

Where the biological individual actually ends.m4a - TRANSCRIPT 2026-09-05 10:24:29

Introduction

At first sight, few biological questions seem easier than asking what counts as an individual. We recognize an animal, a plant, or a human being almost without thinking. A body appears to provide its own answer: here the organism begins; there the surrounding world starts.

Modern biology has made that apparently simple distinction increasingly difficult to maintain.

The physical boundary of an organism does not necessarily coincide with its physiological, ecological, developmental, immunological, or evolutionary boundary. Microbial communities can display striking forms of collective organization. Hosts live in intimate and sometimes indispensable association with microbial partners. Eusocial insect colonies can coordinate their activities so extensively that the colony itself begins to resemble an organism, while the insects composing it remain organisms in their own right.

This shifts the question. Where an organism ends is only part of the problem.

We must also ask what makes a living organization sufficiently integrated, persistent, and distinguishable through time for us to regard it as a biological individual — and whether the same answer can apply across very different forms and scales of life.

That is the problem explored in "*Biological Individuality — The Principle of Systematic Exclusion as a Relational Theory of Biological Individuality*", Monograph No. 3 of the PSE Research Programme.

The monograph approaches *Biological Individuality* through six dimensions of living organization:

- Organizational Boundaries,
- Organizational Integration,
- Adaptive Persistence,
- Developmental Continuity,
- Ecological Coupling and
- Evolutionary Continuity.

These dimensions do not constitute a checklist or scoring system, and no single dimension determines individuality. Their significance lies in their configuration within a particular biological organization and *Context*.

The comparative analysis begins with the relatively familiar case of *the living cell* and then moves through increasingly challenging forms of organization: *biofilms*, *holobionts*, and *eusocial insect colonies*.

As the comparison proceeds, boundaries that initially seemed to coincide begin to separate. Strong integration need not imply unified evolutionary continuity. Ecological dependence need not determine organizational membership. And individuality at one organizational level need not exclude individuality at another.

Biological Individuality consequently emerges less as a fixed property of a materially bounded object than as a relational, multidimensional, and Context-dependent feature of living organization.

The comparison also raises a further question: *whether comparable organizational relations can recur at very different biological scales despite being realized through different mechanisms*. Monograph No. 3 formulates this possibility as the research hypothesis of *Organizational Scale Invariance*.

It remains a hypothesis to be investigated, not a conclusion established by the cases themselves.

The following podcast was generated as an accessible exploration of these ideas. It deliberately uses informal dialogue, analogies, rhetorical emphasis, and simplified formulations to make a highly theoretical argument easier to follow.

This gives the conversation much of its accessibility, *but* occasionally also makes a claim sound stronger or more general than the corresponding argument in the monograph.

