could be a park near you or whatever. That's, that's pretty much healthy. We go in there and we say, what are you doing? Like, how much water are you storing? How much carbon are you storing? How much cooling are you doing? What kind of habitat support do you provide? How about soil erosion? How about do you abate noise?

[00:15:02] Are you like quieting the pla? And we look at all those functions that the forest is doing and we actually measure them. Yeah, I'm storing this much water. I'm storing this much carbon. Then we go to the building site and we say, you're building and its landscaping. Here are the new key performance indicators you need to meet.

[00:15:21] They're called ecological performance indicators so that you get, because the performance, we also measure the current performance in Jonathan. Sometimes it's, you know, it's not quite negative, but it sure is the null set. It's like, no, you know, this has been completely bladed and there are no ecosystem services create,

[00:15:39] **Jonathan FP Rose:** um, by the way, I'm sure, I'm sure it's negative.

[00:15:42] It's, it can be negative. It's

[00:15:42] **Janine Benyus:** really, you know, I've been, I've been there a lot and so have you. Anyway, that's our current performance and we measure that too. And then we say, here's the ecological performance, and that's this emerald standard we call it. And we design into that gap and we say, okay, how would you design if you want cooling?

[00:16:01] You know, how many trees do you put up? Green roofs, but also awnings. And there's other ways the building might shade. Right. So it's this whole or water storage. I would

never think of putting just a sidewalk down. Now that's not permeable and that not, that does not have places for moss to be growing between the cracks.

[00:16:21] And because I now say that sidewalk should not just hold me up, it should contribute, it should store water. So anyway, we, we do these designs that are quite, if you try to look at all 21 ecosystem services, they're called, I call 'em ecological gift. If you try to meet those, your design really changes and suddenly you're not designing just for yourself.

[00:16:44] You want like organisms to come and breed and live in your, on your site. The celebration metrics are when you know salamanders come back to the little pond. You used to have a little waterfall in, right? And now it's full of plants and birds and people are wildlife watching there. And over the years you can actually measure and celebrate.

[00:17:07] What's your giving back? We call it generous to time

[00:17:31] **Jonathan FP Rose:** and in fact. That is what makes nature so resilient. I mean, it nature's sustainability, it's resilience. It's und comes from having so many elements that are continuously giving to each other. It's this amazing act of co-creation, and you gave this a beautiful name, the phrase that nature is creating, the conditions conducive to life.

[00:17:56] And therefore we should really be creating the conditions conducive to life. And I think along with that means we should be recognizing when we're creating conditions that are not conducive to life. That's right. So how did that phrase, did it just pop into your mind?

[00:18:12] **Janine Benyus:** So yeah, it's, it's, it's life creates conditions conducive to life, which is, you know, that beautiful.

[00:18:19] Snake eating its tail kind of a thing. It was in the book, but I remember, I remember writing it and going, yeah, that's it. You know, it was like something that I had been trying to understand for a really, really long time. Ever since I was little. When I would watch year after year. The systems, those ecosystems always got Morphic Con.

[00:18:42] They always got more fertile every year, like life bounces forward. Even if something, if there was a wind gap or a small fire, I'd watch it heal and get more resilient, more fertile mm-hmm. That bouncing forward than it does. And I would think about like, you know, life enhances places and then I just started to ask how, how does it keep getting better every year?

[00:19:07] And it's because one of the things that natural selection says, yes, please. More of this is the propensity to create conditions. Conducive to life. We would often think, well, of course organisms wanna make it better for their offspring. But what, when you think about it, success in the natural world means your genetic material is still in that population, in that pool, 10,000 generations.

[00:19:34] **Jonathan FP Rose:** But this whole idea that natural selection or that evolutionary processes are all about producing things for your offspring. Is a 19th century idea that reflected to me in 19th century colonial. It's like I'm gonna do it for my people view and actually. That is a mental construct. Mm-hmm. And my, I think what we've really learned from nature is that natural systems don't only care about themselves.

[00:20:04] We see that, for example, when trees share their carbohydrates, they may have a preference for their children, but they share with their communities. And that many, many

organisms actually have an instinct. If you can call it that to share with others. And so I think the offspring preference is a cognitive bias that we've imposed on nature.

[00:20:28] **Janine Benyus:** It is true that life wants to continue life, right? That is a drive. That continuity of life is a drive that is larger. It's an emergent property, but the only way you can take care of offspring 10,000 years from now is to take care of the place. Hmm. That's going to take care of all offspring 10,000 years from now.

