

The inner life of plants

The history of the search for plant consciousness, says Latif Nasser, actually tells us more about ourselves.

A CARROT IS strapped to an examining table. After the experimenter wires it up to a galvanometer, he pinches the vegetable with forceps. The machine registers “infinitesimal twitches, starts, and tremors,” according to one report. The year is 1914, the scientist is named Jagadish Chandra Bose, and a journalist in the room writes, apparently without irony: “Thus can science reveal the feelings of even so stolid a vegetable as the carrot.”

Today, that conclusion—and the experiment—seems absurd. Whatever is happening inside a carrot, it’s not a “feeling” in any sense we’d understand. For that, a carrot would need a brain, or at least a central nervous system, which it most certainly does not have. The scientific consensus is clear: Plants do not experience the world the way we do.

“We can’t equate human behavior to the ways in which plants function in their worlds,” writes Daniel Chamovitz, who runs a plant biology lab at Tel Aviv University and surveys the field in a new book, *What a Plant Knows*. (He considers that title a kind of literary shorthand, even a provocation, rather than a serious suggestion that plants can think.)

In hindsight it’s easy to look back on Bose’s experiments as novelty science. But Bose was widely respected, a serious scientist who would soon be knighted for his achievements. And the question of the humanness of plants has a history that stretches far before him, and well after. Three generations of Darwins experimented on the surprising capabilities of plants. Unlikely figures from other realms dove in, too: former CIA operatives, a Presbyterian minister, even Scientology founder L. Ron Hubbard.

Plants might not have minds, but the researchers weren’t entirely misdirected in wondering just how deep plants’ abilities run. Over the last decade, researchers have discovered that even primitive green algae can sense changes in light direction and intensity; that a pea plant in drought conditions can communicate its stress to its soilmates and warn them to prepare for hard times. It has again become tempting to dangle the possibility: Does this mean plants could be conscious? The question may be revealing, but not for the reasons one might think. Today, a glance back at the long, strange inquiry into plant con-

sciousness finds that it might not explain much about plants, but it can tell us a lot about what’s going in the world outside the flowerpot.

FOR MOST OF history, when humans speculated about the inner nature of plants, we did it in the language of souls or spirits. Aristotle postulated that a plant has a “vegetal soul,” but is incapable of sensation; many traditional religions of the past and present, like Jainism, consider plants to possess souls, and followers treat them accordingly.

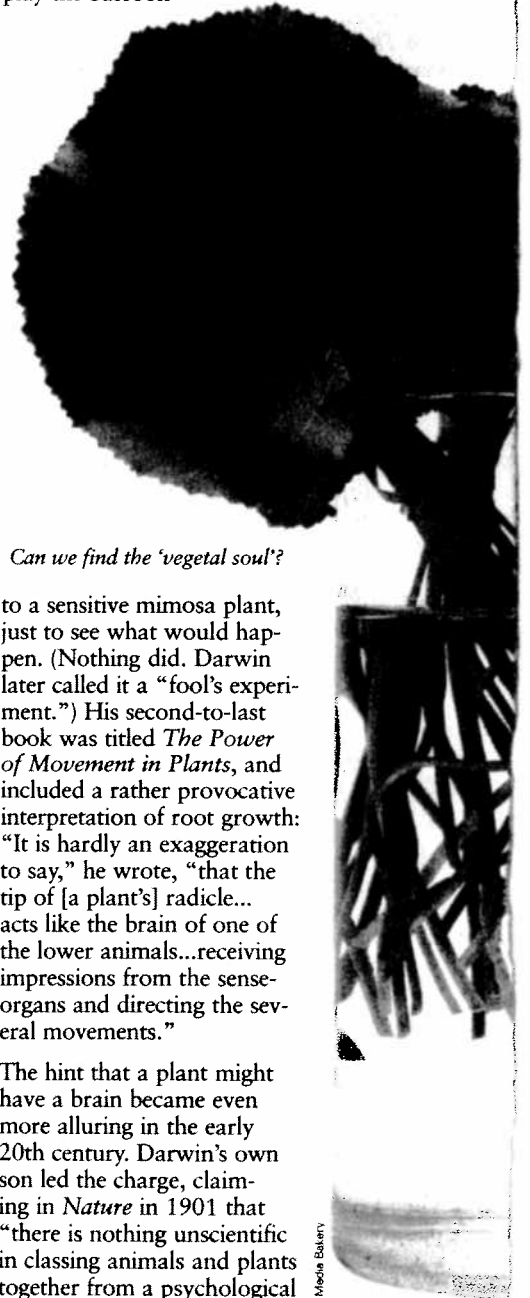
With the Enlightenment, and the emergence of a plant science in its own right, botanists in the West began trying to document those inner lives with data. Physician Thomas Percival cataloged observations that persuaded him that plants had basic senses, like balance and body awareness. For instance, a sprig of mint suspended upside-down grew upwards instead of sprouting toward the ground; he noted that two separate honeysuckle shoots seemed to draw together “for mutual support.” Percival had great hopes for what might be discovered going on inside: He confessed his hope that someone might discover plants’ “capacity for enjoyment,” because if so, “the aggregate of happiness produced by [plants] will be found to exceed our most enlarged conceptions.”

