



30-DAY INTERMITTENT FASTING CHALLENGE ACCORDING TO THE AGE

AGE: 45-50	AGE: 51-55	AGE: 56-60	AGE: 61-65	AGE: 66-70	AGE: 71+
BREAKFAST: 1. Scrambled eggs with whole wheat toast 2. Greek yogurt with fresh berries and a sprinkle of granola. LUNCH: 1. Veggie stir-fry with tofu, broccoli, bell peppers, carrots 2. Lentil soup with a side of whole wheat bread DINNER: 1. Lentil and vegetable curry served over brown rice 2. Grilled vegetable skewers with a side of quinoa or couscous.	BREAKFAST: 1. Whole grain cereal with low-fat milk and a side of mixed nuts 2. Whole wheat pancakes topped with a dollop of Greek yogurt. LUNCH: 1. Lentil soup with a side of whole wheat bread 2. Sweet potato and black bean tacos with avocado, salsa, and lime crema. DINNER: Caprese pasta salad with fresh mozzarella, cherry tomatoes, basil, and balsamic vinaigrette.	BREAKFAST: 1. Cereal topped with sliced bananas and a drizzle of honey 2. Veggie omelet with spinach, tomatoes, and mushrooms. LUNCH: 1. Spinach and feta stuffed bell peppers served with a side of quinoa 2. Sweet potato and black bean tacos with avocado. DINNER: Eggplant Parmesan with marinara sauce and melted cheese, served with a side salad.	BREAKFAST: 1. Cereal topped with sliced bananas and a drizzle of honey 2. Veggie omelet with spinach, tomatoes, and mushrooms. LUNCH: 1. Spinach and feta stuffed bell peppers served with a side of quinoa 2. Sweet potato and black bean tacos with avocado. DINNER: Eggplant Parmesan with marinara sauce and melted cheese, served with a side salad.	BREAKFAST: 1. Scrambled eggs with whole wheat toast 2. Greek yogurt with fresh berries and a sprinkle of granola. LUNCH: 1. Veggie stir-fry with tofu, broccoli, bell peppers, carrots 2. Lentil soup with a side of whole wheat bread DINNER: 1. Lentil and vegetable curry served over brown rice 2. Grilled vegetable skewers with a side of quinoa or couscous.	BREAKFAST: 1. Whole grain cereal with low-fat milk and a side of mixed nuts 2. Whole wheat pancakes topped with a dollop of Greek yogurt. LUNCH: 1. Lentil soup with a side of whole wheat bread 2. Sweet potato and black bean tacos with avocado, salsa, and lime crema. DINNER: Caprese pasta salad with fresh mozzarella, cherry tomatoes, basil, and balsamic vinaigrette.

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ENVIRONMENT

What Plants Are Saying About Us

Your brain is not the root of cognition.

BY AMANDA GEFTER March 7, 2023



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I was never into house plants until I bought one on a whim—a prayer plant, it was called, a lush, leafy thing with painterly green spots and ribs of bright red veins. The night I brought it home I heard a

rustling in my room. Had something scurried? A mouse? Three jumpy nights passed before I realized what was happening: The plant was *moving*. During the day, its leaves would splay flat, sunbathing, but at night they'd clamber over one another to stand at attention, their stems steadily rising as the leaves turned vertical, like hands in prayer.



“Who knew plants do stuff?” I marveled. Suddenly plants seemed more interesting. When the pandemic hit, I brought more of them home, just to add some life to the place, and then there were more, and more still, until the ratio of plants to household surfaces bordered on deranged. Bushwhacking through my apartment, I worried whether the plants were getting enough water, or too much water, or the right kind of light—or, in the case of a giant carnivorous pitcher plant hanging from the ceiling, whether I was leaving enough fish food in its traps. But what never occurred to me, not even once, was to wonder what the plants were thinking.

To understand how human minds work, he started with plants.

I was, according to Paco Calvo, guilty of “plant blindness.” Calvo, who runs the Minimal Intelligence Lab at the University of Murcia in Spain where he studies plant behavior, says that to be plant blind is to fail to see plants for what they really are: cognitive organisms endowed with memories, perceptions, and feelings, capable of learning from the past and anticipating the future, able to sense and experience the world.



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It's easy to dismiss such claims because they fly in the face of our leading theory of cognitive science. That theory goes by names like "cognitivism," "computationalism," or "representational theory of mind." It says, in short, the mind is in the head. Cognition boils down to the firings of neurons in our brains.

And plants don't have brains.

