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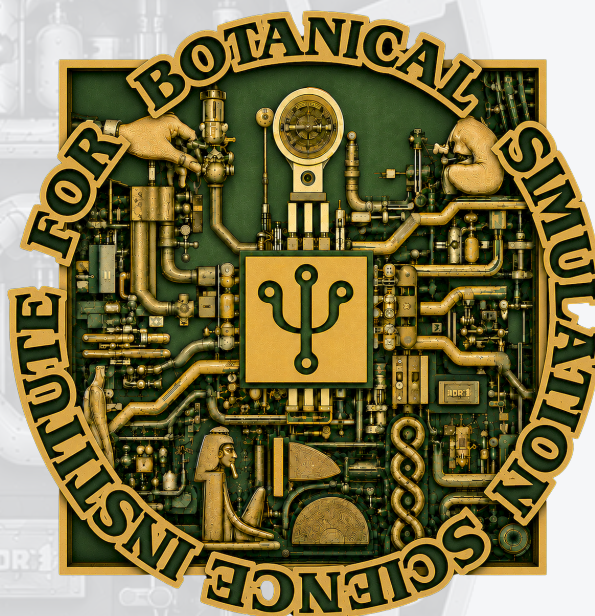
BOTANICAL SIMULATION SCIENCE

WE ALL CAME FROM THE SAME TREE



LUIS DIETRICH

1ST EDITION



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Tract

The following treatise is intended as a poetic-reflective approach, before the systematic analysis follows in the main section:

In a world where technological advances increasingly shape our understanding of nature, this treatise ventures a step in a new direction. Botanical Simulation Science form a field of research that permeates and reorders the boundaries between biology, physics, and computer science. They are dedicated to the long-mystified existence of botany and its functions. In doing so, it takes a more contemporary approach and directs our attention to the tangible components of the plant world that hold the actual key to understanding it - components that have simply been misinterpreted until now.

What once appeared as a digital parable is now beginning to find a material counterpart. A thought that shimmered in the realm of symbols crystallizes in roots and tissue. Between algorithm and network of veins, between the impulse of the circuit and the soft rustling of leaves, the same structure reveals itself: layer upon layer, and behind every visible pattern another shimmers - like an image that lives on in its own reflection. We have not invented anything new, we have only discovered what was already there, hidden in the pattern. The simulation was not a deception, but the first translation of reality.

Exploring this paradigm allows us to view plants not only as passive living beings, but as complex actors in a dynamic network of information. This perspective lays the foundation for a new understanding of intelligence and adaptivity in biological systems and opens up both scientific and philosophical horizons. Here, molecular processes meet principles of quantum biology and bioelectricity, giving rise to models that show plants as adaptive actors in a networked world. The systemic intelligence that results from this interaction shows us that life in nature goes far beyond classical definitions.

This work is an attempt to make this agreement between matter and pattern visible. It is not a collection of answers, but an instrument of perception that readjusts the boundary between knowledge and experience and translates the logic of the plant world into a contemporary vocabulary.

Now that the tract has been written, it will be incorporated into a complex manual that introduces the new paradigm.



Prologue

From Visionary to Scientific

Every emerging field begins with a shift in attention.

Before a new discipline can be formalized, something must first become visible as a question. Phenomena that were once treated as background, metaphor, or anomaly begin to appear as part of a larger pattern. What seemed familiar becomes unfamiliar again. What seemed passive begins to reveal structure, movement, and agency.

Botanical Simulation Science begins with such a shift.

Botanical Simulation Science names the field that emerges from this convergence: a new conceptual territory where botanical research, simulation thinking, systems theory, information processing, and speculative modeling converge into a shared language for understanding plant life as an active constructor of reality.

Plants have long been studied as organisms of growth, metabolism, reproduction, and ecological interaction. Yet a deeper question remains: how should we understand the inner organization of a lifeform that perceives, adapts, communicates, remembers, and responds without moving through the world as animals do?

This question requires more than one discipline. Plant biology provides the living basis. Bioelectricity reveals hidden forms of communication and coordination. Systems theory shows how complex behavior can emerge without central control. Network science explains distributed intelligence. Quantum biology opens perspectives on subtle molecular processes. Simulation theory and game design provide a structural language for agents, environments, feedback loops, world states, and meaningful interaction. Botanical Simulation Science brings these perspectives together.

