**Episode #56**

**Speaker 1** [00:00:01] Welcome to the Cabrera Lab Podcast.

**Speaker 2** [00:00:06] Hey! Hello. Look what we've got here. I know. Are you so excited?

**Speaker 1** [00:00:10] So excited!

**Speaker 2** [00:00:11] Maybe people are wondering, what the hell is going on? It is...

**Speaker 1** [00:00:16] our podcast aversary.

**Speaker 2** [00:00:19] our podcast diversity.

**Speaker 1** [00:00:20] Our podcast's birthday.

**Speaker 2** [00:00:22] It is the one year.

**Speaker 1** [00:00:24] One year.

**Speaker 2** [00:00:25] the first birthday.

**Speaker 1** [00:00:26] When this releases is the first year of the podcast.

**Speaker 2** [00:00:31] Now there are several things we have to say. Yes. A, it's a party. Yes. B, we have thank you.

**Speaker 1** [00:00:37] Yes, so much. It's been a crazy, wild ride, and it's...

**Speaker 2** [00:00:43] from the bottom of our hearts. Very happy.

**Speaker 1** [00:00:45] We're very thankful.

**Speaker 2** [00:00:46] We also have to say a very heartfelt thank you to the one and only Alina, who has kept this going and has gotten all of the episodes up on time when they needed to be there and has made this shine.

**Speaker 1** [00:00:58] degree in evolutionary biology from Cornell. So she sounds like she'd have to learn all this stuff and cameras and technology and sound boards. I don't even know what all that stuff is. She knows stuff we don't know. Yeah.

**Speaker 2** [00:01:14] But we should say thank you to her. Thank you. And.

**Speaker 1** [00:01:17] our whole team.

**Speaker 2** [00:01:18] that we appreciate everybody and the Cabrera Lab team, and we are feeling incredibly blessed.

**Speaker 1** [00:01:24] We love hearing what you want to hear about. And when we do something right, we love hearing that. When we do some wrong, we like hearing that because we can get better. That's better for us, because we can learn.

**Speaker 2** [00:01:36] Alright, you might be wondering, well, what could we possibly talk about on our birthday episode?

**Speaker 1** [00:01:40] I have no idea.

**Speaker 2** [00:01:41] I have thought about it, and I have chosen something...

**Speaker 1** [00:01:44] doozy.

**Speaker 2** [00:01:44] No, no, no. I think it'd be fun. Do you remember a while ago, we had a very popular episode, which were the sacred cows of systems thinking, and also the recent hullabaloo around the critical thinking episodes? Yes. So, I have the love child of those two experiences. What I want to do is take one of the sacred cow's, pull it out from the list, and let's really get into it. It's one of those ones. That's fun. Well, people are always asking me about emergence and about Your dislike of the saying the whole is greater than the sum of its parts. What do you mean that you just hate that phrase? Why do you hate it? And you gotta explain yourself.

**Speaker 1** [00:02:27] It's shocking to me that this is even an hour worth of content or like even 10 minutes. Like it's just such a basic, it confuses people so much and there's just almost no reason for confusion. It's so simple. It's just like word games. Emergence and all this stuff. I mean, emergence is a very powerful scientific concept and complexity is one of the most important scientific studies. I mean, complexity science has really had a huge effect on all of the different disciplines. And so I think everybody should study complexity. I think everyone should be familiar with complexity. It's a wonderful set of discoveries. And yeah, so I'm like really supportive of complexity and complexity science. And, uh, but emergence confuses, emergence is What are you asking? You're asking why am I, why do I get my feathers ruffled about it or is that the idea? Is that the idea?

**Speaker 2** [00:03:34] Yeah, yeah, yeah. There's two parts. One, people don't, people are like, why is he always saying that this is bonkers, that the whole is greater than the sum of his parts? So people want you to, they've asked me to ask you to explain yourself.

**Speaker 3** [00:03:46] Okay

**Speaker 2** [00:03:47] So we're holding you to account on this one. Then once we do that, I want to move into because we were like, well, you and I use the word emergence, and they're like, well, what the hell does that mean, and why is it part of systems thinking, and what does it matter? turn.