[00:20:54] That's where it changes. It's really not about the offspring in your generation unless you take care of the place that will take care of all offspring. It doesn't matter about your offspring. Do you see what I'm saying? What life is really caring for is to create the conditions conducive to all life because the, the quote unquote habitat.

[00:21:17] It is not an abiotic thing. It's a whole community of life. In fact, I love the idea of this word called kbi ota. There's abiotic and biotic, right? The non-living and the living. But really when you start to look at this planet, it's a completely living planet that was co-evolved with life. So kbi, OTI speaks to that, that it's both.

[00:21:43] It's both. And. So that idea that you are worried about your offspring, like we're worried about our offspring, life is worried that the place that all life will be in, because all offspring depend on other life forms that that place is taken care of. And that shift foreground background shift is a huge one.

[00:22:07] It's a relieving one actually, because. It allows you to focus on what's most important, which is are other conditions conducive to all life? And start to ask yourself, what are those conditions?

[00:22:21] **Jonathan FP Rose:** And there have been many, many societies in the past and many indigenous societies still alive today, in which that's a fundamental understanding.

[00:22:32] Yo, it is not a fundamental understanding in our current modern world, but it needs to be. And I actually propose that. This view that life creates the conditions conducive to life, and that is our responsibility. That is our moral response. It is, by the way, it is the survival responsibility. It's actually a selfish responsibility in a way.

[00:22:53] If we're looking for universal ethical guide, that is the universal ethical guide. If every action we undertook, we asked, is this creating or reducing the conditions conducive to life, I think we would solve a whole lot of problems in the world today.

[00:23:09] **Janine Benyus:** I, I completely agree with you. I completely agree with you.

[00:23:12] I think it's the central design brief, and I do think that. There was a time, and many people still feel this, that they do have a moral responsibility as a species on this planet to contribute, right? To be one of many, the large 30 to a hundred million species. We once saw ourselves as very much a part of those, not above those, and that came with responsibility.

[00:23:39] And the responsibility was this. I think that was a design brief, but it was also a. As you say, a filter on what to do and what not to do. Like the right, how to judge the rightness. Like although Leopold said, how do you judge the rightness of anything you do? Is it, will it benefit the biota? You know, will it make it more beautiful?

[00:23:59] **Jonathan FP Rose:** Right.

[00:23:59] **Janine Benyus:** Um, that,

[00:24:00] **Jonathan FP Rose:** right,

[00:24:01] **Janine Benyus:** that, that, it's a simple. It's a simple thing. I mean, I've spent my life now, you know, when I work with these companies, it is not enough to mimic the tubercle on the humpback whale. If you're going to use toxic chemistries and you're going to make it in sweatshops. And you're gonna ship it across the world.

[00:24:21] So we've, we've tried to answer that question, how does life create conditions conducive to life? And we, we use something called life's principles as a scoping mechanism before you even start to make anything. And it's kind of nature's eco checklist. It's what all, all organisms have in common and. You know, it has to do with doing chemistry in life friendly ways.

[00:24:44] And it has to do with cultivating cooperative relationships and, you know, does self renew, does it heal itself? What? Why should my fan have to heal itself? You know? And now we've added, like, does your fan pollinate?

[00:24:57] **Jonathan FP Rose:** Hmm.

[00:24:57] **Janine Benyus:** You know, we've added ecosystem benefits to try to get people to think like. Why would it need to pollinate?

[00:25:03] Well, you know, you've got it up in a, it's an industrial fan up there, and you've got wind open windows, right? Does it allow pollen to flow through? Well, why should I do that? Why should my fan do that? See, but, but every artifact, every natural artifact has to meet ice principles,

[00:25:20] **Jonathan FP Rose:** right? Do more. Right. So, um, I just for the audience want to, just to delve into one example, so when you talk about, for example, non-toxic chemistry.

[00:25:31] Yeah. So we currently produce ceramics under high pressure and enormously high temperatures, which we achieve by burning fossil fuels and oysters can create amazing ceramics using just all naturally available materials at ocean temperature under the water. That's right. They don't need to burn anything.

[00:25:51] That's right. So that's just an example of

[00:25:53] **Janine Benyus:** everything. Everything, you know, everything in the ocean. There's a couple of things that are kind of blow aways. Everything in the ocean is living on fresh water, so they're filtering salt water. So they're a desalination plant. Oh really? I didn't know that. Yeah.

