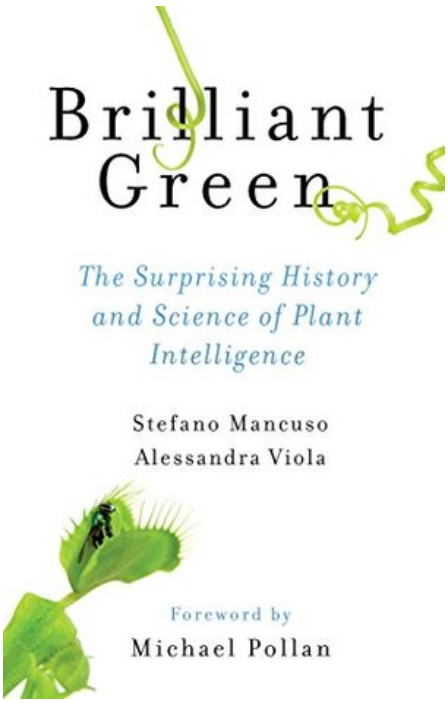

Brilliant Green: The Surprising History and Science of Plant Intelligence

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Are plants intelligent? Can they solve problems, communicate, and navigate their surroundings? Or are they passive, incapable of independent action or social behavior? Philosophers and scientists have pondered these questions since ancient Greece, most often concluding that plants are unthinking and inert: they are too silent, too sedentary -- just too different from us. Yet discoveries over the past fifty years have challenged these ideas, shedding new light on the extraordinary capabilities and complex interior lives of plants.

In *Brilliant Green*, Stefano Mancuso, a leading scientist and founder of the field of plant neurobiology, presents a new paradigm in our understanding of the vegetal world. Combining a historical perspective with the latest in plant science, Mancuso argues that, due to cultural prejudices and human arrogance, we continue to underestimate plants. In fact, they process information, sleep, remember, and signal to one another -- showing that, far from passive machines, plants are intelligent and aware. Through a survey of plant capabilities from sight and touch to communication, Mancuso challenges our notion of intelligence, presenting a vision of plant life that is more sophisticated than most imagine.

Plants have much to teach us, from network building to innovations in robotics and man-made materials -- but only if we understand more about how they live. Part botany lesson, part manifesto, *Brilliant Green* is an engaging and passionate examination of the inner workings of the plant kingdom.

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Brilliant Green: The Surprising History and Science of Plant Intelligence Details

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From Reader Review Brilliant Green: The Surprising History and Science of Plant Intelligence for online ebook

Bradley says

Thanks to Netgalley!

The book asks us, sometimes repeatedly, to step outside of our preconceived notions. Fair enough. I'm not a member of an old-boy scientific network, so I have no vested interests besides learning for learning's sake. So what does Mr. Mancuso ask us to swallow?

Easily enough, it's just the idea that plants are intelligent.

No biggie, actually. I was convinced pretty early in the book, especially when we throw out prejudices such as the need for a "brain" or "eyes" or any of the traditional "sense organs" we animals possess.

Think about it. Plants make decisions all the time, not just in hunting for water, discovering new pockets of phosphorous or other trace elements, competing with other plants, defending against and entering into agreements with bacteria, insects, and animals. Even the way they decide to propagate themselves show a remarkably diverse toolset, from communicating by delicious ripe fruit, chemically unique and heavily directed pheromones that entice very specific animals and insects, and mimicry. And when they choose to do any of it is based on a very complex decision plot.

But they're plants, you say. Just dumb plants. (I'm paraphrasing the the author's imagined critique crowd.) I mow the lawn. It doesn't seem to complain. How smart can it be?

Actually, pretty damn smart. The tips of even a small plant's roots can number 15 million discrete sensory apparatus, and larger plants, like corn, can have upwards of a hundred million. Think of the tips of the roots as the neurons. They make all the decisions. This is real. And real communication takes place across same species of plants over great distances just as real communication is possible and even likely across species.

True non-human, non-animal intelligence right here on Earth? Sure. I'm sold. Look at how plants have learned to communicate with us. If we're so damn smart, then why have plants started preening themselves like courtly lovers trying to land a hot mate with humanity? Hell, they still think that ants are pretty hot shit. Whole colonies will violently defend trees. We are cultivating orchards, food crops, medicinal plants by the hundreds of scores, and in return, these plants THRIVE.