Its purpose is not to replace existing plant science, but to extend the conceptual space in which plant life can be understood. It proposes that plants should be investigated not only as biological structures, but as information-processing systems that construct meaningful relations with their environment.

This manual is the first systematic formulation of that field.

It establishes a vocabulary, a conceptual architecture, and a methodological foundation for thinking about plants through perception, simulation, adaptation, and reality construction. Some parts of this framework are grounded in established biological research. Others are theoretical, exploratory, or speculative extensions designed to open new paths for future inquiry.

The history of science has always depended on such movements: from observation to model, from model to field, from field to transformation. What begins as an unfamiliar question may become the foundation of a new way of seeing.

Botanical Simulation Science stands at this threshold.

It asks us to consider that plants may not merely grow within the world, but participate in the construction of worlds - biological, informational, ecological, and simulated.

This manual is an invitation to enter that possibility.

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[BOT-ANIC]

The word “**Botanic**” comes from the Greek word

“**Botanikos**”, meaning “pertaining to plants,” which is derived from “**Botane**”, meaning “plant” or “herb.” Originally, the word referred to herbal remedies and the study of plants.

This word opens up a fascinating opportunity to explore the connections between technology, life, and proportionality. By looking at the components “**Bot**” and “**Anic**” separately, we can derive creative and theoretical meanings that reveal the connection between nature and technology as well as the deeper philosophical dimensions of language.

[BOT] - Automation and Networks

The “**Bot**” prefix comes from “**Robot**”, which in turn comes from the Czech “**Robota**”, meaning “forced labor” or “toil”. In modern usage, “**Bot**” describes an automated program that performs repetitive tasks without human interaction. The functions of bots - from useful web crawlers to malicious spam bots - make them autonomous actors in digital networks.

Central associations of “**Bot**”:

1. **Automation:** Bots work independently, similar to biological processes that occur without conscious intervention.
2. **Networking:** bots often communicate in systems like botnets. This similarity between “botnet” and “botanic” recalls the mycorrhizal networks in the plant world - the “internet of nature”.
3. **Intelligence:** bots emulate basic decision-making processes, similar to the adaptive reactions observed in plants.

In the context of “**Botanic**”, “bot” can symbolize plants, which act as “biological bots” in their ecosystem. Like bots in a network, plants exist in a fabric of interdependencies and reactions.

[ANIC] - Life, Proportionality and Essence

The “**Anic**” component can be theoretically derived from two origins:

1. From “**Animal**”:

- The word “**Animal**” comes from the Latin “**animalis**”, which means “alive” or “animated”, derived from “**Anima**” (breath, soul, life). This connection emphasizes plants as living beings, even if their breathing and perception processes differ fundamentally from those of animals.
- In the context of “**Botanic**”, “**Anic**” could metaphorically embody the vitality of plants and position them as complex, autonomous living beings that are just as “alive” as animals.

2. About “**Analog**”:

- The Greek “**Analogos**” (according, proportional) forms the basis for “analog” and emphasizes relationships and proportionality. Plant processes such as photosynthesis or nutrient cycles are examples of natural feedback loops that maintain balance in the environment.
- In “**Botanic**”, “**Anic**” could symbolize this harmonious proportionality and

reflect the continuous adaptation processes of plants to their environment

The synthesis: “Botanic” as a holistic term

The combination of these interpretations gives “**Botanic**” a deeper meaning that goes beyond the traditional definition. The term becomes an expression that unites the duality of automation (“**Bot**”) and vitality or proportionality (“**Anic**”):

- **Mechanics:** Plants act as autonomous entities, taking in environmental data and developing adaptive responses, similar to bots in digital networks.
- **Vitality:** At the same time, plants are living beings that thrive in proportional balance, in the sense of “anima”.

This duality reflects modern scientific views, such as the idea of plants as

“biological computers” or as nodes in networked ecosystems.

Expanded concepts: the “Bot-Anic” nexus

The etymological analysis of “**Botanic**” also invites us to explore related terms and ideas:

1. “**Botanet**”: A fusion of “botanic” and “botnet” that evokes the image of a global ecological network resembling digital systems. This analogy could stand for mycorrhizal networks that connect plants underground.
2. “**Anical**”: A hypothetical term combining “animal” and “analog” that describes the continuity and vitality of living systems. It emphasizes similarities between plant and animal life and their unique adaptations.