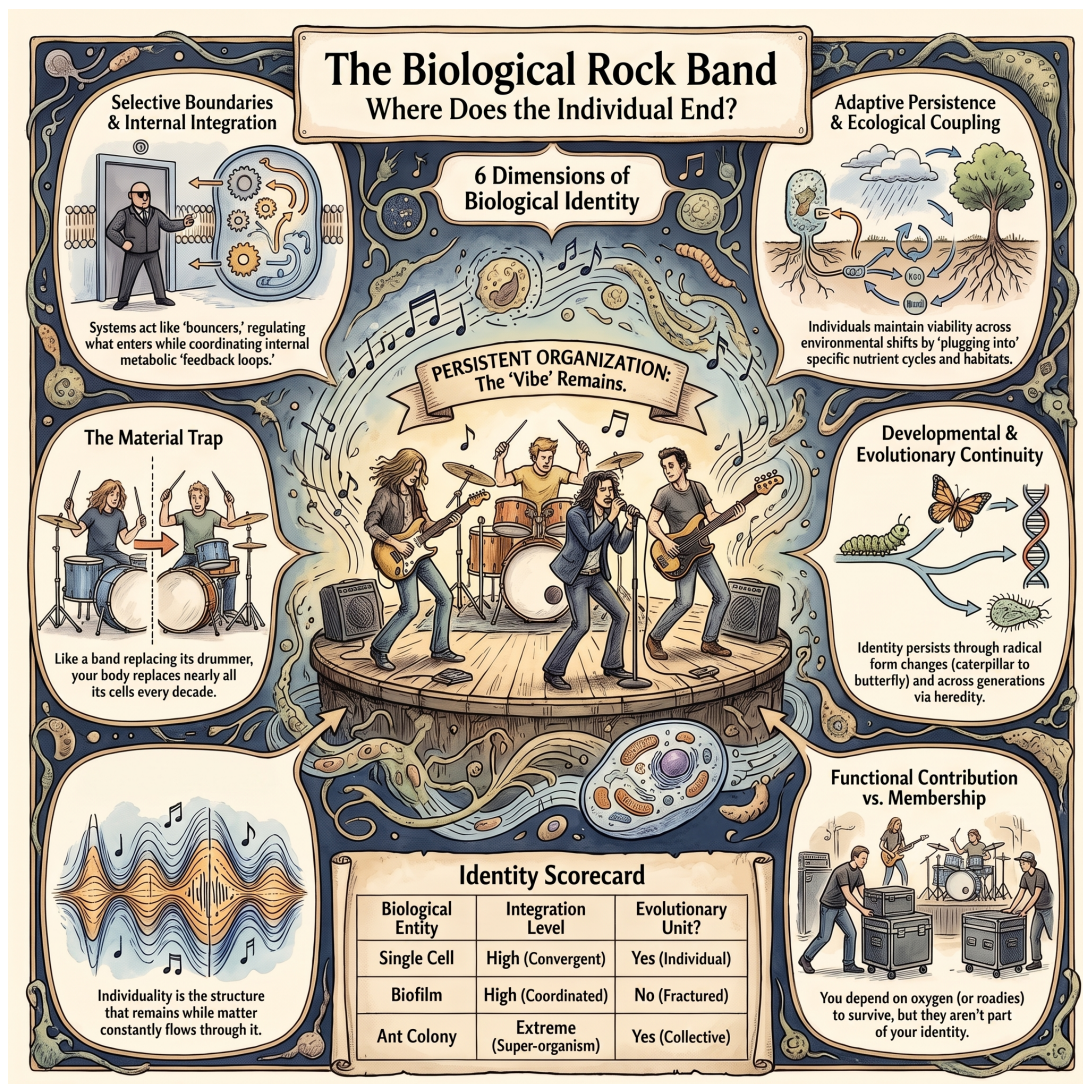
For that reason, editorial annotations have been added at several points in the transcript. They identify where conversational expressions such as “*proves*,” “*completely*,” or “*the exact same*” require scientific qualification; where a complex biological debate has been compressed for explanatory purposes; and where the speakers move beyond the argument of Monograph No. 3 into speculation about other organizational domains.

These annotations are intended to preserve the accessibility of the original conversation while keeping its scientific status clear.

The transcript should therefore be read as an invitation into the problem, *not* as a substitute for the scientific argument developed in the monograph.

And the problem begins with a deceptively simple question:

Where does the biological individual actually end?



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00:00:00 ~

Welcome to this deep dive. Today we .. basically have a single mission. And that is to completely shatter your intuitive idea of what a *biological individual* actually is.

00:00:11 `

Yeah, it's gonna get a little weird today..

00:00:12 ~

It really is! So we're looking at this fascinating, honestly, highly theoretical 2026 scientific paper by H Ch J Stolting. It's called *Individuality* - Monograph number three.

00:00:24 `

Right, out of the .. the *Principle of Systematic Exclusion Research Programme*, or PSE.

00:00:29 ~

Exactly, and we're using this paper plus its supplementary materials to figure out why modern biology is currently in like an absolute crisis over a really simple question, which is .. you know .. *where do you end and where does the rest of the universe begin?*

[Editorial note: "Crisis" is used here rhetorically. Contemporary biology contains multiple, partly non-coincident concepts of biological individuality; this should not be understood as implying a general crisis within the biological sciences.]

00:00:42 `

Sounds like a question for philosophers, Right? Not scientists..

00:00:45 ~

Yeah, totally!

00:00:46 `

But it is currently tearing apart the biological sciences because, .. , for centuries we operated on what Stolting calls the *classical organism concept*,

00:00:55 ~

Which is kind of the biology we all learned in high school.

00:00:57 `

Exactly! The version we grew up with. Like an organism has clear anatomical boundaries, skin, bark, a shell. .. It has physiological integration. Meaning its internal parts all work together to keep it alive. And it has reproductive continuity .. you know .. it makes more of itself.