They're alive. They think. If they give us more pretties, we take very good care of them. I would not be surprised if in the next 100 years, assuming we haven't killed off all the rest of the intelligent life on the planet, most of the plant life turns into one gigantic catering service to humanity. After all, as long as their root systems survive and they're given comfy environments, they're just fine with being eaten. They're not reliant on us, but they sure as hell know how to exploit us. :)

Believe it or not, all of this is proven science. Just because some of us don't believe what is obvious, such as the fact that more than 95% of the world's biomass is plant matter and it'll go on being the dominant life form even if all the animals including us die, doesn't mean it isn't true.

There's an interesting anecdote that paraphrases that we nonchalantly ignore the importance and intelligence

and motive and sensory capabilities of plants JUST because they're slower than we can readily perceive. They're not less complex. In fact, they have all of our senses, plus a much wider capacity to sense. Theories have most plants linked up to at least 20 full-blown senses. Not just our five. Hell, I'd LOVE to be able to sense gravity. Oh, wait. I do: It's that way.

Okay, so perhaps his definition of senses needs a bit more fleshing, whether its animal or plant flesh, but I am convinced on the intelligence. :)

An interesting unproven hypothesis speculate that they work together as emergent properties rather more complicated than simply transmitting through the roots, either chemically, spatially, or even through the tiny clicking sounds that all roots make, whether or not it's the cracking of the cellular wall or it's a method of communication.

Swarming intelligent emergence within a root system. That's so totally awesome. Discussions of AIs and Other Computing Models are also touched in this book.

The only reason I knocked a star was in the total page-time spent exhorting us to just quit it with our animal prejudices, looking for intelligence that's just like us instead of what is apparent all around us. Systems Theory should have put a nail in that coffin of thought, but alas, the opposite is apparently still going strong. I wanted even more facts and even more wild theories, not more persuasive arguments. :)

Stop sitting around like a vegetable, people!

J.S. Meresmaa says

Mainio, hyvin vetävästi ja kansantajuisesti kirjoitettu teos, jonka luettuaan varmasti näkee kasvit toisin. Ajoittain provosoiva ja joissain kohdin toisteinen, mutta Laura Lahdensuun suomennos on todella onnistunut ja kirjaa lukee vaivattomasti. Pohtiminen ei lopu kun kannet sulkee. Kirjassa on monia kohtia, joita tekisi mieli siteerata, mutta valitsen tämän:

"Kasvit ovat Maa-planeetan dominantti laji, ja eläinten läsnäolo on havaittavissa ainoastaan siellä täällä. Tälle on vain yksi selitys: kasvit ovat paljon jalostuneempia, sopeutuvaisempia ja älykkäämpiä eliöitä kuin olemme tottuneet ajattelemaan."

Mila says

Such passion for plants! Very thought provoking.

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shatine says

I've never read a book that sounded more like it was written by an indignant plant.

Robert Teeter says

This small book by an Italian scientist and science journalist makes the case that plants have been underestimated and that they have a kind of “intelligence.” They convinced me — but only for some definitions of intelligence.

The book begins with a survey of ideas about plants in the past. The three major monotheistic religions mostly ignore plants, though Mancuso and Viola point out that Judaism forbids the gratuitous destruction of trees and has a holiday to celebrate their new year. Most philosophers and scientists before the 20th century didn’t think much of plants either, but Democritus, Linnaeus, and Darwin suspected there was more in them than met the eye.

The authors soon build a dichotomy: are plants “social organisms, sophisticated and highly evolved like us” (p. 36)? Or are they “closer to the mineral world than to animal life” (p. 37-8)? Surely those are not the only choices. I didn’t believe either of these possibilities before reading the book, and I didn’t believe either of them when I finished the book.

Elsewhere in the book, however, Mancuso and Viola use a more reasonable formulation: “Intelligence is the ability to solve problems” (p. 126). They note the most obvious difference between plants and animals, that plants are stationary (at least for most of their lives). They are therefore subject to predation by herbivores and therefore cannot have centralized, specialized organs that an animal could eat and kill the plant. So, just as plants have a decentralized circulatory system without a central “heart” to pump fluids throughout their bodies, they also have a decentralized nervous system without having a central “brain.”

The middle of the book, which is the most informative, describes how plants solve problems in their lives, often by means analogous to what animals do. Mancuso and Viola demonstrate that plants have:

a sense of sight
a sense of smell
a sense of taste
a sense of touch
a sense of hearing
15 other senses, including a sense of moisture and a sense of gravity

Plants also communicate. One part of a plant can communicate with another, such as when the roots tell the leaf openings (stomata) whether to open or not. Plants communicate with other plants, such as telling each other when an herbivore is near. Plants communicate with animals, such as when they provide incentives for their moving friends to pollenate them or spread their seeds.