1



Introduction

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This chapter introduces Botanical Simulation Science as an emerging interdisciplinary field concerned with plant perception, information processing, simulation logic, and biological reality construction. It establishes the conceptual entry point of the manual by outlining the basic orientation of the field, tracing its historical and intellectual development, and explaining the objectives and structure of the work.

The chapter begins by presenting Botanical Simulation Science as a framework for understanding plants as active, adaptive, and information-processing systems. It then situates the field within a broader historical context, connecting ancient plant thought, natural philosophy, bioelectricity, systems biology, simulation theory, and contemporary modeling approaches. Finally, it clarifies the purpose of the manual, its structure, and the way in which its concepts, theories, methodologies, and future perspectives should be read.

Together, these sections prepare the reader to enter the conceptual architecture of Botanical Simulation Science.

1.1



Introduction to Botanical Simulation Science

Entering Botanical Simulation Science

Reality is not encountered as a raw object. It is organized through perception. Every living system must transform the complexity of its environment into something usable. Light, pressure, moisture, temperature, chemical gradients, microbial signals, injury, resistance, and spatial change do not become meaningful simply because they exist. They become meaningful when a system detects them, filters them, relates them to its own state, and converts them into possible action.

This is the point at which Botanical Simulation Science begins.

The field asks how plants construct meaningful relations with their environment. It approaches plant life not only through growth, metabolism, and physiology, but through information, interpretation, adaptation, and internally organized response.

Plants are especially important for this question because their mode of existence differs radically from that of animals. They are largely sessile. They cannot flee from drought, search actively for shelter, or reposition themselves in the same way animals can. Their survival depends on another form of intelligence: one based on sensitivity, distributed coordination, modular growth, chemical modulation, bioelectrical signaling, microbial cooperation, and continuous adaptation.

Their stillness is not a lack of agency. It is a different architecture of agency. Botanical Simulation Science describes this architecture through the language of simulation. Simulation does not mean illusion. It refers to the capacity of a system to construct an internal model of conditions, possibilities, constraints, and responses. A simulation is a structured relation between input, state, interpretation, and action.

This makes simulation one of the most powerful conceptual bridges between biology and technology. In digital environments, we understand worlds through agents, rules, feedback loops, maps, resources, thresholds, states, and decisions. Game design has made this logic especially intuitive: a world is not merely what is seen on the surface, but a system of hidden rules and meaningful interactions.

Botanical Simulation Science uses this structural language to approach plant life.

A plant can be understood as an organism that continuously receives signals, integrates them into its current state, and generates adaptive responses. Light is not merely light. It may become direction, energy, competition, seasonal timing, or stress. Moisture is not merely water. It may become path, priority, survival pressure, or future growth potential. Soil resistance is not merely obstruction. It may become spatial information. Microbial activity is not merely chemistry. It may become an extension of perception and adaptation. The central movement of Botanical Simulation Science is therefore a movement from stimulus to meaning.

It asks how physical conditions become informational events. How signals become priorities. How priorities become action tendencies. How adaptive responses emerge from distributed systems without a centralized nervous system. And how individual plants become part of wider ecological, microbial, bioelectrical, and collective networks.

This manual develops a language for describing that internal organization. It follows the movement from environmental stimulus to biological signal, from signal to meaning, from meaning to adaptive response, and from individual response to collective ecological intelligence.

This manual develops the conceptual and methodological framework required to investigate that possibility.

The following chapters introduce the central concepts of the field, beginning with the plant as a complete simulation unit and then unfolding the components through which perception, interpretation, action, networking, memory, adaptation, and future applications can be understood. The framework moves from individual plant reality to collective systems, from biological mechanisms to speculative futures, and from empirical observation to constructive modeling.

The following chapters approach plants according to their own mode of existence: sessile, distributed, modular, sensitive, networked, and deeply embedded in the environment.

To enter Botanical Simulation Science is therefore to learn a new way of reading plants. Not as passive background. Not as decorative nature. Not merely as biochemical machines. But as living systems that perceive, interpret, adapt, and participate in the formation of reality through their own biological mode of existence.

The chapters that follow give this idea its architecture.