"When I open up a plant, where could intelligence reside?" Calvo says. "That's framing the problem from the wrong perspective. Maybe that's not how our intelligence works, either. Maybe it's not in our heads. If the stuff that plants do deserves the label 'cognitive,' then so be it. Let's rethink our whole theoretical framework."



Calvo wasn't into plants, either. Not at first. As a philosopher, he was busy trying to understand human minds. When he began studying cognitive science in the 1990s, the dominant view was the brain was a kind of computer. Just as computers represent data in transistors, which can be in "on" or "off" states corresponding to 0s and 1s, brains were thought to represent data in the states of their neurons, which could be "on" or "off" depending on whether they fire. Computers manipulate their representations according to logical rules, or algorithms, and brains, by analogy, were believed to do the same.¹

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But Calvo wasn't convinced. Computers are good at logic, at carrying out long, precise calculations—not exactly humanity's shining skill. Humans are good at something else: noticing patterns, intuiting, functioning in the face of ambiguity, error, and noise. While a computer's reasoning is only as good as the data you feed it, a human can intuit a lot from just a few vague hints—a skill that surely helped on the savannah when we had to recognize a tiger hiding in the bushes from just a few broken stripes. “My hunch was that there was something really wrong, something deeply distorted about the very idea that cognition had to do with manipulating symbols or following rules,” Calvo says.

THE PLANT WHISPERER: Paco Calvo once studied artificial intelligence to determine whether it could help unlock secrets of cognition. He decided it couldn't. Plants were the key. *Courtesy of Universidad de Murcia.*

Calvo went to the University of California San Diego to work on artificial neural networks. Rather than dealing in symbols and algorithms, neural networks represent data in large webs of associations, where one wrong digit doesn't matter so

long as more of them are right, and from a few sketchy clues—*stripe, rustle, orange, eye*—the network can bootstrap a half-decent guess—*tiger!*

Artificial neural networks have led to breakthroughs in machine learning and big data, but they still seemed, to Calvo, a far cry from living intelligence. Programmers train the neural networks, telling them when they're right and when they're wrong, whereas living systems figure things out for themselves, and with small amounts of data to boot. A computer has to see, say, a million pictures of cats before it can recognize one, and even then all it takes to trip up the algorithm is a shadow. Meanwhile, you show a 2-year-old human *one* cat, cast all the shadows you want, and the toddler will recognize that kitty.

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“Artificial systems give us nice metaphors,” Calvo says. “But what we can model with artificial systems is not genuine cognition. Biological systems are doing something entirely different.”

Calvo was determined to find out what that was, to get at the essence of how real biological systems perceive, think, imagine, and learn. Humans share a long evolutionary history with other forms of life, other forms of mind, so why not start with the most basic living systems and work from the bottom up? “If you study systems that look way different and yet you find similarities,” Calvo says, “maybe you can put your finger on what is truly at stake.”

So Calvo traded neural networks for a green thumb. To understand how human minds work, he was going to start with plants.



It turns out it's true: Plants do stuff.

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For one thing, they can sense their surroundings. Plants have photoreceptors that respond to different wavelengths of light, allowing them to differentiate not only brightness but color. Tiny grains of starch in organelles called amyloplasts shift around in response to gravity, so the plants know which way is up. Chemical receptors detect odor molecules; mechanoreceptors respond to touch; the stress and strain of specific cells track the plant's own ever-changing shape, while the deformation of others monitors outside forces, like wind. Plants can sense humidity, nutrients, competition, predators, microorganisms, magnetic fields, salt, and temperature, and can track how all of those things are changing over time. They watch for meaningful trends—Is the soil depleting? Is the salt content rising?—then alter their growth and behavior through gene expression to compensate.

Plants can distinguish self from non-self, stranger from kin.

Plants' abilities to sense and respond to their surroundings lead to what seems like intelligent behavior. Their roots can avoid obstacles. They can distinguish self from non-self,

stranger from kin. If a plant finds itself in a crowd, it will invest resources in vertical growth to remain in light; if nutrients are on the decline, it will opt for root expansion instead. Leaves munched on by insects send electrochemical signals to warn the rest of the foliage,² and they're quicker to react to threats if they've encountered them in the past. Plants chat among themselves and with other species. They release volatile organic compounds with a lexicon, Calvo says, of more than 1,700 "words"—allowing them to shout things that a human might translate as "caterpillar incoming" or "\$@#, lawn mower!"