Plants even sleep, a fact Linnaeus was one of the first to notice, but still not much is known about why they do so.

The book has a few egregious errors of science, which make it difficult to trust the authors when they make bold claims.

"We know that the first single-celled organisms that appeared on the planet were algae — that is, the plant

kind of living things. Through photosynthesis, they created the oxygen that enabled life to spread over the earth. This included the emergence of eukaryotes, or animal cells." (p. 29)

No, both plants and animals are eukaryotes. (The term refers to organisms with cells having a nucleus and organelles, not to the cells themselves.) Organisms with simpler cells, such as bacteria, are called prokaryotes.

"It’s like saying that if 100 is the total weight of everything alive, according to various estimates, between 99.5 and 99.9 percent is composed of plants. Or to put it another way all living animals — humans included — represent only a trace (a scant 0.1 to 0.5 percent)." (p. 40)

This seems to be saying that all living things are either plants or animals. What about fungi, protista, bacteria?

"… [T]he vectors are bats (cheiropteroi in Greek), which are used to carry pollen from many American desert cacti, such as the Joshua Tree." (p. 109)

The Joshua tree is a yucca, not a cactus.

Despite some overblown claims for plant intelligence and a few errors, this book is worth reading for some solid information about plant capabilities, some of which have only recently been discovered.

Disclaimer: Island Press sent me a free copy of this book as part of their “blind date with a book” promotion.

Re-posted from Water Librarian's Blog.

Annie says

This is not as kooky a book as it appears.

I really like one of the fundamental ways this is argued: we are intensely anthropocentric, and so we really define “intelligence” as “most like humans.” We might not say it in so many words, but that’s really the beans of it. That’s a pretty circular definition when applied to ourselves, isn’t it?

Thinking about this reminds me of Ender’s Game, a bit. The buggers. Because people perceived them as unthinking and unintelligent and, most importantly, unfeeling, they were to be exterminated— like the bugs they were thought to be. But in actuality, it was just that the hive queens were the only real decision-making minds, and the buggers existed in a very different kind of consciousness, and communicated in ways humans weren’t aware of, but they were no less “intelligent” — something only Ender was able to recognize.

The author mentions a Star Trek (I think it was) episode in which an alien species who lives and moves on a much faster time frame than us (much as we live and move faster than plants, who take weeks to, say, move into sunlight, instead of seconds) comes to earth and thinks we’re no more sentient than rocks, simply because they don’t perceive us as even moving— we’re to them what plants are to us!

Plants are not intelligent like us. No one is intelligent like us, because we made up the word intelligent and it only fairly applies to us, since we define it by ourselves. But every species, if they had words, would define

intelligence as most like themselves. So judging any other species by ours is clumsy, egotistic, and pointless.

That's a major prejudice that we have to be aware of when dismissing plants as little more than rocks. It's a prejudice that for thousands of years prevented us from recognizing that animals have rights (admittedly, a few people persist under the delusion that there is nothing immoral about vivisecting a dog, but for the most part, even people who support animal testing recognize it's "a necessary evil" or something along those lines).

I also loved the puns just casually thrown in and unacknowledged. "A most FRUITFUL correspondence." "We hope this will help PLANT some doubts."

Charming, thought-provoking, credible little book.

J.L. Sutton says

Plant intelligence is fascinating! Even though we've been exposed to plants our entire lives, examining plant intelligence is like looking at something alien. While they may give us comfort or nourishment, to many of us, plants are simply there. They don't do anything or solve problems or talk with us or to each other. But what if we're missing something?

In Brilliant Green: The Surprising History and Science of Plant Intelligence, Stefano Mancuso and Alessandra Viola explore views of plant intelligence from thinkers in ancient Greece and the Renaissance, imminent scholars such as Linnaeus and Darwin as well as evolutionary history and case studies. On a comparative basis, plants have more senses than animals (Mancuso and Viola claim at least 15 senses for plants) and have been on a different evolutionary track for millions of years longer than any animals. They engage in behaviors to defend themselves when they are threatened by predation. Should we discount plant intelligence because they don't have anything resembling the brain of animals? This would be to ignore the amazing proliferation and successful adaptation of plants around the world. It would also ignore their survival strategies (which combine problem-solving and communication).

Plant adaptation is nothing short of incredible! The release of chemicals attracting or warning insects or other plants is not accidental. Odors are produced, for instance, which attract insects necessary for pollination. Conversely, when specific plants are attacked by certain insects, they release chemicals making their leaves indigestible. This message goes out to plants up to hundreds of meters away which are not yet under attack. Both examples are certainly communication. When plants commit to these strategies, they expend energy which could have been used for other purposes.