[00:26:07] Even and mangroves that have their roots in the water, they're living in fresh water. They have to desalinate. So that's like, wow. Wow. And also that everything, you know, all the coral reefs and all the. Anything that's hard shells or whatever is made from dissolved CO₂. So we're sitting there going, wow, we have a lot of CO₂.

[00:26:25] What are we gonna do? All this carbon dioxide? And these organisms are quietly in ambient seawater conditions around their own bodies without a kiln making these ceramics, as you say, like abalone the inside of abalone shell, that mother of pearls twice as tough as our high tech ceramics that are in jet engines.

[00:26:45] So it's not that they're. They're weak so that they're manufactured differently because they have to manufacture in or near their own body.

[00:26:55] **Jonathan FP Rose:** So. This is really interesting. So I'm gonna ask a question. I don't know if this works or not, but, so leaves have this incredible capacity. They take hydrogen oxygen from the H₂O, from the water, from the earth, and they take carbon dioxide from the air and they.

[00:27:13] And a couple photons of electricity and they rearrange the molecules, the electrons, and they create carbohydrates that are the sugars that power their growth and the growth of others. So is that a similar chemical process that's happening underwater? This kind of extracting hydrogen, oxygen, carbon.

[00:27:32] Maybe a potassium or something and, and or phosphorus and kind of reorganizing them.

[00:27:37] **Janine Benyus:** Yeah, it's chemistry. There are six biosynthetic pathways or, or chemical recipes. Think about cooking in the kitchen. There are six pathways that we know of that take carbon dioxide and turn it into chemistry. Life doesn't really, you know, even a leaf doesn't.

[00:27:52] Turn it into electrons to put in a wire. Right. It's stored instantly in sugars as she Seth. So yeah, there's six different ways and it, it's talk about the playbook for, you know, drawing down the carbon that's currently in our atmosphere. The legacy carbon. There's a amazing, they're twin sisters. They have a company called Ruby Laboratories.

[00:28:14] They're doing a series of chemistries to take CO₂ and turn it into fibers.

[00:28:20] **Jonathan FP Rose:** Hmm.

[00:28:22] **Janine Benyus:** So, you know, there's, and there's lots of people working on biodegradable fibers and working on this, but that's just look and people do look at the carbon dioxide one biosynthetic pathway, but there's lots of them. Yeah.

[00:28:52] **Jonathan FP Rose:** Hmm. Okay. So now you're writing another book? Yeah. And the, the book is organized around a series of organizational ideas. So let's walk through the different chapters and the big ideas that are in each one of those.

[00:29:06] **Janine Benyus:** Hmm. Well, the book, the book is a biology book.

[00:29:12] **Jonathan FP Rose:** Mm-hmm.

[00:29:13] **Janine Benyus:** And it's for people who, you know, it's to increase our biological literacy about the world so that we might emulate it.

[00:29:21] And so I, I tried to look at realms where, you know, if economists could learn about something about the natural world, what might they be interested in? And so that chapter is how does Nature grow and right size. And scale very in very important concepts, right? In a, in a pro-growth economy that we have now.

[00:29:46] **Jonathan FP Rose:** So, but by the way, nature knows how to stabilize. So when we go back to your example of after a forest fire in an earthquake or something and nature's incredibly FEC and it's growing like crazy and it's going through, well, you know, it has plants that'll stabilize the soil and then smaller trees that are growing, you know, it has a whole succession system and it help them.

[00:30:06] And it grows in complexity, but then it reaches, you know, what we used to call a climax forest. It's the wrong name, but it reaches a level of maturity where it has more or less the same amount of energy flow, water flow, material flow in and out of it. Although trees are always being born and dying and the overall system is not, doesn't just continue to keep growing.

[00:30:29] You know, we don't get a thousand feet tall trees. Yeah. So nature's growth does. I don't wanna say self limit, well, I want your words on this. It's not that it's self-limit, but it reaches a balance and then it focuses more on the balance than on the increase in size, I guess is what I'm saying.

[00:30:47] **Janine Benyus:** That's right.

[00:30:48] We would call it, you know, it, it qualitatively develops, right? Life's always integrating development and growth. So for instance, you know, an embryo grows for a while and then it makes sure. That it develops all the nerves and blood vessels that are needed to connect each cell. So there's like this, these phases of growing and then developing and then growing and developing.