Percival was no outlier. The impulse was so widespread among serious scientists that when Charles Darwin’s grandfather Erasmus wrote his massive 1800 tome *Phytologia, or the Philosophy of Agriculture and Gardening*, he was able to recount a number of contemporary experiments. One scientist stimulated barberry flowers with a pin; another zapped a balsam with electricity. A third shipped apple trees to New York to see whether they’d accommodate to the new time zone. Erasmus Darwin’s conclusion: “Have vegetable buds irritability? Have they sensation? Have they volition?... I am persuaded they possess them all.”

In an 1839 monograph on blushing—mostly in humans—British physician Thomas Henry Burgess included a chapter in which he claimed that plants could similarly wither or droop in response to “external impressions.” Pioneer American horticulturist Luther Burbank spoke to his saplings, mollycoddling them with what he

called “a vibration of love.” (The childless bachelor Burbank thought his green thumb qualified him enough to write a child-rearing manual titled, aptly enough, *The Training of the Human Plant*.)

Even Charles Darwin himself was drawn to the question, running experiments such as having his budding botanist son Francis play the bassoon



Can we find the ‘vegetal soul’?

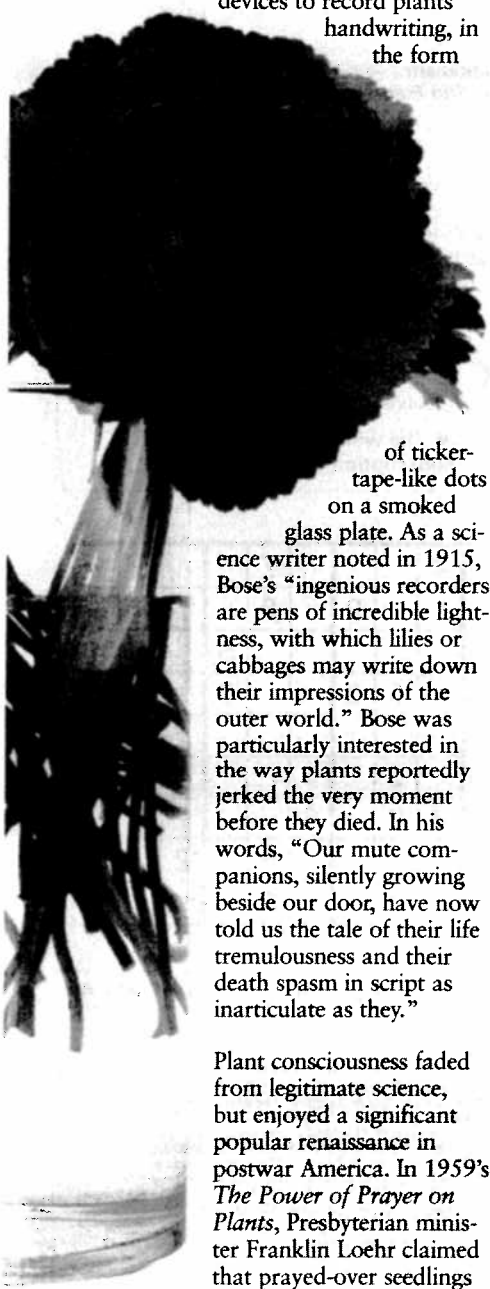
to a sensitive mimosa plant, just to see what would happen. (Nothing did. Darwin later called it a “fool’s experiment.”) His second-to-last book was titled *The Power of Movement in Plants*, and included a rather provocative interpretation of root growth: “It is hardly an exaggeration to say,” he wrote, “that the tip of [a plant’s] radicle... acts like the brain of one of the lower animals...receiving impressions from the sense-organs and directing the several movements.”

The hint that a plant might have a brain became even more alluring in the early 20th century. Darwin’s own son led the charge, claiming in *Nature* in 1901 that “there is nothing unscientific in classing animals and plants together from a psychological

Media Bakery

standpoint,” and in a 1908 issue of *Science*, “We must believe that in plants there exists a faint copy of what we know as consciousness in ourselves.” In 1905, botanist Raoul Francé’s *Germes of Mind in Plants* reached a similar point: “What grander lesson could the speechless plants give than that which they have taught us: that their sense life is a primitive form, the beginning of the human mind!”