**Speaker 1** [00:04:01] The reason emergence is so interesting is because it's surprising. That's it. Emergence is surprising. It's surprising systemic behavior. So when, for example, a great example is like ant colonies or ant hills, right? You have, you have a little, you have a little ant.

**Speaker 2** [00:04:21] That's very scientific.

**Speaker 1** [00:04:23] Right? And you have a little ant brain and that ant brain for all intents and purposes is not hyper intelligent, right? It's like, it's not a super intelligent.

**Speaker 2** [00:04:37] It's like a single neuron, right?

**Speaker 1** [00:04:38] No, I mean, but it's like, it's not that smart. Now, if I multiply that one ant times 100,000, right? And I'm just gonna use the word dumb. I don't mean like that as a pejorative against the ant. I'm saying there's not like a tremendous amount of intelligence going on, right. And if you think about, I'm gonna multiply that times 100000 ants, What would you expect? to get, you would expect to get like hyper dumb, like extreme

**Speaker 2** [00:05:14] 100,000 dumb.

**Speaker 1** [00:05:15] Yeah, extreme dumbness. That's what you would expect. Collective dumbness, collective dumbness Collective, dumb. Right? Yeah. Well, that's not what we get. What we get is intelligence. Whoa, exclamation point. That's emergence. And the reason it's emergence is cause you're like, well, where did the intelligence come from? If all the ants are dumb, where it did come from. That's an interesting scientific question. That is a deeply valid and important question. If all the things that I put in the system are dumb, but the output of the system is smart, what happened?

**Speaker 2** [00:05:57] Okay.

**Speaker 1** [00:05:58] That's emergence. That's why we're fascinated by emergence because it's fascinating. You're like, wow, how did that happen?

**Speaker 2** [00:06:05] Okay, so just to take it out of that example for a second, so what you're saying is there's system-wide behavior or outcomes that is not immediately obvious.

**Speaker 1** [00:06:15] You can't find it in any of the parts.

**Speaker 2** [00:06:17] Yeah, so you don't see the origins of that emergent property or that outcome of the system by looking at the individual.

**Speaker 1** [00:06:24] And it's a trick, it's trick of language. That's why it's really not actually that interesting, it's just a trick. It's just, so it gets a little complicated, but it all hinges on what we call parts. Okay. If this is the whole, then everything that is in it, in the whole is a part. Right. Let's say that we have a bunch of ants that are part of the whole. and the answer relating to each other.

**Speaker 2** [00:06:56] which they are.

**Speaker 1** [00:06:57] are the relationships part of the whole.

**Speaker 2** [00:07:00] Well, I think some people would say no and some people would say yes.

**Speaker 1** [00:07:03] Okay, the people that would say no, it's just totally absurd. Are they inside the circle or not? Yes. So they're part of the whole.

**Speaker 2** [00:07:13] but what people are saying is, but you can't see them, so they're not part.

**Speaker 1** [00:07:17] They're part. They're part of the whole. When did we decide that things that are part of the whole aren't parts? And why would we play this silly semantic game? It's part of whole, but it's not parts of the hole. Right. I mean, it's just semantics. It's a part of a whole. And guess where the intelligence is coming from? It's coming from the relationships. It's come from the simple rules that ants follow when they meet up with each other. So again, if I take these ants. and then this ant and this ant meet up with each other, contained in their little brains and their bodies, is a set of rules that they follow when they interact. Yes. Or if they interact with what one ant leaves over, like a pheromone trail. So if this ant interacts with the pheromo trail, that's how they interact with each others, right? Right. So those interactions, those relationships, are part of the whole. And that's where the intelligence is coming from. It's coming from the collective dynamics. So these are dynamics. This is dynamic, dynamic, dynamic, right? The relational dynamics. You collect the dynamics. So we call them collective dynamic, the set of dynamics.