[00:31:13] And one of the things that you see, you know, one of the growth imperatives is that, you know, when I look at a tree, I see it as a distribution network, an ex network of exchange. Because I see it as full of, you know, these xylem and flow, these, these tubes that are, that are delivering water from the roots and that are delivering, you know, and, and now are connected to the Michal fungi.

[00:31:39] And then, you know, the sugars that you describe are being distributed throughout the tree and throughout the forest. So it's a distribution network. And these systems grow. They don't grow beyond the point that they can deliver. Nutrients to every cell. And I don't mean every leaf, I mean every cell in that leaf.

[00:32:00] So that's the qualitative development. Can I get nutrients to every cell? And so a lot of the right sizing that you see is about, that's the right size for a distribution network and this place and with this species. You know, it's interesting that we. Regenerative finance folks are beginning to look at some of the energy, network science that's been done on flow structures in ecosystems, for instance, or in our bodies.

[00:32:31] This idea that, you know, for instance, in your own body, it's very important that nutrients get to every cell or else you have necrosis, but we off, we have been in economic times where we've, you know, for instance. Started to shut down local banks and only have regional banks or national banks. And life has all three levels.

[00:32:53] By the way, they don't just have local banks, they don't just have small distributors to individual cells. They also have, you know, arteries, larger flow networks that are more efficient in certain ways. Right. And then they have the largest ones. So they have small, medium, and large distribution vehicles, if you will, can think about it as large roads or smaller roads or tiny roads, right?

[00:33:18] That concept of, of a hierarchy of those different ways to get stuff around is really important. So when we drop local banks, we get necrosis, economic necrosis. In neighborhoods that are red line. Right? Right. Like that's how you translate biological ideas into social innovation is by thinking stuff like that.

[00:33:41] **Jonathan FP Rose:** That's amazing because what I also get out of that is if nature says that we're gonna grow to the level, but the the prime goal. Is not the growth. The prime goal is the distributing nutrients, sufficient nutrients to every cell. Yeah. So if we organize our economy or society about that, that would mean there'd be no poverty.

[00:34:02] It'd be that everybody would be nutritiously, fed and housed. And you would say, I. I'm only going to grow if it enhances our capacity to do that. And any growth that stresses our capacity to do that or limits our capacity to do that, we're not gonna do because it's, it, as you said, has necrosis to the system and we see so equal distribution in a way, under that view to me, currently has a, a human moral view, but now it's taking on a life principle view.

[00:34:34] **Janine Benyus:** Mm-hmm. Yeah. I mean that's a, you have to be very careful when you apply nature's wisdom to social innovation. You know that you're not doing what they did in the eugenics movement. Yeah. Which was misreading Darwin and misreading natural selection to be survival of the fittest when he actually said, and meant survival of the fit.

[00:34:55] So we've been down that road before and I, I just wanna put that caveat in, but if you choose the right. You don't want like lions as your model or bees. We're not lions, we're not bees. But when you look at the ecosystem level and you look at deep patterns that you see everywhere about, for instance, distribution, whether it's in your blood vessels or leaves or trees, you also begin to realize that the distribution networks, the physical ones, actually have something very much in common, like your bronchial passages and the roots of tree.

[00:35:29] Have if you right. If you look at it just mathematically, they both describe the same branching mathematics, right? And then they asked why. Why are they all, why are they mathematically? So that's what's most efficient because it's the way to get things to each cell. So that's when you can then say, this is an important pattern in the natural world.

[00:35:49] **Jonathan FP Rose:** Right. Okay. So we got. So you described an economic one, keep going. Name it. Let's walk through another chapter.

[00:35:57] **Janine Benyus:** Um, so then some of the other chapters are, you know, how does, how does nature heal from trauma? Hmm. Which is one, I think we really, everybody says that, Jonathan, whenever I say that chapter, everybody's like, wow.

[00:36:10] Yeah. Like, I think we're, I think we're like in need of some of that wisdom and it's, it is amazing. And it's, you know, you were starting to describe. One of the things that life does is this continual, let's call the adaptive cycle. You know, you were talking about a forest that gets to a point where it's very tied together and very closely tight, networked, and yet it gets, it gets to

a point where it's then vulnerable to the next phase of release that happens with a forest fire or whatever.