00:01:13 ~

And I mean, when you're looking at a dog or you know an oak tree, that definition holds up perfectly. Oh, perfect! You can literally count them on a table. Like one dog, one tree ..

00:01:24 `

But the problem is, once you zoom in or zoom out, that neat little package just starts leaking everywhere. ..

The paper points out that modern biologists are approaching this whole concept of individuality from entirely conflicting angles these days.

00:01:40 ~

Like they aren't even looking at the same things anymore..

00:01:42 `

No, they aren't!

Evolutionary biologists they're looking for units of Darwinian selection, right? They want to know what is actually evolving and passing on traits.

Okay, yeah!

But then *immunologists* are looking at *self versus non-self*, like 'what does the body tolerate and what does it attack?'

00:01:58 ~

The immune response..

00:01:59 `

Exactly. And then *ecologists* they're out there mapping interaction networks and energy flows. And the big crisis is that .. these boundaries just do not overlap anymore.

00:02:09 ~

So, like the physical edge of an animal might not actually be its evolutionary edge.

00:02:14 `

Yeah, exactly. Or an ecological boundary might completely ignore the physical skin of the organism. .. The whole framework of the classical organism is failing because we keep discovering biological entities where the anatomical, immunological and evolutionary lines are .. just they're drawn in completely different places.

00:02:32 ~

You know, I was trying to wrap my head around this crisis when I was reading the source material and I came up with an analogy ..

00:02:38 `

Oh, let's hear it.

00:02:39 ~

Okay, think about trying to define a famous *rock band*, right? .. Is the band defined by the original human members who founded it? .. Or is it defined by the legal trademark owned by a record label? Even if like literally all the members change?

00:02:56 `

Ah, like the *Ship of Theseus* ..

00:02:58 ~

Exactly! Or is it defined by the distinct sound they produce? Depending on who you ask? Like a music historian, a lawyer or a fan? The boundary of what actually constitutes the band changes completely.

00:03:09 `

I like that. That is a highly functional analogy for what Stolting is trying to solve here. Because if you just look at the material stuff, .. you know .. the specific musicians in the band or the specific cells in a body, you lose the thread of what the entity actually is.

00:03:24 ~

Right, because the cells are always changing.

00:03:26 `

Exactly. So Stolting argues we need a fundamental shift in how we observe life. He proposes that we evaluate biological individuality based on something he calls *persistent organization*.

[Editorial note: Persistent Organization is the ontological point of departure for the analysis, not a sufficient criterion of Biological Individuality. Monograph No. 3 explicitly distinguishes Persistent Organization from Biological Individuality.]

00:03:39 ~

Persistent organization? Okay, so basically how a system maintains its identity while constantly exchanging matter with the environment.

00:03:46 `

Precisely. Yeah, to use your band analogy, it's the *structure* of the band that persists. Even if the drummer quits and gets replaced.

00:03:53 ~

Right, the vibe stays the same.

00:03:55 `

Yeah, and in biology, you are constantly replacing your cells, right? .. Breathing out carbon. .. Taking in new nutrients.. You are not the same physical stuff you were 10 years ago.

00:04:04 ~

Not even close!

00:04:05 `

Not even close .. Yeah .. but *your organization persists*.

00:04:08 ~

So instead of drawing a physical line around a body and calling it an individual, Stolting gives us a *new analytical toolset* to sort of measure this persistent organization. And the monograph outlines six dimensions of living organization to do this.

00:04:23 `

Yeah, and we should definitely walk through these because they form the whole lens we're going to use for the rest of this deep dive. Let's do it.

So Stolting's six dimensions map out the different ways biological continuity happens in nature. The first one is organizational boundaries. .. Now it's super tempting to think of this as just a physical wall. But in this framework a boundary is about how a system actively regulates exchange with the outside world.

It's the selective filtering of what comes in and what goes out.

00:04:53 ~

Oh, like the *bouncer at a club* basically deciding who gets in and who gets kicked out. Just to maintain the vibe inside.

00:04:58 `

That is .. yeah .. that's the mechanism! Yes, it regulates flow. Got it!

The second dimension is *organizational integration*. This is internal coordination. Think of interdependent processes like metabolism. Nervous systems, chemical feedback loops, all working together to keep the organization running smoothly.