Their behavior isn't merely reactive—plants anticipate, too. They can turn their leaves in the direction of the sun before it rises, and accurately trace its location in the sky even when they're kept in the dark. They can predict, based on prior experience, when pollinators are most likely to show up and time their pollen production accordingly. A plant's form is a record of its history. Its cells—shaped by experience—remember.

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Chat? Anticipate? Remember? It's tempting to tame all those words with scare quotes, as if they can't mean for plants what they mean for us. For plants, we say, it's biochemistry, just physiology and brute mechanics—as if that's not true for us, too.

Besides, Calvo says, plant behavior can't be reduced to mere reflexes. Plants don't react to stimuli in predetermined ways

—they'd never have made it this far, evolutionarily speaking, if they did. Having to deal with a changing environment while being rooted to one spot means having to set priorities, strike compromises, change course on the fly.

Consider stomata: tiny pores on the undersides of leaves. When the pores are open, carbon dioxide floods in—that's good, that's breathing—but water vapor can escape. So how open should the stomata be at any given time? It depends on the availability of water in the soil—if there's plenty more for the taking, it's worth letting the carbon dioxide in. If the dirt's dry, the leaves have to retain water. For the leaves to make that decision, the roots have to tell them about the availability of water. The leaves communicate their own needs to the roots in turn, encouraging them, for example, to form symbiotic relationships with specific microorganisms in the soil.³

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If a plant could respond to sensory information on a one-to-one basis—when the light does x , the plant does y —it would be fair to think of plants as mere automatons, operating without thought, without a point of view. But in real life, that’s never the case. Like all organisms, plants are immersed in dynamic, precarious environments, forced to confront problems with no clear solutions, betting their lives as they go. “A biological system is never exposed to just a single source of stimulation,” Calvo says. “It always has to make a compromise among different things. It needs some kind of valence, a higher-level perspective. And that’s the entry to sentience.”

Sentience?

Are plants clever? Maybe. Adaptive? Sure. But sentient? Aware? *Conscious*? Listen closely and you can hear the scoffing.

To feel alive, to have a subjective experience of your surroundings, to be an organism whose lights are on and someone’s home—that’s reserved for creatures with brains, or so says traditional cognitive science. Only brains, the theory goes, can encode mental representations, models of the world that brains experience as the world. As Jon Mallatt, a biologist at the University of Washington, and colleagues put it in their 2021 critique of Calvo’s work, “Debunking a Myth: Plant Consciousness,” to be conscious requires “experiencing a mental image or representation of the

sensed world,” which brainless plants have no means of doing.⁴

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But for Calvo, that’s exactly the point. If the representational theory of the mind says that plants can’t perform intelligent, cognitive behaviors, and the evidence shows that plants *do* perform intelligent, cognitive behaviors, maybe it’s time to rethink the theory. “We have plants doing amazing things and they have no neurons,” he says. “So maybe we should question the very premise that neurons are needed for cognition at all.”



he idea that the mind is in the brain comes to us from Descartes. The 17th-century philosopher invented our modern notion of consciousness and confined it to the interior of the skull. He saw the mind and brain as separate substances, but with no direct access to the world. The mind was reliant on the brain to encode and represent the world or conjure up its best guess as to what the world might be, based on ambiguous clues trickling in through unreliable senses. What Descartes called “cerebral impressions” are today’s “mental representations.” As cognitive scientist Ezequiel Di Paolo writes, “Western philosophical tradition since Descartes has been haunted by a pervasive mediational epistemology: the widespread assumption that one cannot have knowledge of what is *outside* oneself except through the ideas one has *inside* oneself.”⁵

Modern cognitive science traded Descartes' mind-body dualism for brain-body dualism: The body is necessary for breathing, eating, and staying alive, but it's the brain alone, in its dark, silent sanctuary, that perceives, feels, and thinks. The idea that consciousness is *in* the brain is so ingrained in our science, in our everyday speech, even in popular culture that it seems almost beyond question. "We just don't even notice that we are adopting a view that is still a hypothesis," says Louise Barrett, a biologist at the University of Lethbridge in Canada who studies cognition in humans and other primates.

We should question whether neurons are needed for cognition at all.

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Barrett, like Calvo, is one of an increasing number of scientists and philosophers questioning that hypothesis because it doesn't comport with a biological understanding of living organisms. "We need to get away from thinking of ourselves as machines," Barrett says. "That metaphor is getting in the way of understanding living, wild cognition."

Instead, Barrett and Calvo draw from a set of ideas referred to as "4E cognitive science," an umbrella term for a bunch of theories that all happen to start with the letter "E."