[00:36:43] And I, I get to watch that in real time. 'cause I live in the Bitterroot Valley. I live surrounded by wilderness. So I get to see a lot of wildfires and I get to walk through those places as they heal. And what happens after that release of all of those ashes and I'm drawing something in my, if you can imagine the adaptive cycle, which is taken from ecological research, is a infinity sign.

[00:37:09] So now we're up the for loop of that infinity sign or that eight on its side. We're at the top of it now where the we're the forest. Literally releases all of its nutrients and then it curls around and it starts what's called the reorganization cycle or the healing cycle, and that reorganization cycle is where the forest knits itself back together.

[00:37:35] But that's also where it has a chance to do things differently. Remember I was talking about bouncing forward, so it can knit itself together with the seeds that are in the bank, but other organisms will come in. There's new ways that things can come together. So as it goes through that reorg loop, which is a fastest part of the cycle, it then gets to a point where, you know, the seedlings are up, the soil's all, you know, uh, held by the root systems.

[00:38:01] And, and then next thing you know, it's, it's on its way to grow for hundreds of years from seedling to forest again. And, uh, you can really look at that and try to imagine where we are in that cycle.

[00:38:15] **Jonathan FP Rose:** So I look at the disruption of globalization that is happening right now. And as a consequence, by the way, not just the globalization disruptions happening right now, but the multi-generation of it.

[00:38:29] And there are places in Appalachia and places, I'm sure in Montana, and there are places here in the Hudson, Mid-Hudson River Valley, which have been disconnected from the globalization loop and in many ways. Economically, we would've said they're left behind. But actually what I think is they're the places with the most opportunity, because they're not already bound into a constraining system of a global financier or a national finance system and a national politics.

[00:38:58] They, they actually have the most potential, as you said, that's a reorganizing loop to reorganize themselves, find their own natural fitness, yeah. To their bio region and then reemerge. Yeah.

[00:39:13] **Janine Benyus:** That's right, that's right. That you, you, you had talked of them as islands of coherence when we were speaking before, and that's, there's also another, there's another biological analog to that, which is the way a forest starts its journey back to health is very different from when, you know, we take a.

[00:39:39] A devastated field, say in the rainforest, and we wind up, we are gonna restore it. So we put trees in rows like corn,

[00:39:48] **Jonathan FP Rose:** you know? Right?

[00:39:48] **Janine Benyus:** Which is like, that never happens. So what actually happens, right? If you watch over long periods of time, something come back to life, it starts with islands. Okay,

so what those islands are that are in the open, imagine this open field and then a bird comes and it lands on, you know, one piece of grass that's left poops out a seed, and then that seed grows into a tree or, or a little seedling.

[00:40:16] But then what happens is it creates a protected area behind it if it's, you know, it creates a windward and a leeward. So anytime you start something, like if you even start an organization, I always tell people just. Just start, just start something, because then you create conditions conducive to life behind you.

[00:40:33] Mm-hmm. Literally, that's what happens. Mm-hmm. So all around, once one gets started, yeah. I'm, I'm in the sun. It's pretty hot, but they're shade behind me. That makes it available for other organisms to get going. And then more birds come. They bring different kinds of seeds. So suddenly you have this mixed species group.

[00:40:52] And it's in a little small roundish island. But if you look across the field, there's many of these. And what happens in restoration is that they congeal natural regeneration. Right? Is they geal? And that, if you compare that, and I've sat in, I've stood in in forests, and we do it as a management practice.

[00:41:13] It's now called Applied Nucleation.

[00:41:15] **Jonathan FP Rose:** Hmm.

[00:41:16] **Janine Benyus:** Where we actually put, you just go out and put, you know, stakes in a field. And invite birds in. You do an invitation and then you start to, you know, you start to build this, to start that regeneration the way the natural world does. It's much, I've been there and it's much more biodiverse than, say, a plantation where you're every few inches, which is the engineering way to do it.

[00:41:40] It's not a biomimetic way. The Biomimetic way is what you're talking about. And Christopher Alexander talked about in the nature of water, talked about these centers and holes. In a city, right? And just make sure you get the centers right. Make sure you've got the cafe on the corner with the bench and the tree.

[00:41:57] That's a center and that invites people in, right? Yeah.