00:05:15 ~

Okay, that makes sense. What's the third?

00:05:16 `

Third is *adaptive persistence*. This is the capacity of the system to maintain its viability when conditions change. So if the environment gets hotter or resources drop, can the system regulate itself? Adjust its behavior or its physiology? And actually survive?

00:05:35 ~

Right, which feels distinctly different from the fourth dimension, right?
The developmental continuity.

00:05:40 `

Very different, yeah!

00:05:41 ~

Because adaptation is reacting to a change *right now* but developmental continuity is about connected states *through time*.

00:05:47 `

Exactly.

00:05:48 ~

Like a caterpillar becoming a butterfly the system radically changes its physical form. But it remains part of an ongoing continuous developmental history.

00:05:57 `

You hit on a crucial distinction there: Adaptation handles external shocks. Development handles internal programming across time.

00:06:05 ~

Okay, got it.

00:06:05 `

Then we have the fifth dimension which is *ecological coupling*. Living systems don't exist in a vacuum, obviously. .. So this dimension measures the necessary continuous relations with the environment. The specific habitats, the nutrient cycles, the symbiotic interactions that the organization requires just to persist.

00:06:22 ~

So how it plugs into the world around it ..

00:06:24 `

Yes. And finally, the sixth dimension: *evolutionary continuity*.

00:06:29 ~

The *transgenerational* stuff. Right ..

00:06:31 `

Reproduction, heredity, variation .. How the system participates in Darwinian selection across generations. ..

00:06:39 ~

So to recap, those are six dimensions:

Boundaries, integration, adaptive persistence, developmental continuity, ecological coupling and evolutionary continuity.

00:06:48 `

That's the list!

00:06:49 ~

But wait, I'm stuck on something here. If we're applying this out in the field, is this just a scorecard? What do you mean?

Like, if a biological entity scores a solid six out of six across these dimensions, it officially wins the title of individual? ..

00:07:02 `

No! That is a really common misconception when reading frameworks like this. But Stolting is emphatic that this is *not* a checklist.

Oh really?

Yeah, it's not a binary test where you pass or fail. He calls it a relational configuration.

Okay..

See, in some living things these dimensions all neatly overlap. But in others, they are distributed across entirely different spatial levels. Or they just act independently of one another.

Individuality in this framework is a *matter of degree*. It is entirely *Context dependent*.

Wow, Okay!

[Editorial note: This is a central methodological qualification. The six dimensions are analytical dimensions, not necessary-and-sufficient criteria or a scoring system. Biological Individuality is assessed through their relational configuration within a specified Context.]

00:07:30 ~

So let's actually test this framework on the real world because I know that's where the monograph gets pretty wild.

It does! We're going to start at the bottom in the *complexity ladder* and sort of see what happens to individuality as we move up.

First up, *the free living cell*.

00:07:45 `

Yeah, the free living cell is the perfect reference case for this framework. Which is exactly why Stolting starts there. In a single cell all six of those dimensions we just talked about converge beautifully into one tiny package.

00:08:00 ~

Right, it's super tidy. Like the lipid membrane acts as the organizational boundary the internal metabolism is the integration.

00:08:06 `

Exactly.

00:08:06 ~

It adapts to changes. It develops. It ecologically couples with its environment for nutrients and it divides through mitosis to create evolutionary continuity. It's just incredibly tidy.

00:08:16 `

It is the biological equivalent of a closed loop. .. but the neatness completely disappears the moment we look at our next case study. Which is *biofilms*.

00:08:25 ~

Oh right, and just to be clear for you listening: when we say biofilms we aren't just talking about a loose pile of bacteria on a surface somewhere. We are talking about *highly structured communities*.

00:08:34 `

Right, biofilms are fascinating because they represent a massive leap in persistent organization. A biofilm actually exudes an extracellular matrix. A literal shared scaffolding made of proteins and sugars that houses millions of individual bacteria.

00:08:51 ~

It's like a city ..

00:08:52 `

It is! But it's not just a shared apartment building. The cells inside a biofilm engage in what's known as *quorum sensing*.

00:09:00 ~

Okay, let's pause on that for a second because the mechanics of *quorum sensing* are just mind blowing. It's essentially chemical voting .. right?