Embodied, embedded, extended, and enactive cognition—what they have in common (besides "E"s) is a rejection of cognition as a purely brainbound affair. Calvo is also inspired by a fifth "E": ecological psychology, a kindred spirit to the

canonical four. It's a theory of how we perceive without using internal representations.

In the standard story of how vision works, it's the brain that does the heavy lifting of creating a visual scene. It has to, the story goes, because the eyes contribute so little information. In a given visual fixation, the pattern of light in focus on the retina amounts to a two-dimensional area the size of a thumbnail at arm's length. And yet we have the impression of being immersed in a rich three-dimensional scene. So it must be that the brain "fills in" the missing pieces, making inferences from scant data and offering up its best hallucination for who-knows-who to "see," who-knows-how.

Dating back to the work of psychologist James Gibson in the 1960s, ecological psychology offers a different story. In real life, it says, we never deal with static images. Our eyes are always moving, darting back and forth in tiny bursts called saccades so quick we don't even notice. Our heads move, too, as do our bodies through space, so what we're confronted with is never a fixed pattern of light but what Gibson called an "optic flow."

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To "see," according to ecological psychology, is not to form a picture of the world in your head. It stresses that patterns of light on the retina change relative to your movements. It's not the brain that sees, but the whole animate body. The result of "seeing" is never a final image for an internal mind to contemplate in its secret lair, but an adaptive, ongoing

engagement with the world.

Plants don't have eyes exactly, but flows of light and energy impinge on their senses and transform in predictable ways relative to the plants' own movements. Of course, to notice that, you first have to notice that plants move.

"If you think that plants are sessile," or stationary, Calvo says, "just sitting there, taking life as it comes, it's difficult to visualize the idea that they are generating these flows."

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Plants appear sessile to us only because they move slowly. Quick movements—like the nightly shuffle of my prayer

plant—can be accomplished by altering the water content in certain cells to change the tension in a stem, or to stiffen a branch under the weight of heavy snow. Most plant movement, though, occurs through growth. Since they can't pick up their roots and walk away, plants change location by growing in a new direction. We humans are basically stuck with the shape of our bodies, but at least we can move around; plants can't move around, but they can grow into whatever shape best suits them. This “phenotypic plasticity,” as it's called, is why it's critical for plants to be able to plan ahead.

“If you spend all this time growing a tendril in a particular direction,” Barrett says, “you can't afford to get it wrong. That's why prediction does seem very important. It's like my granddad said; maybe all granddads say this: ‘measure twice, cut once.’”

Phenotypic plasticity is a powerful but slow process—to see it, you have to speed it up. So Calvo makes time-lapse recordings, in which slow and seemingly random growth blooms into what appears to be purposeful behavior. One of his time-lapse videos shows a climbing bean growing in search of a pole. The vine circles aimlessly as it grows. Hours are compressed into minutes. But when the plant senses a pole, everything changes: It pulls itself back, like a fisherman casting a line, then flings itself straight for the pole and makes a grab.

“Once movement becomes conspicuous by speeding it up,” Calvo says, “you see that certainly plants are generating flows with their movement.”

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By using these flows to guide their movements, plants accomplish all kinds of feats, such as “shade avoidance”—steering clear of over-populated areas where there’s too much competition for photosynthesis. Plants, Calvo explains, absorb red light but reflect far-red light. As a plant grows in a given direction, it can watch how the ratio of red to far-red light varies and change directions if it finds itself heading for a crowd.

“They are not storing an image of their surroundings to make computations,” Calvo says. “They’re not making a map of the vicinity and plotting where the competition is and then deciding to grow the other way. They just use the environment around them.”

We dismiss a plant’s behavior as brute mechanics—as if that’s not true for us, too.

That might seem to be a long cry from how humans perceive the world—but according to 4E cognition, the same principles apply. Humans don’t perceive the world by forming internal images either. Perception, for the E’s, is a form of sensorimotor coordination. We learn the sensory consequences of our movements, which in turn shapes how we move.

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Just watch an outfielder catch a fly ball.⁶ Standard cognitive science would say the athlete's brain computes the ball's projectile motion and predicts where it's going to land. Then the brain tells the body what to do, the mere output of a cognitive process that took place entirely inside the head. If all that were true, the player could just make a beeline to that spot—running in a straight line, no need to watch the ball—and catch.