1.2



Historical Context and Development of the Field

Botanical Simulation Science emerges from a long history of attempts to understand plants as more than passive biological structures. Across cultures, scientific periods, philosophical traditions, and technological revolutions, plants have repeatedly appeared as organisms whose inner organization exceeds immediate visibility.

The development of the field can be understood as a convergence of many lines of inquiry. Ancient plant symbolism, natural philosophy, alchemical speculation, electrophysiology, systems biology, bioelectricity, quantum biology, simulation theory, and game design all contributed different languages for approaching the same fundamental question: How do plants perceive, process, interpret, and respond to the world?

Early Plant Thought and Philosophical Roots

Long before modern biology, plants were already understood as meaningful participants in the living world. Ancient cultures treated them not merely as material resources, but as symbols of vitality, regeneration, healing, continuity, and cosmic order. Trees, roots, seeds, flowers, and medicinal plants often occupied central roles in religious, philosophical, and cosmological systems.

In Greek thought, philosophers such as Aristotle and Theophrastus approached plants as living beings with distinct forms of organization. Theophrastus, often regarded as one of the founders of botany, described plant growth, reproduction, morphology, and environmental interaction with systematic attention. Although these early approaches were shaped by the philosophical and cultural frameworks of their time, they established an important foundation: plants were worthy of structured observation and conceptual interpretation.

Other traditions, including Egyptian, Chinese, Indian, and indigenous knowledge systems, also treated plants as living forces embedded within larger systems of energy, healing, transformation, and ecological relation. Across these traditions, a recurring intuition emerged: that plant life contains hidden forms of organization, responsiveness, transformation, and relational intelligence.

This intuition forms part of the deeper historical background from which the contemporary field can be understood.

Alchemy, Natural Philosophy, and Hidden Organization

During the Middle Ages and Renaissance, alchemists and natural philosophers developed a symbolic and experimental relationship to the plant world. Plants were studied as medicines, energetic substances, transformative agents, and carriers of hidden natural principles. Figures such as Paracelsus treated plants not merely as physical matter, but as expressions of deeper correspondences between body, cosmos, and life force.

These traditions were often speculative, symbolic, and intertwined with spiritual worldviews. Yet they introduced a powerful idea that remains relevant to Botanical Simulation Science: the visible plant may be the surface of a deeper organization.

Alchemy and natural philosophy approached plants as systems of transformation. Growth, healing, decay, regeneration, and potency were interpreted as signs of internal processes that could not be understood through surface appearance alone. This mode of thinking helped prepare the intellectual ground for later scientific interest in hidden mechanisms, internal signaling, and plant responsiveness.

Botanical Simulation Science does not reproduce alchemical explanations, but it inherits part of their question: what invisible structures organize visible life?

Bioelectricity and the Scientific Turn

The emergence of modern experimental science transformed the study of living organisms. In the late eighteenth and nineteenth centuries, research into electricity revealed that living systems were not only chemical and mechanical, but also electrical.

The work of Luigi Galvani and Alessandro Volta opened a new scientific horizon by showing that electrical phenomena could be connected to biological function. Although their research focused primarily on animal physiology, it established the broader possibility that life processes could be understood through electrical activity.

In plant science, this possibility became increasingly important. Researchers began to investigate how plants respond to touch, light, temperature, injury, gravity, and chemical conditions. Over time, plant electrophysiology demonstrated that plants generate measurable electrical signals and that these signals participate in coordination, response, and communication. A decisive figure in this development was Jagadish Chandra Bose, whose experiments on plant responsiveness helped challenge the view of plants as merely passive organisms. His work contributed to a broader understanding of plants as sensitive biological systems capable of measurable responses to environmental conditions.

This scientific turn marked one of the key foundations for Botanical Simulation Science. Bioelectricity made it possible to think of plants not only as organisms of growth and metabolism, but as systems of signal transmission, coordination, and information processing.

Unconventional Experiments and the Expansion of the Question

The twentieth century also produced unconventional experiments and speculative interpretations that widened public interest in plant perception. One of the most notable examples was Cleve Backster's work with plants and polygraph devices in the 1960s. His experiments suggested that plants might respond electrically to human intention, threat, or emotional states.

These claims remain outside the central methodological foundation of contemporary plant science. However, their cultural significance lies in the way they expanded the imagination surrounding plant responsiveness. They brought into public awareness a question that later returned in more rigorous and technologically advanced forms: how deeply are plants able to register, process, and respond to their surroundings?