**Speaker 2** [00:08:37] all the interaction.

**Speaker 1** [00:08:38] All the relationships, all the interactions, leads to the emergent properties, or emergence. So you have agents, you have simple rules, the agents follow simple rules which lead to collective dynamics, right, because they're interacting. The set of interactions is the collective dynamics and the collective dynamic produce the emergent property. So there's nothing mysterious, there's nothing religious, there is nothing mysterious. There's nothing untoward, there is nothing ghostly, there is nothing magical. There's amazing things are happening. All science. Nothing mystical. And to say that the whole is greater than the parts Mm-hmm is to allow for this very mystical explanation of things. It's like you create a little place where you can drive a truck, a mystic truck through it. And there's no reason for it. Right. There's just no reason for it now. There is one case where the words that are chosen are specifically chosen by people that are using those words in very specific ways. They're called mathematicians.

**Speaker 3** [00:09:57] Mm-hmm.

**Speaker 1** [00:09:58] and they're saying the whole is greater than the sum of its parts. Now in mathematics, sum means additive, meaning plus. And so to a mathematician, they're being quite literal. They're saying, the whole is greater than the simple sum of it's parts because there's more than just additive going on here. That's true, but the problem is, When that gets translated to the general public, they say the whole is greater than the parts. Right. And they think the whole is greater that the parts, the whole was never greater than parts. The parts are exactly equal to the whole. Right. They're exactly equal. There's no like magical thing happening here.

**Speaker 2** [00:10:41] Right, because there are rules and scientifically observed behaviors. Those dynamics can be observed in the case of ants and other types of systems.

**Speaker 1** [00:10:53] Well, and the thing that I guess probably the reason that it's a little bit of a pet peeve for me is if you're amazed by this output, this emergent property, you're really going to be amazed by where it comes from. Right. And if you say, oh, well, this is just something greater than what's happening inside this whole, then you never look for where it's coming from. and where it's coming from is the most remarkable part. It's the most remarkable part of the story. And it tells you something really important about complex adaptive systems, which is that the simple rules that govern them are really important. And it tell you something about this multiplicative property where when we all do something, we see amazing effects that the micro makes the macro. And if we just say that the macro is bigger than all the micro, the macro was more than all the micro then we miss how absolutely elegant the micro is.

**Speaker 2** [00:12:05] and the dynamics between and among them.

**Speaker 1** [00:12:07] Yeah. And so it bugs me because it allows us to miss what's really truly special about these systems and be like, oh, just the emergent property. Like I'm some magician.

**Speaker 3** [00:12:19] Bye.

**Speaker 1** [00:12:20] Like you know it's like almost it's almost bordering on snake oil. Right. And I load snake oil you know where the action is in the simple rules. Literally where the action is is in simple rules and the simple rule is when you understand them. Right? Like ants they go out and they search for food and they'll pick up you know if I have an ant station, you know, like a hill, and I put like food here. a little pile of food at A, and then a little pile of at B, and a little pile of a food at C. You know, C is longer than B is longer then A. The ants, these dumb little guys, they'll go out randomly to search for food, they'll find food, and they'll bring it back. And what'll happen is, this little pile will go away first, this pile will away second, and this third. And that's intelligent behavior. And so you go, wow, that's really, that's emergent behavior, right? Well, how are they so intelligent? Well, what they're doing is they're going out randomly in all directions, looking for food. When they find food, they shoot pheromones out of their butt and they create a pheromonetrail. Right. And then the third rule, right, so the first rule is go search for food, second rule is shoot ptheromones. Yep. This third rule is. never cross a pheromone trail. Well, what that third rule does is it makes it so more ants, when ants hit the pheromon trail, they find the food. When they find food, they shoot more pheramones. So this pheronone trail actually gets bigger and bigger. It's like for ants, like Las Vegas of pherompone trails. Like there's just.

**Speaker 2** [00:14:06] It's like a highway.

**Speaker 1** [00:14:07] It's like a highway that's lit up, right? It's neon lights for ants. So more ants find it, more ants go to it, and they grab all the, and then this food dissipates, it's gone, and the pheromone trail has a delay, and it goes away. If you were to kill this third rule, which is don't cross the ptheromone trails, stay on it, the whole immersion property would collapse.