00:09:06 `

It is exactly a chemical vote. Individual bacteria constantly secrete these signaling molecules called *auto-inducers*. .. And when the concentration of these molecules in the environment hits a specific threshold, a quorum, it triggers a massive simultaneous change in gene expression across the entire colony.

00:09:23 ~

That is wild!!

00:09:24 `

They literally stop acting like solo swimmers and start acting like a tissue!

00:09:28 ~

So they're actually coordinating their behavior. The source material also talks about shared metabolic *gradients*. How does that work in a biofilm?

00:09:36 `

Think of it like an assembly line based on location. The bacteria on the outer edge of the biofilm are exposed to oxygen. So they perform aerobic respiration.

00:09:46 ~

Right, standard oxygen breathing ..

00:09:47 `

But in doing so they consume *all* the oxygen which creates an anaerobic oxygen-free zone deep inside the biofilm.

00:09:55 ~

Oh wow!

00:09:56 `

So the bacteria living in that deep zone *switch to a completely different type of metabolism*. And they end up producing metabolic byproducts that the outer bacteria actually need to survive.

00:10:06 ~

They are literally feeding each other by altering their shared environment. .. So, when we look at our six dimensions biofilms have incredible organizational integration and adaptive persistence operating at a *collective level*.

00:10:18 `

Very much so!

00:10:19 ~

Like the biofilm as a whole can survive an antibiotic attack that would just instantly kill any single free floating cell!

00:10:26 `

But here is the critical pivot in Stolting's argument:

00:10:31 `

If you look at that level of integration you might be really tempted to call the biofilm a single biological individual.

00:10:38 ~

I mean .. I would ..

00:10:39 `

Right! But what happens when we look at the sixth dimension? Evolutionary continuity? ..

00:10:45 ~

Does the biofilm evolve as one giant entity?

00:10:49 `

No, it doesn't and that's the catch!

While biofilms have massive collective integration their evolutionary continuity remains firmly anchored at the level of the individual constituent cells.

00:11:00 ~

So the individual bacteria inside the biofilm are still the ones passing on their specific genes, competing with each other .. Maybe even mutating at different rates.

00:11:09 `

Exactly. They retain their own distinct reproductive lineages. They cooperate to build a matrix and survive a threat, sure, but they do not reproduce collectively as a single evolutionary unit.

[Editorial note: This is a deliberately simplified formulation. Biofilms can display complex evolutionary dynamics at multiple levels. The argument of Monograph No. 3 is the narrower one that strong collective integration does not, by itself, establish unified evolutionary continuity or Biological Individuality at the biofilm level.]

00:11:21 ~

Interesting!

00:11:22 `

This proves a major takeaway from the monograph. ..

Collective organization does not automatically equal collective individuality.

[Editorial note: “Proves” is too strong in the scientific sense. The biofilm case illustrates and supports the distinction between collective organization and collective individuality; it does not by itself prove a general proposition.]

00:11:28 ~

Because the evolutionary part is missing at the group level ..
Right.

00:11:32 `

The biofilm shows us that you can have extreme integration without having unified evolutionary continuity.

00:11:38 ~

Okay, so if bacteria can do this on a rock in a stream, what happens when that rock is actually my stomach? Oh boy.

Yeah, let's bring this uncomfortably close to home and look at *holobionts*, because this is where the paper starts directly messing with our own sense of self.

00:11:52 `

Yeah, a holobiont is simply defined as a host organism plus its entire associated microbiome. So you, listening to this right now, you are a holobiont ..

00:12:02 ~

.. a walking ecosystem ..

00:12:05 `

Truly, the trillions of bacteria, fungi and viruses living on your skin, in your mouth and in your gut—they are fundamentally entangled with your biology.

00:12:13 ~

And the text highlights just how extreme that entanglement actually is. Like we aren't just giving these microbes a free ride they dictate our digestion. .. They shape the development of our immune systems. In some organisms, like certain squids or insects, the microbes literally guide anatomical development. ..

Like if the microbe isn't there the animal just grows up deformed.

00:12:34 `

And this profound physiological and ecological coupling sparked one of the biggest debates in modern biology, which is the *hologenome theory*. ..

The *hologenome* concept argues that because the host and the microbes are so tightly integrated, they should be considered a *single unified unit of evolution*.

A single individual!

00:12:55 ~

But the text references critics of this idea too, right?

Specifically, researchers like *Douglas & Werren*¹.