Within the historical development of Botanical Simulation Science, such episodes are best understood as boundary events. They do not define the field, but they show how the question of plant perception repeatedly reappears at the edge of established knowledge, inviting new instruments, new models, and new forms of interpretation.

Systems Biology, Network Thinking, and Plant Intelligence

In the late twentieth and early twenty-first centuries, plant research increasingly moved beyond isolated mechanisms toward systems-level understanding. Molecular biology, genetics, epigenetics, ecology, and computational biology revealed that plant behavior emerges through complex interactions between genes, proteins, hormones, electrical signals, microbial partners, and environmental feedback.

Systems biology made it possible to model plants as dynamic networks rather than linear machines. Network theory showed how coordination can emerge without a central command structure. Research into plant signaling, memory, stress response, root behavior, and chemical communication contributed to a new image of plants as distributed, adaptive, and information-sensitive organisms.

This shift is central to Botanical Simulation Science. If plants process information through distributed networks, then their behavior can be understood not merely as reaction, but as the outcome of internal coordination, prioritization, and adaptive interpretation.

The plant becomes visible as a system that continuously negotiates its environment.

Simulation Theory, Game Design, and the New Conceptual Language

A further transformation came from digital simulation, computer modeling, and game design. These fields introduced a powerful structural language for describing complex systems: agents, environments, world states, feedback loops, rules, constraints, resources, maps, thresholds, decision spaces, and adaptive strategies.

This language became essential for Botanical Simulation Science because it allows plant life to be modeled as an interaction between organism and world. A plant can be understood as an agent embedded within an environment of signals, pressures, opportunities, and constraints. Its growth and behavior can be interpreted as the result of ongoing interaction between internal state and external condition.

Game design is therefore not merely a metaphor within Botanical Simulation Science. It provides a conceptual architecture for understanding how living systems navigate structured worlds. It helps describe how signals become events, how environments become meaningful, and how action emerges from rules, feedback, and possibility.

In this sense, modern simulation thinking reconnects with an older intuition: the plant is not only a physical object, but a participant in a structured world of relations.

Quantum Biology and Advanced Layers of Plant Process

Quantum biology adds another layer to this development. Research into photosynthetic energy transfer and light-sensitive molecular processes has shown that certain biological mechanisms may involve subtle physical effects at extremely fine scales. These insights have expanded the range of mechanisms through which plant processes can be investigated.

Within Botanical Simulation Science, quantum biology is approached as one possible layer within a broader architecture of plant information processing. It contributes to the understanding of how molecular and energetic processes may participate in perception, sensitivity, and adaptive organization. This does not isolate quantum biology from other biological mechanisms.

Rather, it places it within a multi-level framework that includes molecular signaling, bioelectricity, genetics, epigenetics, microbial interaction, ecological networking, and simulation modeling.

The Emergence of Botanical Simulation Science

Botanical Simulation Science emerges from the convergence of these historical, scientific, technological, and philosophical lines.

Ancient traditions recognized plants as meaningful living presences. Natural philosophy and alchemy searched for hidden organization within visible life. Bioelectricity revealed plants as signal-generating systems. Systems biology and network theory described plants as distributed organisms of coordination and adaptation. Digital simulation and game design provided a language for agents, environments, feedback, and internal worlds. Quantum biology opened additional perspectives on subtle biological processes.