[00:42:02] **Jonathan FP Rose:** So also, you know, we think a lot, there's a lot of talk now about individual trauma and, and the healing of individual trauma. And one of the thing, the points that Dan Segel has been making is you cannot heal your trauma individually. By the way, part of it is connecting parts within yourself.

[00:42:21] Mm. But the healing of trauma is a we activity, not a me activity. It's actually psychodynamically. It's sociologically, it is. You heal as a collective. You heal in relation to others. You, it's very hard to just heal on your own and you heal much faster when you're healing collectively and you're part of a healthy community.

[00:42:43] So there's, anyway there. That's just another parallel.

[00:42:46] **Janine Benyus:** It's so true. And you know, yeah, Jack Saul saw that too. Right In,

[00:42:51] **Jonathan FP Rose:** right

[00:42:51] **Janine Benyus:** In uh, communities that were devastated after hurricanes or whatever, how people heal collectively. And that's this idea. There's another idea that's more than even a hypothesis right now.

[00:43:04] It's been proven so many times and it's called the stress gradient hypothesis, which is, it's counterintuitive to the way we think, but it's shown that as conditions on the ground get harsher organisms have, they get into positive groups that help each other facilitative groups. More than they do in easy places.

[00:43:31] So when you go up to the top of a Alpine where a lot of this work was done up in Chile, you see these beautiful cushion plants, Yara plants, and they, they're kind of a mossy looking kind of plant and tucked in there. There's all kinds of other plants, flowering plants that grow and they protect each other from the wind and the harsh conditions.

[00:43:51] Those. The propensity to collectively get together to handle those conditions. That goes up in stressful times. So that doesn't surprise me that after a hurricane

[00:44:04] **Jonathan FP Rose:** we're helping each other. So we need a little stress. We need not too much. Okay. So what's another one of your chapters?

[00:44:10] **Janine Benyus:** There's a chapter about how does life self-organize for collective act.

[00:44:17] Mm-hmm. I guess you know, that's one that we're talking about now. And how does that. How do, and these, in this book, this book is called the Universals. They're nature's universals, right? But I'm looking at patterns and I don't just look at patterns at one scale or like, what do primates do? You know, I, I'm looking from literally from the molecular to the biospheric to look at those sorts of deeper, deeper patterns.

[00:44:41] So collective action can happen on the level of cells. And how they, it's so beautiful how cells collectively work together to do things

[00:44:52] **Jonathan FP Rose:** well, first of all, a cell is a collection just of the mitochondria and the cell. I mean, a cell already is a joint venture. Now tell

[00:44:58] **Janine Benyus:** about that. Tell about the, uh, endo symbiosis.

[00:45:01] **Jonathan FP Rose:** Well, go ahead. You do it.

[00:45:03] **Janine Benyus:** Well, yeah. I mean, you know, every eukaryotic cell was two separate beings. One bacterium that engulfed another, you know, ingested it, but didn't digest it. And then that became, that border within became, had a different skillset, which was, it could, it could respire, it could, it could break down food with oxygen that became our mitochondria in every animal cell.

[00:45:29] Um, and then every plant cell, it was a chlorophyll. It was a photosynthetic bacteria that was ingested but not digested.

[00:45:36] **Jonathan FP Rose:** For example, the mitochondria, they have actually different DNA than our main cells, so they actually are, they're literally a different organism. Every one of our

cells is actually this joint venture between a mitochondria that's providing energy and it has its own.

[00:45:53] Maternal kind of genetic path from the rest of the cells, so, right. I actually wanna go back to, you used this word self-organizing. Yeah. And yet we think of self as meaning individual. Yeah. So it's. I know what you mean by self-organizing, meaning not externally motivated, but kind of internally motivated, but it's really collective organizing.

[00:46:17] It's,

[00:46:18] **Janine Benyus:** that's right. Yeah, it is. Because what you're talking about is a collection of, of agents that are, the system is the self.

[00:46:28] **Jonathan FP Rose:** Right. And we even needed, it's so interesting. This is a problem with our Western modern language. When you mentioned a tree, I have a Hopi friend who says, you know, we see trees as a verb.

[00:46:39] You see them as a noun, and you described it as a process. And so. Even, you know, we use this thing of agents, which represent an individual, but in fact, what we're learning is that nothing, you know, every organism has microorganisms within it that are affecting it. And we have vertical gene flow and horizontal gene flow, and it's like all so interconnected.