00:13:01 `

Yeah, they point out a massive flaw in calling a holobiont a single evolutionary individual. .. And that flaw is *dynamic membership*.

00:13:09 ~

Right, dynamic membership, which completely undermines the hologenome theory, because your microbial membership is incredibly dynamic. .. Like you do not have the same microbiome you had 10 years ago.

You swap out microbes based on your diet, where you travel, who you kiss or you know whether you take a course of antibiotics.

[Editorial note: “Completely undermines” overstates the scientific conclusion. Dynamic membership, differing transmission routes, and partially independent evolutionary lineages are major difficulties for strong versions of the hologenome/holobiont-as-unit-of-selection thesis. The status of holobionts as evolutionary individuals remains debated.]

00:13:25 `

And the transmission mechanisms are totally different too. I get my DNA vertically from my parents but I get my gut bacteria horizontally from like a piece of cheese I ate yesterday. Or from the dirt in my garden ..

00:13:38 ~

Which means those microbes have entirely different evolutionary lineages and histories than you do.

00:13:43 `

Exactly! They don't share your evolutionary fate.

00:13:45 ~

Okay, but I have to stop you there because I am genuinely stuck on something ..

00:13:49 `

Sure, what is it?

00:13:50 ~

If I literally cannot digest my food without these gut bacteria and my immune system completely relies on them to figure out what to attack, how can you possibly say they aren't part of me?

00:14:02 `

I know it feels incredibly counterintuitive but Stolting resolves this by making a really vital distinction between functional contribution and organizational membership.

[Editorial note: “Resolves” should here be read as “addresses within the proposed PSE framework.” The distinction between functional contribution and organizational membership is an analytical proposal, not a settled resolution of the biological debate.]

00:14:12 ~

Okay, what is the difference? Break that down for me.

¹ [Douglas, A. E., & Werren, J. H. (2016). Holes in the hologenome: Why host-microbe symbioses are not holobionts. *mBio*, 7(2), e02099-15]

00:14:14 `

Let's use an analogy. Think about oxygen. .. You absolutely depend on oxygen to survive. It dictates your cellular metabolism. Without it, you die in minutes. But you wouldn't say the oxygen in the room is part of your organizational identity, right?

00:14:28 ~

Right, because it's just a resource I'm pulling from the environment.

00:14:32 `

Exactly! Just because you are ecologically dependent on a gut microbe, just because it provides a critical function doesn't automatically grant it organizational membership in your specific biological individuality.

00:14:44 ~

Oh wow!

00:14:45 `

The Holobiont case study proves that functional integration, our *second* dimension, can be incredibly strong while evolutionary continuity, the *sixth* dimension, remains completely fractured.

00:14:56 ~

That makes so much sense: extreme dependence does not equal identity.

00:15:00 `

Exactly!

00:15:00 ~

The host and the microbe are deeply coupled .. but they have different boundaries, different developmental histories and just entirely different evolutionary interests.

00:15:09 `

You are an ecosystem but you and the ecosystem are not the exact same individual.

00:15:13 ~

Man, that completely flips how I look at my own biology!

00:15:16 `

It does!

00:15:16 ~

But let's push this framework to its absolute limit now. Let's look at the final test case in the monograph.

00:15:22 `

Ah, yes ..

00:15:23 ~

What happens when the parts making up the collective are fully formed multicellular animals themselves?

We are talking about *eusocial insects*: ants, bees, termites.

00:15:34 `

Yeah, eusociality is the ultimate stress test for the concept of distributed individuality. When we run an ant colony through our six dimensions, we see staggering levels of organizational integration.

00:15:46 ~

Right, like the division of labor! ..

00:15:48 `

Yes, you have rigid division of labor: *foragers*, *nurses*, *soldiers*. All coordinating wildly complex tasks like building architecture or waging war. And they do it entirely without a central brain or a CEO barking orders.

00:16:01 ~

And they have intense organizational boundaries too. Not just the physical ant hill but *chemical* borders.

00:16:06 `

So, the chemical borders are amazing.

00:16:08 ~

The text mentions they use cuticular hydrocarbons. How does a chemical border wall actually work in practice?

00:16:14 `

It is a brilliant mechanism. Basically, ants secrete heavy waxes, these hydrocarbons, onto their exoskeletons. And as they constantly groom each other and rub against each other they mix these waxes which creates a unique colony-specific chemical profile.