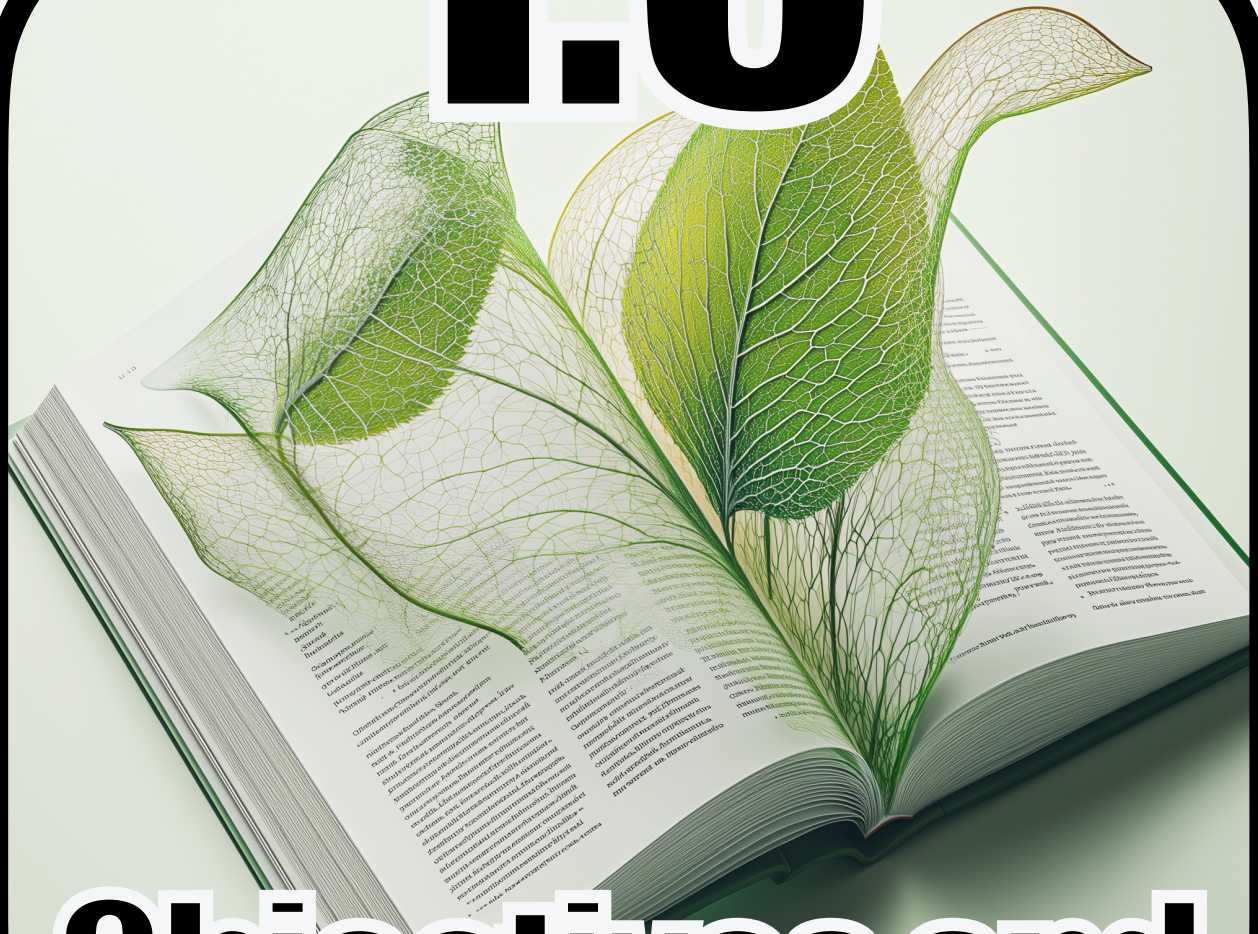
Together, these developments created the conditions for a new field.

Botanical Simulation Science brings them into one conceptual framework. It investigates plants as biological systems that perceive, process, interpret, adapt, and participate in the construction of reality through their own mode of life.

The historical development of the field is therefore not a straight line, but a branching structure: philosophical, symbolic, scientific, technological, and speculative paths converging into a new way of understanding plant life.

This manual continues that development by giving the field its first systematic architecture.

1.3



Objectives and Structure of the Manual

Botanical Simulation Science is an interdisciplinary field concerned with plant perception, information processing, simulation logic, biological adaptation, and the construction of Botanical Simulation Reality. This manual provides the first systematic introduction to the field, its central concepts, theoretical foundations, methodological approaches, and future implications.

Its purpose is not only to summarize existing knowledge, but to establish a coherent framework through which plants can be understood as active, distributed, information-processing systems. The manual brings together perspectives from botany, systems theory, bioelectricity, network science, quantum biology, simulation modeling, game design, ecology, and philosophy in order to create a shared language for future research and conceptual development.

Objectives of the Manual

The manual has four primary objectives.

First, it introduces the foundational concepts of Botanical Simulation Science. These concepts provide the vocabulary through which the field becomes readable: the plant as a simulation unit, the internal construction of Botanical Simulation Reality, the Botanical Avatar as an operative perspective, the Botanical Information Base as an interpretative framework, and the distributed systems through which plants perceive, adapt, and communicate.