[00:47:02] Totally. And whatever we disconnect it, it, the grades, its health. Yeah. And when we reconnected, it grows its health. And so we almost need a language that. We need a modern language that eliminates the atom in a way and sees the flow.

[00:47:20] **Janine Benyus:** Exactly. You know, I have a really hard time like, like self-healing. Yeah.

[00:47:24] It doesn't heal itself. It is always collective. So it is in our language. I mean, our language is really interesting to me, you know? I thought a lot about why we in western industrial culture are just coming to biomimicry now.

[00:47:38] **Jonathan FP Rose:** Hmm.

[00:47:39] **Janine Benyus:** Coming to like, look to other organisms, right. Who might have wisdom, you know, and, and it's in our language we talk about the lower kingdom.

[00:47:49] **Jonathan FP Rose:** Hmm.

[00:47:50] **Janine Benyus:** Higher primates, like it's right there. You know how othering our whole colonial journey has been, how othering and how human supremacy. Has such, it's So I have gone to conferences where scientists, knowing I was in the audience, I have a, their first slide is biomimicry with a universal slash sign through it.

[00:48:19] They're engineered. Whoa. Yeah,

[00:48:22] **Jonathan FP Rose:** you know what? You shouldn't even go to those conferences.

[00:48:24] **Janine Benyus:** There's a particular engineer who loves doing this, and what he says is basically where. We don't, literally, they use this word slavishly or slavishly, imitate a natural world. We get some ideas, but then we go beyond nature, beyond what nature can do.

[00:48:44] And I'm like, really? So I have these conversations like, you know, 'cause I go up afterwards and I'm like, you know, let's, let's compare something. Let's compare a solar cell to a leaf. Right. You know? Well, it's much more efficient. Yeah. But what happens at the end of its useful life, a leaf can create more leaves or mushrooms or, right.

[00:49:07] Like that whole conversation about where you, where you start bragging about something. You know, once you put a lot of what we've done into a system in Western industrial culture, and once you put it into a system, it pales. Right. It really, really pales, and yet there is this idea that, you know, what could we possibly learn from these organisms?

[00:49:31] I think that's diminishing. But certainly when we first started this work, it was seen as, it's quite odd that you would traffic with the lower organisms.

[00:49:41] **Jonathan FP Rose:** Mm-hmm. You know, so, yeah. By the way, there's a, a writer named James Bridle who has a phrase that everything is equally evolved. Yeah. So if you think about it, the Big Bang happened 13.2 or whatever billion years ago, and then every atom, every organism, everything that exists today are all 13.2 billion years old.

[00:50:04] Yeah. They're all equally evolved. None is older than the other. None is more evolved than the other. They've all evolved over that whole long length of time. Yeah. And what has grown, what, what you can say has grown more is the complexity and integration of the system. Yeah. So you can rank the systems by, but you can't say that this is a higher species and that's a lower species.

[00:50:27] Right, because they all rely on each other. That's right.

[00:50:31] **Janine Benyus:** They're not like life doesn't make things life. Life makes things disappear into systems. Into community.

[00:50:37] **Jonathan FP Rose:** Yeah. Anyway, I would say to those scientists with the, the nullify, uh, biomimicry. Great. Uh, just, you know, why don't you just continue on with no bacteria and microorganisms of your life just to eliminate, you know, like, just purify yourself, get rid of all those in, and don't touch anything that was made by microorganism bacteria.

[00:50:58] Exactly. And you know, just living your higher realm.

[00:51:00] **Janine Benyus:** Exactly. It's so incredible. Anyway, but it's very few. It's a very small number. Most of the people that are doing biomimicry as a practice where they're looking to the natural world for answers for guidance, they're very humble. It humbles you, right? To try to do even the, just to come closer to how, how spectacular these organisms are.

[00:51:25] **Jonathan FP Rose:** So there's something that's inspirational about it. There's enormous in many lessons, and we only discussed a few of the lessons that you can extract from it. But then there's something spiritual and you said to me, it's like looking into a stream and seeing the face of God.

[00:51:42] **Janine Benyus:** Yeah. That's been the journey of writing this book on Nature's Universals for me.

[00:51:47] I have the luxury of really having gone through about 29,000 papers and about 280 books to really revisit where we are, both in Western science and indigenous science and think where biology is coming right now is. Maybe a point that, you know, the quantum physicist came to where it is very, it's, there are so many deep patterns that are shared by so many organisms, and by, as you say, even the molecules have the same collective action that's going on, right?