It acts like a *biometric password*. When two ants meet they tap antennae essentially smelling each other's wax. If the profile matches, you belong. If it's even slightly off, you are instantly recognized as an outsider and attacked.

00:16:44 ~

So it functions exactly like a cell membrane rejecting a foreign body just scaled up to a macro level. ..

Okay, so they have the boundaries, they have the integration but the most important shift here, the thing that actually separates the ant colony from the biofilm we talked about earlier, is that sixth dimension again, ..?

Evolutionary continuity.

00:17:03 `

This is where the magic happens, Because unlike the biofilm where every single bacterium is still competing to reproduce for itself, a eusocial colony undergoes reproductive specialization.

00:17:14 ~

Right, *only the queen gets to reproduce*. The vast majority of the worker ants are completely sterile.

00:17:20 `

Which fundamentally changes the evolutionary math .. Because the workers cannot pass on their own genes directly their evolutionary interests become perfectly aligned with the colony.

Wow!

Their own individual evolutionary success is entirely dependent on the colony surviving long enough to produce a new generation of queens and drones.

00:17:38 ~

So they have essentially outsourced their reproduction ..

00:17:41 `

Yes! It shifts the evolutionary continuity away from the individual ant and elevates it firmly to the collective level of the colony. The workers are biologically functioning like the somatic cells in your body, in your skin or muscle cells, which also gave up their right to reproduce to support your reproductive organs.

[Editorial note: The podcast deliberately simplifies the evolutionary biology of eusociality. Reproductive specialization and high relatedness can produce strong alignment of evolutionary interests and support colony-level selection, but "*perfect alignment*" should not be read literally. Evolutionary processes can remain relevant at multiple organizational levels.]

00:18:00 ~

That is just so. An ant colony is literally a single distributed body. .. The queen is the reproductive system. The soldier ants are the immune system. The foragers are the digestive system going out to gather nutrients and bring them back to the stomach of the colony.
It's an organism where the cells can detach, walk 20 yards into the forest and come back.

00:18:20 `

Which is exactly why biologists often refer to them as *super-organisms*. .. The dimensions of integration, boundaries and evolutionary continuity all converge powerfully at the macro level of the colony. ..

But Stolting points out a final, incredibly important twist here..

.. Ooh, Let's hear it ..

Despite this massive shift to collective organization, the individual worker ants do not cease to be individual organisms.

00:18:44 ~

Wait .. really?

00:18:45 `

Yeah! They still retain their own physical boundaries. They still maintain their own individual physiological metabolism to stay alive. They go through their own distinct developmental histories, from egg to larva to pupa to adult.

00:18:58 ~

So wait, let me get this straight. They are distinct biological individuals, functioning as gears inside a larger biological individual?

Exactly,

00:19:08 `

The eusocial colony proves that biological individuality doesn't have to exist at just one level at a time. *It can exist at multiple nested levels simultaneously.*

[Editorial note: Here too, "proves" is used conversationally. The case supports the possibility of nested or multilevel Biological Individuality; the monograph treats such attribution as comparative and theoretically informed rather than automatically established by organizational similarity.]

00:19:16 ~

Nested levels ..

00:19:17 `

Yeah! You have deep organizational individuality at the level of the single ant, securely nested inside deep organizational individuality at the level of the colony.

00:19:26 ~

That is mind-bending! The boundaries don't just blur; they stack on top of each other.

They do. So let's pull all of this together .. We've gone from a single cell to the chemical voting of a biofilm to the messy ecological borders of the holobiont to the nested, distributed body of the ant colony.

00:19:43 `

It's quite a journey ..

00:19:44 ~

What is the grand conclusion Stolting is actually drawing from comparing all of these bizarre biological configurations?

00:19:50 `

Well, we need to zoom out and look at the theoretical climax of the monograph.

By analyzing these dimensions across different scales Stolting introduces a hypothesis called: *Organizational scale invariance*.

00:20:05 ~

Organizational scale invariance .. what does that mean for how we understand life?

00:20:08 `

.. .. A cell uses a physical lipid membrane to maintain its boundary. An ant colony uses chemical pheromones and violent behavioral responses to maintain its boundary.

The stuff is different, the physical mechanisms are different but the relational architecture -the topology of how the system persists- is the exact same.