**Speaker 2** [00:14:32] Yes, and the ants would die.

**Speaker 1** [00:14:33] and the ants would die or bad things would happen. This episode is sponsored by Training Camp, the ultimate online spot for building the mental fitness that drives personal and professional change and success. At Training Camp you'll have access to the science and practice of thinking with personalized thinking assessments, tiered training and best of all, practice that improves skill. Go to CabreraLab.org to learn more. And now... Back to the episode. Don't be so enamored by the emergent property. Be enamored the parts of the hole that are creating it. That's what's amazing about it.

**Speaker 2** [00:15:14] You know, we are trained, though, to look first at the outcomes of the system than we are to the inputs.

**Speaker 1** [00:15:21] And that's the problem is we keep looking at these outputs. The outputs are already done. If you really want to affect complex adaptive systems, which is all the systems that we care about, right? All the organizations, all the system we care, homelessness, all the things that we want to try to fix. Those are emergent properties. If you don't understand that the simple rules that are driving the independent agent behavior, or semi-autonomous or autonomous agent behavior. are what's driving that outcome, then you're never gonna understand how to change that outcome.

**Speaker 2** [00:15:58] Right, meaning if you want to change the outcome of a system, we get distracted thinking we can work directly on the outcome, but we have to go and work on the inputs at the local level. We have to change rules, we have change the agents, we need to change something that's happening inside of here to change what's coming out of it.

**Speaker 1** [00:16:16] Yeah, we're impressed by the wrong thing. It's like that's not the coolest part. Yeah, the coolest part is how that intelligence happens. Yes. And it happens at the micro multiplied. So the micro multiplied makes the macro. And that's amazing. Yeah. That's amazing, it's a little bit somewhat like in the old days, when people saw things like the equivalent of the Grand Canyon, They used to think... Well, in order to create something that big, that grand, it must have been like a massive, because it's a massive effect, it must've been a massive cause. So there must've some kind of like biblical tidal wave that caused the Grand Canyon. That's how people used to think in the time of Lamarck and things like that, right? And of course, that's not true. It's like little things caused the grand canyon. eons. Yes. Right? Yeah. And to understand that those little things, that's why if you want to change your life, change the little things. Yeah. If you want to get good at thinking, do the little thing. If want to be amazing at basketball, focus on the little fundamentals. Yes. When we say the sum, the whole is greater than the sum of its parts, it causes us to, it's like we do like a head fake over to the wrong thing. The micro multiplied makes the macro. Look at the micro. It's amazing.

**Speaker 2** [00:17:50] Yeah, but I'm saying as a default, we are not trained to do that. We do not think about that. Like when we're talking to a group of executives and they have some outcome that they don't like in their business, they're focused on the outcome. Focusing out and they're trying to figure out all these ways to change the outcome and they are not thinking about what were the inputs and the dynamics along the way that led to the outcome because what they need to do is backtrack it.

**Speaker 1** [00:18:19] They need to understand how it happened and and and this idea that the whole is greater than the parts is Is like it's like it creates confusion Right because you go all the whole was so special. No, it's not The whole is exactly equal to the parts and the parts includes the relationships

**Speaker 2** [00:18:37] and there are huge dangers to ignoring the relationship.

**Speaker 1** [00:18:40] Oh my god, they're everything, that's the collective dynamics. But we think just structural parts, well there's relational parts too, and you know all these structural parts really just break down to relational parts anyway.

**Speaker 2** [00:18:52] Yes, but to a lot of people, the, I mean, you've said it, I think you say nature hides all of its secrets in relationships, right? So like relationships are not as easily observed. They're not as easy. They're sort of invisible to people. So they think about the stuff.

**Speaker 3** [00:19:09] Yeah

**Speaker 2** [00:19:09] And they don't think about all the interactions among the stuff that's leading to the thing. Look, I'm talking like you, the stuff and the thing, that's how you talk, with no content. You just like the thing with the thing and the stuff. Why is this important, this concept for systems thinking? Because we're talking about systems thinking.