Nobody seemed to pursue this question with more enthusiasm than Bose. In addition to his carrot-wiring experiment, Bose engineered an altogether different series of devices to record plants’ handwriting, in the form



of ticker-tape-like dots on a smoked glass plate. As a science writer noted in 1915, Bose’s “ingenious recorders are pens of incredible lightness, with which lilies or cabbages may write down their impressions of the outer world.” Bose was particularly interested in the way plants reportedly jerked the very moment before they died. In his words, “Our mute companions, silently growing beside our door, have now told us the tale of their life tremulousness and their death spasm in script as inarticulate as they.”

Plant consciousness faded from legitimate science, but enjoyed a significant popular renaissance in postwar America. In 1959’s *The Power of Prayer on Plants*, Presbyterian minister Franklin Loehr claimed that prayed-over seedlings

thrived while prayed-against ones “seemed to twist and writhe under the negative power.” And in the 1960s and 1970s, a potent cocktail of *Silent Spring*-era environmentalism, New Age spirituality, and Watergate-inspired mistrust of authority gave new energy to claims about what might really be going on with plants.

Darwin’s bassoon recital found a second wind in the work of Dorothy Retallack, a Denver-area grandmother who published *The Sound of Music and Plants* in 1973, the result of experiments that she conducted for a college biology class (her results, as summed up by a *New York Times* headline: “House plants hate hard rock”). Science fiction writer and Church of Scientology founder L. Ron Hubbard developed a theory that plants share human emotions; in 1968, *Life* magazine ran a photo of Hubbard plugging crocodile clips into either side of a tomato, an experiment that Hubbard claimed as proof that “tomatoes scream when sliced.”

Most provocative of all was a 1973 book titled *The Secret Life of Plants*, which featured the experiments of Cleve Backster, a polygraph specialist convinced that plants could read minds. Backster shared his findings with the Stanford Research Institute, where experimenters were concerned with paranormal topics such as remote viewing—the ability to see distant, hidden locations. At the time, this research was top secret, funded as part of the CIA’s project MK-Ultra to develop psychic weapons for use in the Cold War. (Oddly enough, Backster and both of the writers of *The Secret Life of Plants* all formerly worked for the CIA, and at the time many of the key Stanford researchers were Scientologists.)

WHATEVER THESE EXPERIMENTS revealed about plants, it’s not hard to see what they revealed about people’s shifting preoccupations. The 18th-century empiricists focused on measurable sensations. The 19th-century studies reflect a distinctly Romantic concern for emotions and sentiment—an attitude that also cropped up in the floridly written home-gardening manuals of the time. Around the turn of the 20th century, the new science of the human mind—psychology—triggered a corresponding hunt for the plant mind. The ’60s and ’70s counter-culture reimagined plants as silent pacifist sufferers at the same time napalm rained over the jungles of Vietnam.

Today, research on plants doesn’t start from the assumption that they may be

able to think, or feel, or read minds. Nonetheless, scientists are building a picture of how plants sense the world that is remarkably complex. In 2006 Penn State researchers demonstrated that the parasitic dodder vine can smell the difference between wheat and tomato plants. In 2007 a pair of Canadian researchers determined that plants can tell the difference between their own kin and strangers of the same species. “Plants have this kind of hidden but complicated social life,” one of the researchers said.

As scientists piece together the plant sensorium, some of those earlier notions are getting a boost from the modern obsession with neuroscience: The past few years have seen the emergence of “plant neurobiology,” a new field that flirts with the idea of a vegetal mind. Proponents of the field look for chemical, electrical, and anatomical similarities between animals and plants—for instance, between information networks in plants and nervous systems in animals, or between the architecture of roots and the architecture of neurons. Plant neurobiologists have their own conferences, their own journal, even their own professional society. The approach isn’t without controversy; 36 botanists signed a letter to a prominent research journal in 2007 saying the field is “founded on superficial analogies and questionable extrapolations.”

Chamovitz, who heads Tel Aviv’s Manna Center for Plant Biosciences, dismisses the concept of plant intelligence as a scientifically useful idea; to him, it “does not further our understanding of either intelligence or plant biology.” But, as his book title attests, he recognizes the power of metaphor to “help us make connections that we might not normally make.” In a phone interview, he pressed the point even further: “I don’t really think hard-core scientists think that plants are sentient in the way that mammals are sentient,” he said, “but [plant neurobiologists] are challenging us to redefine for ourselves what we mean by sentient.”

So what is going on inside that begonia on your windowsill? The question is tantalizingly unanswerable. And despite all the odds stacked against us, we’ll probably never stop asking it. Chamovitz himself admits to talking to the plants in his lab. His explanation: “Why? Why do people pray? Why do people talk to God?”

The plants have yet to weigh in.

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