[Editorial note: "The exact same" is stronger than the claim made in Monograph No. 3. The comparison identifies candidate correspondences in organizational relations across scales. Whether these constitute recurrence of a common organizational architecture is precisely what the hypothesis of Organizational Scale Invariance proposes for further investigation.]

00:20:29 ~

It's like finding out that the blueprint for a bicycle is *somehow* identical to the blueprint for a solar system ..

.. Yeah, it's just a massive theoretical leap ..

00:20:37 `

It is a massive leap and we should definitely note that Stolting is very careful to frame this as a *research hypothesis*.

00:20:43 ~

Right, it needs more testing.

00:20:45 `

Yeah, it requires rigorous, independent proof and mathematical testing across other biological systems.

He is clear that this is distinct from general complexity science, which just sort of notices that patterns repeat everywhere.

[Editorial note: This is an informal oversimplification. Complexity science investigates and explains a wide range of recurrent quantitative and structural regularities, including scaling relations, network structures, feedback processes, and self-organization. The intended distinction is that PSE's Organizational Scale Invariance hypothesis makes the more specific proposal that comparable organizational relations may recur across scales despite different material realizations.]

00:20:58 ~

Okay, gotcha.

00:20:59 `

Scale invariance is a specific testable claim about the fundamental ontology of living organization.

[Editorial note: At this stage, Organizational Scale Invariance is formulated as a research hypothesis. Its empirical operationalization and the conditions under which it can be independently tested remain part of the research programme.]

00:21:05 ~

So, taking all of this in, I want to connect this directly back to you -the listener- because understanding the six dimension framework should completely change how you view yourself. When you look in the mirror now, you shouldn't just see a static collection of meat and bones. You shouldn't see a closed off binary package.

You are a persistent organization.

00:21:24 `

You are a dynamic, ongoing process. You are constantly navigating, exchanging matter, selectively interacting with a changing world and relentlessly renewing your organization. ..

Your identity is not defined by the material you are made of today because -honestly- that material will be gone in a few years.

.. Your individuality is defined by the persistence of your relational configuration.

[Editorial note: This is a popular summary, not a formal definition. Monograph No. 3 treats Biological Individuality as a relational, multidimensional and Context-dependent property. Persistent Organization is foundational to the analysis but does not alone define Biological Individuality.]

00:21:47 ~

It's a much more fluid, entangled way to look at life ..

00:21:50 `

It really is!

00:21:51 ~

Well, thank you for taking this deep dive with us today. But before we go we want to leave you with one final thought. Something inspired directly by the supplementary materials of Stolting's monograph. ..

00:21:59 `

.. If persistent organization and these six dimensions apply across vastly different scales entirely regardless of the physical material involved: *What happens when we point this framework away from biology?*

00:22:12 ~

Exactly! What happens if we take these six dimensions and apply them to human institutions or to *artificial intelligence*?

00:22:19 `

It's a crazy thought experiment ..

00:22:20 ~

Think about a massive multinational corporation. It actively regulates its organizational boundaries. You know .. hiring and firing, non-disclosure agreements. .. It has intense internal integration across departments. .. It adapts to market changes to persist. It develops over time. It ecologically couples with its economic environment and supply chains ..

00:22:42 `

So could a corporation -or maybe a decentralized self-learning *AI network*- eventually score highly enough across these specific dimensions to become a new kind of non biological individual?

[Editorial note: This closing passage is a speculative extension beyond the argument of Monograph No. 3. Its six dimensions were developed specifically for biological organization and should not simply be transferred as a scorecard to institutions or artificial intelligence. Later monographs in the PSE Research Programme investigate other organizational domains on their own terms.]

00:22:55 ~

Right! If the underlying architecture of individuality doesn't require flesh and blood, *where do we actually draw the line?*

00:23:01 `

That's a great question!

00:23:02 ~

So the next time you try to count the objects on a table or count the living things in a room, just remember the neat precise packages we want to see ..

.. They might just be an illusion ..

[Editorial note: The monograph does not claim that biological individuals or their boundaries are illusions. Its conclusion is that Biological Individuality can be relational, multidimensional, graded, and Context-dependent, and that different organizational boundaries need not coincide.]

00:23:11 `

The world is far more beautifully entangled than that!

00:23:14 ~

Thanks for listening! Keep diving deep!

END of Podcast

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