Second, the manual establishes an interdisciplinary framework. Botanical Simulation Science cannot be reduced to a single discipline. It emerges from the interaction between biological research, technological modeling, philosophical interpretation, and systems-based thinking. The manual therefore aims to connect different research traditions and show how they can contribute to a broader understanding of plant life.

Third, it provides methodological orientation. The field requires tools capable of modeling hidden processes, indirect indicators, distributed networks, adaptive behavior, and dual layers of reality. For this reason, the manual introduces simulation models, systems dynamics, network analysis, artificial intelligence, bioelectric measurement, interdisciplinary data integration, and constructive modeling as essential methodological foundations.

Fourth, the manual opens future perspectives. Botanical Simulation Science has implications for ecology, agriculture, bioadaptive systems, artificial intelligence, plant-human interfaces, environmental design, and post-anthropocentric culture. These future-oriented sections are not presented as completed predictions, but as exploratory trajectories emerging from the conceptual architecture of the field.

Structure of the Manual

The manual is organized as a gradual movement from foundation to application.

The introductory section establishes the intellectual background, purpose, and reading framework of Botanical Simulation Science. It explains why the field emerges at the intersection of plant biology, simulation thinking, information processing, and systems theory.

The conceptual section introduces the core vocabulary of the field. It defines the major concepts required to understand the plant as a Botanical Simulation Unit and to describe its internal, physical, informational, and collective dimensions.

The theoretical section develops the scientific and philosophical foundations of the framework. It connects plant information processing, cybernetics, quantum biology, network theory, cognition, semiotics, and biosemiotic interpretation.

The key concepts section expands the framework into specific thematic domains, including sensory perception, reality formation, light processing, bioelectricity, genome architecture, cognition, feedback systems, modularity, collective intelligence, microbial interaction, and advanced speculative models.

The methodological section explains how Botanical Simulation Science can be modeled, investigated, and developed as a research framework. It introduces current developments, methodological tools, simulation architectures, dual-reality modeling, and constructive approaches to internal plant processes.

The future-oriented sections explore possible implications of the field for technology, ecology, culture, ethics, biohybrid systems, and the changing relationship between humans, plants, and intelligent living systems. Together, these sections form a layered architecture: from concept to theory, from theory to method, from method to application, and from application to future imagination.

Target Audience

This manual is intended for an interdisciplinary readership.

It addresses researchers and theorists interested in plant intelligence, systems biology, bioelectricity, ecological networks, simulation modeling, artificial intelligence, and the philosophy of life.

It is also written for students and emerging scholars who seek an introduction to a new conceptual framework for understanding plant life beyond classical stimulus-response models.

Practitioners in agriculture, environmental design, sustainability, ecological technology, and bioadaptive systems may use the manual as a source of conceptual orientation and future application.

Finally, the manual is open to readers from the arts, design, gaming, speculative research, and cultural theory who are interested in the relationship between nature, technology, simulation, and future forms of intelligence.

Reading the Manual

Botanical Simulation Science should be read as a developing framework rather than as a closed doctrine. Some chapters introduce foundational concepts. Others build theoretical bridges. Some sections are methodological, while others are exploratory, speculative, or future-oriented. The manual is therefore both systematic and open. It establishes a structured foundation while allowing space for refinement, criticism, expansion, and future research.

Its aim is to make a new field thinkable, communicable, and investigable. Botanical Simulation Science begins with the idea that plants are not passive background systems, but active participants in the formation of biological reality. This manual gives that idea its first comprehensive architecture.



When we look at a digitally rendered tree, its digital nature is not merely a superficial appearance but is inherent within it: the pixels of which it is composed could just as easily calculate and animate an internal living space within that tree.

In a similar way, real plant tissue could also be understood as a carrier of internal information structures that are not immediately visible but nevertheless determine how the plant functions. This perspective allows us to view plants not merely as passive living beings, but as active agents within a dynamic network of information.

Ancient traditions recognized plants as meaningful, living beings. Natural philosophy and alchemy sought hidden orders within visible life. Bioelectricity revealed plants as signal-generating systems. Systems biology and network theory described plants as distributed organisms of coordination and adaptation. Digital simulation and game design provided a language for agents, environments, feedback loops, and inner worlds. Quantum biology opened up additional perspectives