Some of the stories about plant intelligence and communication are fascinating. The problem, I guess, is that I'd heard much of the evidence before. You need to read to the end to see that the idea of collective intelligence which was quickly brought up but just as quickly dropped in an earlier chapter, is addressed more interestingly (as a type of swarm behavior like a flock of birds or as a sort of computer network). Also, I would have been okay with more speculation about how we might someday hope to decode some of the language of plants. I was really hoping for more there. Still, this is an interesting look at that 99%+ of life on earth which is often taken for granted! 3.75 stars.

Atrophaeus says

Ein wirklich gelungenes Buch.
Der Autor öffnet Einem in humorvoller, verständlicher und einfacher Art und Weise die Augen für die Welt der Pflanzen.
Stefano Mancuso schafft es mit Witz und ohne belehrend zu wirken verfestigte Sichtweisen aufzubrechen.
Es ist feststellbar, dass dies wohl sein größtes Anliegen war.
Nach diesem Buch begreift man die Pflanzen nicht mehr als ein passives "vegetierendes" sondern äußerst aktiv handelndes Lebewesen.

Der direkte Link zum Buch:
https://amzn.to/2mek2IR

Sally says

This is a manifesto rather than a textbook, by one of the chief scientists in plant behavior, who seeks to convince the reader that plants are indeed intelligent creatures rather than life forms barely above the minerals. The author and his research have taken a lot of criticism based on the assumed fact that plants cannot be conscious, so this is a subject he feels very strongly about. He points out that our evaluation of intelligence derives largely from observing motion, and because plants are rooted to one spot and move their parts slowly (only appreciated with time-lapse photography), we see them as objects rather than actors. Moreover, because they cannot flee danger, they are built on a modular rather than a centralized "organ" plan: they have circulation but no heart, they breathe without central lungs, perceive light without eyes, etc. This allows many plants to regenerate even if over 90% of their above-ground mass is destroyed (say, by an herbivore or fire). It follows that plant intelligence is unlikely to be centralized in an organ (brain), traditionally one of the main objections to plants being conscious. He also treats the senses found in plants.

If you are looking for a sober, academic discussion of this subject, look elsewhere. This book aims to convince a popular audience that plants are conscious beings rather than mere objects and that they deserve our respect and further scientific investigation.

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Rino says

Schön aufgemacht ist es ja, das Büchlein, aber leider entspricht es sowohl in Sprache als auch vom Inhalt her eher einer besseren Galileo-Sendung als einem richtigen Sachbuch. Die kurzen Kapitel gehen kaum auf die

Details der beschriebenen Mechanismen ein, über die man durchaus gerne mehr erfahren hätte, und so bleibt leider auch der Informationsgehalt dem Umfang des Buches entsprechend eher dünn. Wenn sich auf den wenigen Seiten dann auch noch Elemente inhaltlich wie sprachlich wiederholen, dann ist das bei dem Preis eigentlich nicht mehr zu verzeihen.
Schade, weil das Thema überaus interessant wäre, wenn man es denn mit etwas mehr Tiefgang behandelt und eine etwas seriösere Ausdrucksweise dafür gefunden hätte. Dafür weisen die ausführlichen und gut lesbar erörterten Literaturhinweise angenehm auf bessere Lektüre hin.

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trovateOrtensia says

L'autore, che è studioso di neurobiologia vegetale, scrive queste pagine per contrastare una percezione del mondo naturale che, dalle lontane origini aristoteliche (la tripartizione delle facoltà dell'anima in vegetativa, sensitiva e intellettiva) arriva sino a noi in una forma non molto dissimile dalla formulazione rinascimentale datale da Charles de Bovelles, la cosiddetta "piramide dei viventi". Secondo tale classificazione, il mondo minerale "est", il regno vegetale "vivit", l'animale non umano "sentit", mentre soltanto l'uomo "intellegit".
Il testo è leggero e molto divulgativo, a volte quasi al limite della superficialità, ma è comunque utile per ricordarsi che l'uomo non è il vertice della piramide del "creato", e che essere diversi da noi umani non vuole dire necessariamente essere inferiori.

E mi piace qui ricordare queste poche, bellissime parole di Sebald, in Austerlitz: "Non c'è in fondo nessun motivo per negare una psiche alle creature più umili. A sognare di notte non siamo soltanto noi e i nostri cani o gli altri animali domestici, legati da millenni alle nostra emozioni; anche i mammiferi più piccoli, i topi e le talpe indugiano dormendo, (...) in un mondo esistente soltanto dentro di loro, e chissà, disse Austerlitz, forse anche le tignole sognano, forse sogna anche la lattuga in giardino, quando di notte leva lo sguardo alla luna".