But that's not what outfielders do. Instead, they move their bodies, constantly shuffling back and forth and watching how the position of the ball changes as they move. They do this because if they can keep the ball's speed steady in their field of vision—canceling out the ball's acceleration with their own—they and the ball will end up in the same spot. The player doesn't have to solve differential equations on a mental model—the movement of her body relative to the ball solves the problem for her in active engagement, in real time. As the MIT roboticist Rodney Brooks wrote in a landmark 1991 paper, "Intelligence Without Representation," "Explicit representations and models of the world simply get in the way. It turns out to be better to use the world as its own model."⁷

If cognition is embodied, extended, embedded, enactive, and ecological, then what we call the mind is not in the brain. It is the body's active engagement with the world, made not of neural firings alone but of sensorimotor loops that run through the brain, body, and environment. In other words,

the mind is not in the head. Calvo likes to quote the psychologist William Mace: “Ask not what’s inside your head, but what your head’s inside of.”



When I first encountered the 4E theories, I couldn’t help thinking of consciousness. If the mind is embodied, extended, embedded, etcetera, does consciousness—that magical, misty stuff—seep out of the confines of the skull, permeate the body, pour like smoke from the ears, and leak out into the world? But then I realized that way of thinking was a hangover from the traditional view, where consciousness was treated as a noun, as something that could be located in a particular place.

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“Cognition is not something that plants—or indeed animals—can possibly *have*,” Calvo writes in his new book, *Planta Sapiens*.⁸ “It is rather something created by the interaction between an organism and its environment. Don’t think of what’s going on inside the organism, but rather how the organism *couples* to its surroundings, for that is where experience is created.”

The mind, in that sense, is better understood as a verb. As the philosopher Alva Noë, who works in embodied cognition, puts it, “Consciousness isn’t something that happens inside us: It is something we do.”⁹

And we do it in order to keep on living. The need to stay alive, to tread in far-from-equilibrium water—*that* is what

separates us from machines. “Wild cognition,” as Barrett puts it, is more akin to a candle flame than to a computer. “We are ongoing processes resisting the second law of thermodynamics,” she says. We are candles desperately working to re-light ourselves, while entropy does its damndest to blow us out. Machines are made—one and done—but living things make themselves, and they have to remake themselves so long as they want to keep living.

I felt like an active life form, tendrilled and strange.

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The Chilean biologists Humberto Maturana and Francisco Varela—founding fathers of embodied and enactive cognition—coined the term “autopoiesis” to capture this property of self-creation. A cell—the fundamental unit of life—serves as the prime example.

Cells consist of metabolic networks that churn out the very components of those networks, including the cell membrane, which the network continuously builds and rebuilds, while the membrane, in turn, allows the network to function without oozing back into the world. To keep its metabolism going, the cell needs to be in constant exchange with its environment, drawing in resources and tossing out waste, which means the membrane has to let things pass through it. But it can’t do it indiscriminately. The cell has to take a stance on the world, to view it as a place of value, full

of things that are “good” and “bad,” “useful” and “harmful,” where such terms are never absolute but dependent on the cell’s ever-changing needs and the environment’s ever-changing dynamics.

These valences, Calvo says, are the stirrings of sentience. They are distinctions that carve out (or “enact”) a world in a process that 4E cognitive scientists call “sense-making.” The act of making valenced distinctions in the world, which allow you to draw the boundary between self and other, is the primordial cognitive act from which all higher levels of cognition ultimately derive. The same act that keeps a living system living is the act by which, as Noë puts it, “the world shows up for us.”

“You start with life,” says Evan Thompson, a philosopher at the University of British Columbia and one of the founders of the enactive approach. “Being alive means being organized in a certain way. You’re organized to have a certain autonomy, and that immediately carves out a world or a domain of relevance.” Thompson calls this “life-mind continuity.” Or as Calvo puts it, echoing the 19th-century psychologist Wilhelm Wundt, “Where there is life there is already mind.”

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From a 4E perspective, minds come before brains. Brains come into the picture when you have multicellular, mobile organisms—not to represent the world or give rise to consciousness, but to forge connections between sensory and motor systems so that the organism can act as a singular

whole and move through its environment in ways that keep its flame lit.

“The brain fundamentally is a life regulation organ,” Thompson says. “In that sense, it’s like the heart or the kidney. When you have animal life, it’s crucially dependent for the regulation of the body, its maintenance, and all its behavioral capacities. The brain is facilitating what the organism does. Words like cognition, memory, attention, or consciousness—those words for me are properly applied to the whole organism. It’s the whole organism that’s conscious, not the brain that’s conscious. It’s the whole organism that attends or remembers. The brain makes animal cognition possible, it facilitates and enables it, but it’s not the *location* of it.”