**Speaker 1** [00:19:30] Well, I think you brought up the really important thing, which is when we have these outcomes that we don't like, these big, whole level, you know, the emergent outcomes, right? What we do is we try to fix them, because we don' t like them. And the fix is a little bit like we throw a rock into the ocean. And when nothing happens, we throw bigger rock in the ocean, and then we get like cat to come and throw a boulder into the ocean and like no matter how big the rock gets, you're not going to have any effect on the ocean.

**Speaker 2** [00:20:08] Did you just say a cat to throw a boulder?

**Speaker 1** [00:20:11] No, like a big, one of those big Tonka trucks.

**Speaker 2** [00:20:16] Oh, like a kitty cat?

**Speaker 1** [00:20:17] Oh, like a kitty cat? Yeah.

**Speaker 2** [00:20:19] It's just picturing this little tiny cat. OK, so the boulder doesn't change. Nothing changes because that's all outcomes.

**Speaker 1** [00:20:27] because it's all outcomes, right? And if they really want to change it, they should focus on some of the parts, right, but they think that the emergence isn't in the parts. It's greater than the parts it's not in the part. So then you're like, okay, where is it? They're like oh, it's just mystery.

**Speaker 2** [00:20:47] Yeah, but.

**Speaker 1** [00:20:48] It's not a mystery.

**Speaker 2** [00:20:49] Yes.

**Speaker 1** [00:20:49] It's not, it's the relationships.

**Speaker 2** [00:20:51] The second problem is if they focus on the parts and they think of the parts as only the stuff and not the interactions among the stuff, then they're still missing half the

**Speaker 1** [00:21:00] Yeah, and even worse if we think of the interactions as not stuff because it's all just physical stuff It's material stuff. Even the things you can't see is material stuff So it's always stuff. Some of it is a little less visible So yeah, if we if we make it into a mystery, right? then then we lose touch with what's really going on and I mean we talk about it as if like think of it this way if if you know Ten clowns went into a bar in the back door. and a kangaroo. One clown and a kangaroo came out. We would be like, hey, a clown and kangaroo just emerged out of that bar. That's right. And we'd be like.

**Speaker 2** [00:21:54] It's magic.

**Speaker 1** [00:21:57] And you're like, no, there's nine clowns in the park.

**Speaker 2** [00:22:03] and they're interacting in the bar.

**Speaker 1** [00:22:04] Yeah. Maybe one of the clowns is in the kangaroo's pouch. Maybe. So maybe there's eight clowns in the bar. But there's nothing magical happening. It's just something comes out of the system. Some outcome. Some emergent property. Those are the emergent properties coming out of system. It's like a black box.

**Speaker 2** [00:22:24] And it's all observable.

**Speaker 1** [00:22:25] It's all observable, and nothing magic is happening.

**Speaker 2** [00:22:30] No, it's part of the system.

**Speaker 1** [00:22:31] And that's a good thing, like, if it's magic, then you're at a Penn and Teller show. And that's, you know, whatever it is, but.

**Speaker 2** [00:22:42] It hasn't.

**Speaker 1** [00:22:42] It has its place, but it's not, it's not. It's not science. Yeah, you're just like, and it's entertainment. Yeah. We're talking about something that exists.

**Speaker 2** [00:22:51] the clown kangaroo bar system. Yes. That's something that's real.

**Speaker 1** [00:22:56] And clowns don't disappear. No. They never disappear. Yeah, so I mean, I don't really know what else to say about it. It just seems so basic. So I don' know why people have such difficulty. And I don''t mean people like in the general public because they don'''t. But when you talk to somebody that presumably knows, you know, complexity or something like that and they go, you know, how can you say this? This is blasphemy. And I''m like, how could you not say that? Right. Is it in the circle or not?

