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Igniting Ideas, Bridging Minds

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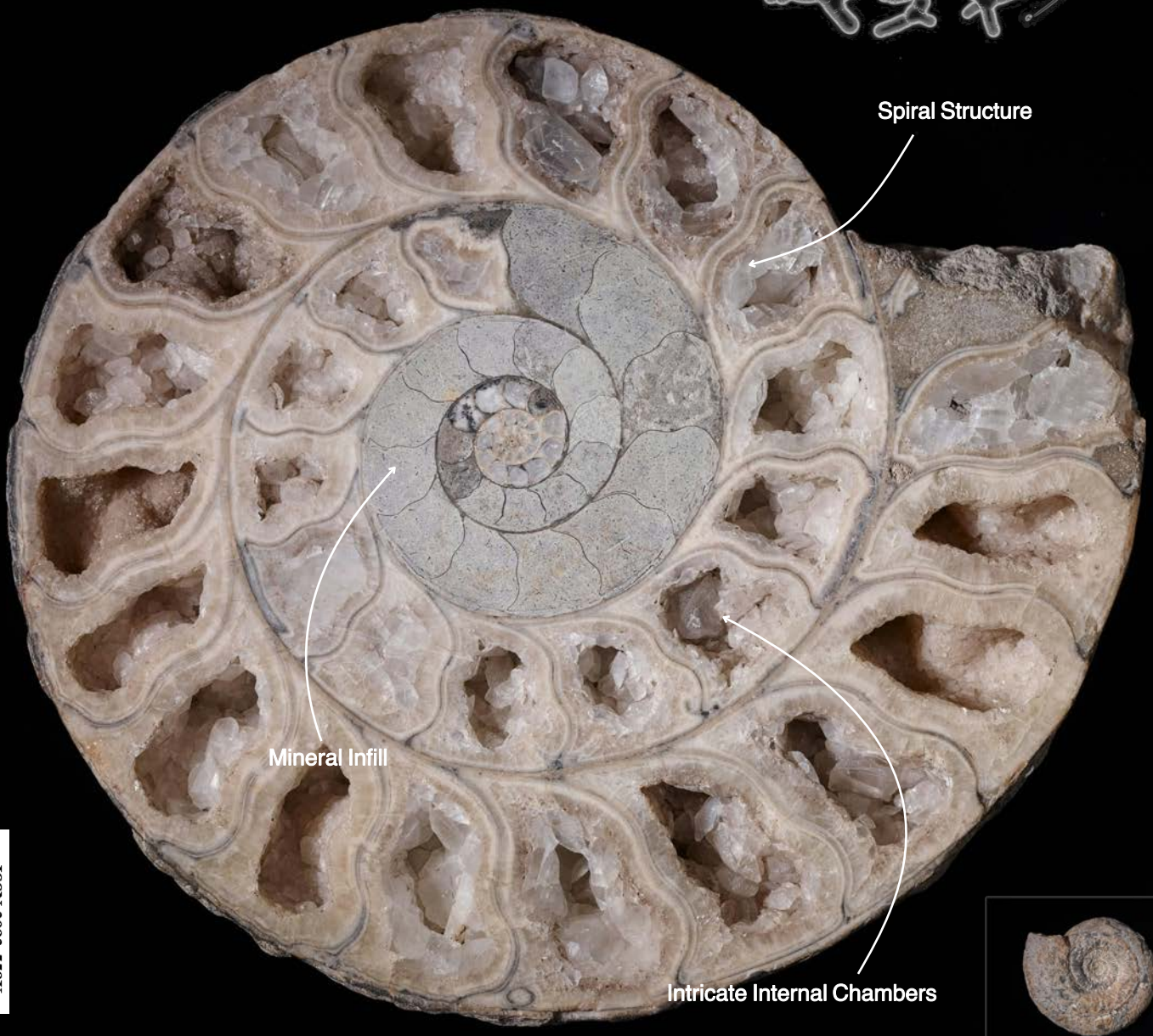

Sectioned Ammonite Fossils by Birmingham Museums Trust

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What fossils reveal about Evolution, Extinction, and Future

Ammonites, extinct marine mollusks from over 65 million years ago, leave behind intricately spiraled fossil shells that serve as a visual bridge between biology, geology, and time. Their chambered structures, often echoing the golden ratio, reveal nature's deep, mathematical patterns, uniting life, science, and the ancient Earth.

Inducing Natural Intelligence in Agriculture: Artificial Intelligence Alone is Not Sufficient

REVIVING ECOSYSTEM INTELLIGENCE FOR FUTURE FARMS

By Gamini Seneviratne, Sidath Ekanayaka and Mahesh Premarathna

Artificial Intelligence (AI) is revolutionizing agriculture by enabling precision farming, which optimizes resource use and increases yields[1]. By utilizing AI-driven sensors and drones, farmers are able to observe crop health, soil conditions, and livestock in real time, which facilitates more informed decision-making[2]. These innovations enable farmers to utilize resources more effectively, cut down on waste, and lessen labor by automating crucial processes such as planting, irrigation, harvesting, and distribution. However, in our pursuit of technological advancement, we often overlook a critical, time-tested component of sustainable ecosystems, Natural Intelligence (NI), particularly in the form of microbial life.

While AI-driven tools rely on a combination of factors, primarily data, algorithms, and connectivity of observable data, NI arises from millions of years of evolutionary adaptation and symbiotic relationships. In natural ecosystems like forests, complex microbial communities have thrived without human intervention, sustaining biodiversity, resilience, and balance[3]. These microorganisms, especially when organized in soil biofilms form a living, intelligent network that governs nutrient cycling, soil structure, and plant health[4]. Soil biofilms are structured microbial communities that adhere to surfaces and to one another, forming an integral part of the rhizosphere, the zone of soil influenced by plant roots[5].

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These microbial biofilms serve as nature's own version of a decentralized communication and resource-sharing network. Through biochemical signaling, they facilitate cooperation among microbes and between microbes and plants[6]. They help defend against pathogens, enhance nutrient uptake, and build healthy, structured soils. This form of NI is not just passive, it's active, dynamic, and foundational to long-term ecological health.

Unfortunately, numerous contemporary farming methods, including intensive tillage, monoculture cropping, and over-reliance on chemical fertilizers and pesticides, disturb these microbial networks. This disruption compromises soil health and threatens the core principles of sustainable agriculture[7]. If Smart Agriculture is to truly progress, it must look beyond AI and begin to integrate and mimic the principles of NI found in microbial ecosystems.

Harnessing the potential of microbial biofilms presents an opportunity to align technological innovation with ecological wisdom. Promoting and sustaining healthy microbial communities through practices like reduced tillage, crop diversification, and especially the use of biofilm-based biofertilizers, i.e., BFBFs, can restore soil vitality, increase crop resilience, and reduce reliance on synthetic fertilizers, particularly by concentrating carbon, nutrients, and moisture in the root zone[8,9,10]. Achieving this on a global scale across

millions of hectares is not feasible with any other technology. Therefore, this method not only promotes regenerative agriculture but also boosts the ecological intelligence of our farming systems.

The future of agriculture is not solely dependent on advanced machinery or more intelligent algorithms. Our capacity to harmonize these tools with the inherent intelligence of natural systems is essential. By connecting AI with NI, especially using a microbial biofilm approach, we can create a more resilient, productive, and sustainable future for agriculture.

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