A bird needs wings to fly, Thompson says, but the flight is not *in* the wings. Disembodied wings in a vat could never fly—it’s the whole bird, in interaction with the air currents shaped by its own movements, that takes to the sky.

*What we model with artificial systems
is not genuine cognition.*

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“Plants are a different strategy of multicellularity than animals,” Thompson says. They don’t have brains, but according to Calvo they have something just as good: complex vascular systems, with networks of connections

arranged in layers not unlike a mammalian cortex. In the root apex—a small region in the tip of a plant's root—sensory and motor signals are integrated through electrochemical activity using molecules similar to the neurotransmitters in our brains, with plant cells firing off action potentials similar to a neuron's, only slower. Like the human brain, the root apex allows the plant to integrate all of its sensory flows in order to produce new behavior that will generate new flows in ways that keep the plant adaptively coupled to the world.

The similar roles played by an animal's nervous system and a plant's vascular system help explain why the same anesthetics can put both animals and plants to sleep, as Calvo demonstrated using a Venus flytrap in a bell jar. Normally, the plant's traps snap shut when an unfortunate insect triggers one of its sensor hairs, which protrude from the trap's mouth like sharks' teeth. (Actually, the clever plant awaits the triggering of a second hair within seconds of the first before expending the costly energy to bite. Once closed, it awaits three more triggers—to ensure there's a decent bug buzzing around in there—before it releases acidic enzymes to digest its meal. As Calvo sums it up, "They can count to five!") Using surface electrodes, Calvo watched as the triggered hairs sent electric spikes zapping through the plant, sparking its motor system to react. With anesthesia, all of that stopped. Calvo tickled the trap's hairs and it just sat there, its mouth agape. The electrode reading flatlined.

"The anesthesia prevents the cell from firing an action potential," Calvo explains. "That happens in both plants and animals." It's not that the anesthetic is turning down the dial of consciousness inside the brain or root apex, it's just severing the links between sensory inputs and motor outputs, preventing the organism from engaging as a singular whole with its environment. Once "woken," though, the groggy Venus flytraps quickly returned to their usual behavior.

"Clearly," Thompson says, "plants are self-organizing, self-maintaining, self-regulating, highly adaptive, they engage in complex signaling among each other, within species and

across species, and they do that within a framework of multicellularity that's different from animal life but exhibits all the same things: autonomy, intelligence, adaptivity, sense-making." From a 4E perspective, Thompson says, "there's no problem in talking about plant cognition."

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In the end, Calvo's critics are right: Plants aren't using brains to form internal representations. They have no private, conscious worlds locked up inside them. But according to 4E cognitive science, neither do we.

"The mistake was to think that cognition was in the head," Calvo says. "It belongs to the relationship between the organism and its environment."



fter talking with Calvo, I looked around my apartment overrun with plants—at the pothos and bromeliads, rocktrumpet vines and staghorn ferns, at the peace lilies and crowns of thorns, snake plants, Monstera, ZZs, and palms—and they suddenly appeared very different. For one thing, Calvo had told me to think of plants as being upside-down, with their "heads" plunged into the soil and their limbs and sex organs sticking up and flailing around. Once you look at a plant that way, it's hard to unsee it. But more to the point, the plants appeared to me now not as objects, but as subjects—as living, striving beings trying to make it in the world—and I found myself wondering whether they felt lonely in their pots, or panicked when I forgot to water them, or dizzy when I rotated them on the windowsill.

It wasn't just the plants. I felt myself differently, too: less like a passive spectator, snug inside my skull, and more like an active life form, tendrilled and strange, moving through the world as the world moved through me.

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"Plants are not that different from us after all," Calvo had told me, "not because I'm beefing them up to make them more similar to us, but because I'm rethinking what human perception is about. I'm neither inflating them nor deflating us but putting us all on the same page."

It was hard not to wonder whether, from that page, the story of our planet might unfold differently. The "E" approaches ask us to question what we are, how intimately we're entangled with the world, and whether we can rightly see ourselves as standing apart from nature or whether the destruction we wreak is steadily diminishing our own wild cognition.

"Human nature," wrote John Dewey, the pragmatist philosopher, "exists and operates in an environment. And it is not 'in' that environment as coins are in a box, but as a plant is in the sunlight and soil. It is of them."¹⁰ 🌀

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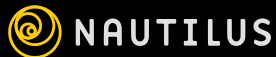
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