[00:52:27] Like that there's this, you know, part of all that is, and that really all we are are these patterns and we share them. With these organisms. We are not separate from them. We actually are filled with exactly the same patterns, deep patterns, and that commonality is spiritual to me, the fact that there's unity in the diversity, I find the diversity beautiful.

[00:52:55] I find the unity. Spiritual. Yeah, it's incredible. I mean just, you know, you, we talked about growth and. The other way nature grows is through networks. So we only talked about individual growth, but really nature grows through networks, right? It connects to more and more of itself and to other networks, right?

[00:53:15] And, and now when we look at those networks in biology, whether it's our brain cells or the gene regulation networks, protein regulation networks, mutualism networks, food webs, all these networks in the natural world. It turns out they've got incredible architecture and structure to them that is similar, whether you're looking at a food web in the Everglades or you're looking at a plant, pollinator mutual web in an alpine Rockies, the way they organize themselves in a network.

[00:53:48] Is very, very similar depending on what they're, if they're in a mutualistic network, you can look at how it's organized, meaning you know what organisms are interacting with, which organisms and what processes. They have these things called network motifs, which are the processes that they do, the communication processes.

[00:54:06] Those are, even though there's so much diversity, we've realized, oh my gosh. Here they are. They fall into these categories that are similar to some of our networks as well, our social networks. And so for me, part of what got us into this issue where we don't feel like, like we feel like we're not part of all that is we feel like we're superior.

[00:54:28] Part of that was that we didn't see the commonalities. And so it kind of is a scales from your eyes kind of moment. Mm-hmm. When you see those deep patterns of flow. Of network of cycles that we're a part of. We may be monkey wrenching some of the flows right now. We might, we might wanna stand back from that monkey wrenching and join these beautiful cycles.

[00:54:54] That's, that's my hope.

[00:54:56] **Jonathan FP Rose:** You know, it's interesting, um, part of the, I don't know if it's the motto of the United States, but the phrase e pluribus unum. Yeah. Which means out of many one.

[00:55:07] **Janine Benyus:** Yeah.

[00:55:08] **Jonathan FP Rose:** I think they wrote it as a political idea, but it's actually a spiritual idea.

[00:55:13] **Janine Benyus:** Mm-hmm.

[00:55:14] **Jonathan FP Rose:** And if we, and it's obviously a biological idea and um, it'd be amazing if we could actually live by that.

[00:55:22] Yeah. It would be. Pluribus Unum to create the conditions conducive to life.

[00:55:28] **Janine Benyus:** We hold these biological truths to be self-evident.

[00:55:31] **Jonathan FP Rose:** Ooh, you've got it.

[00:55:36] That should be the subtitle of your book. We know these biological truths to be self-evident. Yeah,

[00:55:43] **Janine Benyus:** yeah. It's just us. It's just us trying to be, learn to be good earthlings really. Um. You know, and that's what every species walks through, that through that learning journey, every species learns to be how to be an

[00:55:57] **Jonathan FP Rose:** earthling here.

[00:55:58] And by the way, lots of humans have learned that. Yeah, that's right. There's a lot of indigenous cultures. It's just weird currently living in this distorted culture. It's so crazy. Right. Well, Janine, thank you so much for giving us a pathway forward. Your work is really elucidating and illuminating. An a, a holistic way of thinking that actually will help us flourish.

[00:56:23] So I'm very, very grateful for this conversation and really we are very lucky to have you in the world doing this work.

[00:56:29] **Janine Benyus:** Oh, Jonathan, you as well. I can't wait for your new book and for this rich conversation.

[00:56:35] **Jonathan FP Rose:** Thank you. And I look forward to seeing you again. That's the,

[00:56:39] **Janine Benyus:** yeah, well, Montana awaits.

[00:56:45] **Jonathan FP Rose:** Thank you to our guest, Suzanne Simard. The Common Good is a production of the Garrison Institute and is hosted by me, Jonathan FP Rose. We'd love to hear your thoughts about the podcast. Please send us a note at podcast@garrisoninstitute.org and let us know what you think. If you've enjoyed this episode, please consider leaving a positive review on Apple Podcasts.

[00:57:08] This show is produced by the Garrison Institute with Production and Marketing from the Podglomerate. Its theme music was composed by Jonathan FP Rose, and performed by Jog Blues. We look forward to being with you again soon.