**Speaker 2** [00:23:29] Well, I will say...

**Speaker 1** [00:23:29] Because if it's in the circle, it's part of the circle.

**Speaker 2** [00:23:32] Yes, and I think to answer what you said, which is why people don't understand it, I think people don t understand it because this whole debate about some of the parts, not some of parts, has become sort of thought of as an academic conversation. It's like a debate inside of academia.

**Speaker 1** [00:23:53] Yeah, but it's really not.

**Speaker 2** [00:23:54] Right, it's not. It's real world.

**Speaker 1** [00:23:56] I don't mean people like the people that aren't in the in the field Obviously the reason they don't understand it is because people keep saying stupid shit like the hole is greater than the sum of its parts Yeah, it's just without understanding like other than the when the statements being said mathematics

**Speaker 2** [00:24:12] automatically.

**Speaker 1** [00:24:12] But most of the time when people say this, they're not saying it mathematically.

**Speaker 2** [00:24:18] No, but I also think we have a lot of people, we fall into default modes of thinking and habits where we tend to only see the things that seem the sexiest, the most interesting, the outcome-based stuff, right? And so then we give that our focus. And I think if people just realize that that output came from a set of inputs interacting with each other, then the whole thing is, you know. wide open and debunked, right? It's like, Oh, well, I can see that. Yeah. And you can see it with anything.

**Speaker 1** [00:24:50] these complex adaptive systems, or CAS's, the thing that I think is remarkable about them is they're all the systems we care about. All the systems that humans care about are CAS's. So this is the science of the stuff we care abut.

**Speaker 2** [00:25:06] That's true, and I mean, if you think about, for example, when you have a second kid or a third kid, you don't just have three kids. You have three and all of the dynamics between kid one, kid two, kid one. Kid three, kid three, and two. There's all this other stuff that comes with that. And that whole, all of those interactions of every member of the family is the emergent property of your family, how your family's behaving and the outcomes of your families.

**Speaker 1** [00:25:34] I just find that what's going on in the system is far more interesting in actuality than what comes out. The what comes is a really interesting indicator that something interesting is going on inside. The fact that only a clown and a kangaroo came out is not the interesting part. The interesting part is, what are the clowns doing?

**Speaker 4** [00:26:01] their party.

**Speaker 1** [00:26:01] Like, what are they doing?

**Speaker 2** [00:26:03] They're partying.

**Speaker 1** [00:26:03] Yeah, they're in there doing something. That's the interesting part.

**Speaker 2** [00:26:07] Well, what's also interesting...

**Speaker 1** [00:26:08] If you want to fix that system, if you want that system to change, if you that system that have a different emergent property, you got to go in the bar and you got figure out what's going on in there. Thank you very much for joining us.

**Speaker 2** [00:26:22] and change the interaction.

**Speaker 1** [00:26:23] Change the simple rules. When Murray Gell-Mann said, who won the Nobel Prize, he helped to start the Santa Fe Institute, which is the premier place to study complexity, has had a profound effect on almost every discipline of science. When when Murray Gall-Mahn talked about naming the field of complexity, he wanted to name it Plectics. He wrote a very short paper on let's call it Plectics. And the reason that he wanted to name it that was because the word plek, the word root plek P-L-E-K, is in the form, in the word simple, which originally was like simplex, and it's also in the words complex, that those both come from the root pleck. And what he was saying is what's really fascinating about complexity science and complex adaptive systems. is the absolute sort of interdependence or this relationship between complexity and simplicity. Well, the emergent property is complexity, but it is deeply tied to these simple things that these guys are following. That tether, this statement causes that tether not to be looked at, in my opinion. This statement allows us to just be enamored by this instead of being like, whoa, let's follow that back to where it's all happening. The micro multiplied makes the macro. Yes. That's why it bugs.

**Speaker 2** [00:28:10] I think you've made your point.

**Speaker 1** [00:28:11] Because I think it robs people of how beautiful this and how elegant this nature that we exist in is. It's so elegant and so simple and so beautiful.

**Speaker 2** [00:28:25] I think you explained yourself well, now people know.

**Speaker 1** [00:28:27] There you go. That's a wrap.