Vda.Claudio says

Un libro per certi versi rivoluzionario. Molto divulgativo, presenta la rivoluzione copernicana nel mondo della biologia: le piante sono essere molto più complessi e importanti di quello che si pensa. L'autore ci prende per mano e ci guida prima in un excursus storico che spiega le origini del comune atteggiamento di indiferenza della gente comune nei confronti dei vegetali e poi smonta questa concezione superandola per arrivare a una del tutto nuova e meravigliosa. Infatte esse vedono, si muovono e sono intelligenti.

Alison says

I came into this book quite supportive of the author's fundamental premise: that plants have lives as complex and deserving of respect as humans. I was intrigued by The Hidden Life of Trees: What They Feel, How They Communicate – Discoveries from a Secret World - which is excellent - and wanted a more scientific overview of the research Peter Wohlleben cites in that book. This was not it.
Instead, this is a rant about how underestimated plants are, with constant silly sarcasm and petulance like: "how could the stupidest and most passive beings on the planet have achieved this primacy?" or "The first advantage of having a modular organization, to give just one example, is that, for a plant, being eaten isn’t that big a deal! Could any animal say that?" I'd like to say this is interspersed with scientific facts, but it kinda isn't. I considered giving this book two stars because Mancuso doesn't actually distort or misrepresent

studies : but that's because he simply doesn't cite them. And some cursory research challenged some of his assertions, such as that playlists assist running speed. However, most of the science in the book is basic and uncontroversial. Mancuso's intention in writing the book seems not to be revealing new science but rather to convince us that extreme anti-plant prejudice has meant we don't respect what is already known.
I could have respected this approach if it wasn't for how ludicrously overblown it becomes. Among other things, Mancuso argues that Gregor Mandel's work was underestimated simply because he worked on plants, which was also the reason Barbara McClintock waited four decades for her Nobel Prize (sexism, apparently, has nothing on floraphobia).
This was the first in a trio of books read on holiday dealing with non-human cognition, the others being Marlene Zuk's Sex on Six Legs: Lessons on Life, Love, and Language from the Insect World and Gisela Kaplan's Bird Minds: Cognition and Behaviour of Australian Native Birds. While all three authors (and I struggle to mention them together here, given the other two wrote good science) struggle with defining intelligence, a term which implies not only a value judgement but also unhelpful linearity, Mancuso takes this to extremes: "If we define intelligence as the capacity to respond to problems, then it’s not possible to demarcate any kind of threshold above which intelligence appears ... Anyone who disagrees, and still maintains that certain animals are intelligent and others not, should be willing to tell us at exactly what point in evolution intelligence appears." By doing this, he undermines his entire argument - that plants show intelligence, by redefining it out of existence. This is a far dry from rejecting the term as unhelpful, and exploring the different elements of cognition we can identify in plant life.
And it's a huge shame really. Because the more we learn about non-human living beings, the clearer it seems to be becoming that humans are not unique, but just one manifestation on a spectrum of adaption, learning, and responding to our environment. Mancuso is quite right, I still believe, in his assertion that we are blinded by the differences - particulqrly in timescale and organ specialisation -
to the similarities between animals and plants. We all respond to stimuli, adapt to surrroundings, interact, express distress and comfort. Obviously, the internal world of a plant is going to radically different to our own, but that doesn't necessarily make it lesser. Mancuso is setting up a lab to study pkant cognition, and I really hope the science it produces is much better than this. We cvould use more understanding of the world ofvliving things, unblinded by an assumption that we are better at living than they.

Pouting Always says

I really felt disappointed with this book because I was expecting much more science and content. The writing wasn't as mature and eloquent as I've come to expect with science and nonfiction books, even pop science. The majority of the book is spent talking about challenging our own belief systems and rethinking the way we view plants, but I felt like the supporting evidence was lacking. I already knew that plants use their pheromones to communicate and adjust based on one another's pheromones. Also the fact that roots are used in a similar fashion to sensory organs was something that's well known. I just wish there was more in depth science and more talk about plant functioning as well as reproduction. I really just felt like the author was trying to be revolutionary and change people's thinking with this radical idea that plants are living and may deserve rights the way animals do but there needs to be much more proof to back up an argument that seeks to question our own ideas of what constitutes intelligence and consciousness.
