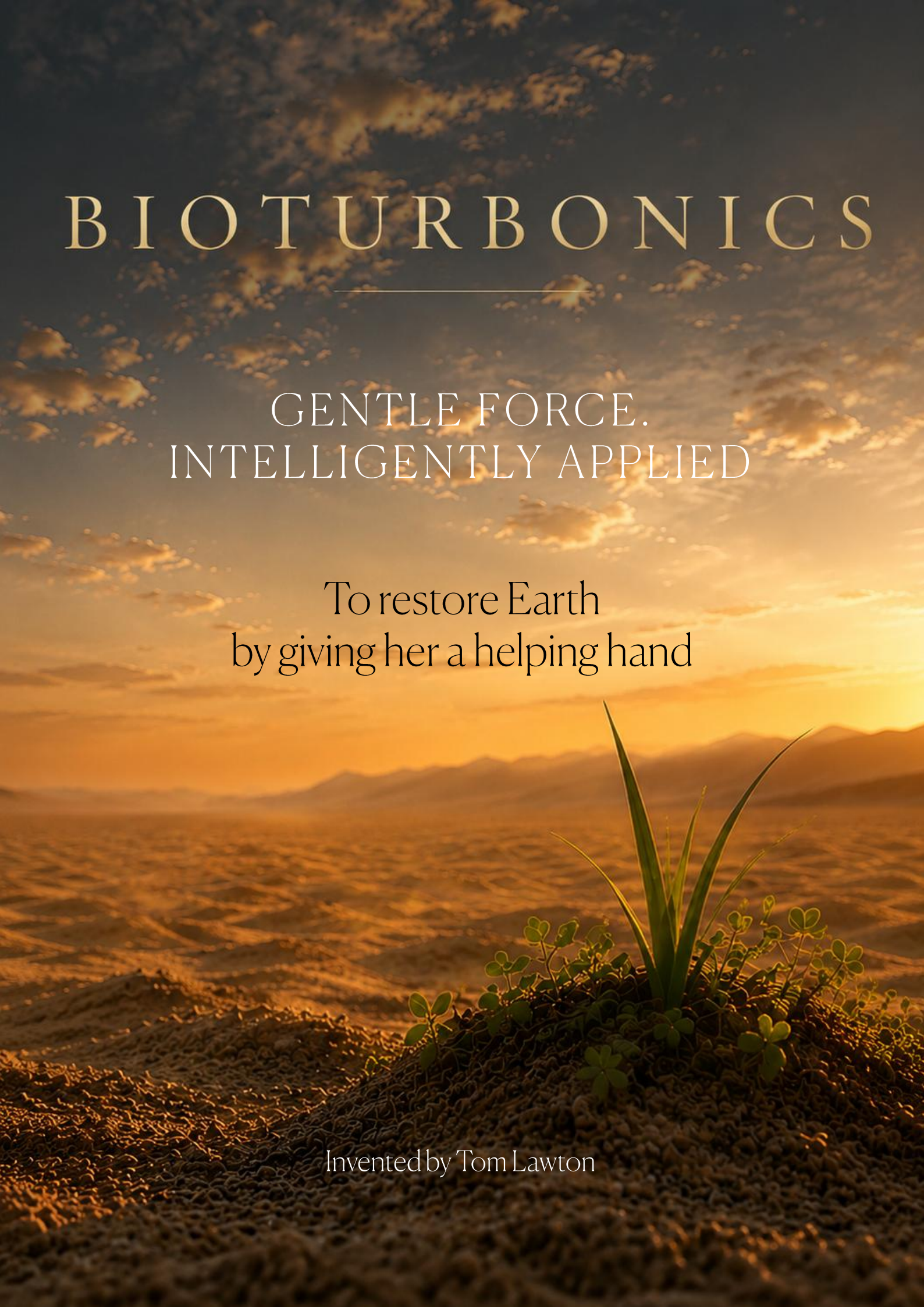

BIOTURBONICS
GENTLE FORCE.
INTELLIGENTLY APPLIED
To restore Earth
by giving her a helping hand
Invented by Tom Lawton

The Bioturbonator

For thousands of years humanity has learned how to move soil.

We have dug it.

Turned it.

Broken it.

Pulverised it.

These methods helped build civilisation.

Yet healthy soil has never been created in this way.

Healthy soil is woven.

Roots explore. Earthworms tunnel. Fungi connect. Water finds pathways.

Organic matter becomes part of something greater than itself.

Life does not force the ground into existence.

It patiently invites it.

The Bioturbonator begins with a simple question.

Could engineering participate in these same processes?

Not by overpowering nature...

...but by helping it.

This is the philosophy of Gentle Force.

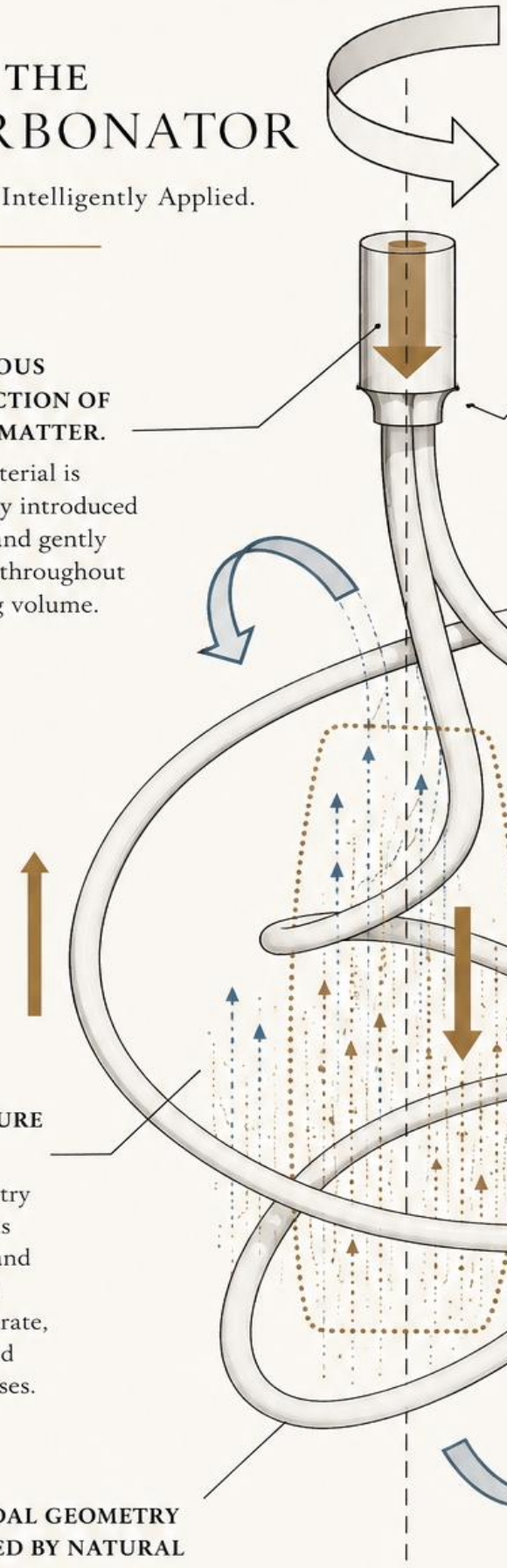
It asks whether machinery might become less destructive, more intelligent, and ultimately more humble.

Not replacing nature.

Working with her.

THE BIOTURBONATOR

Gentle Force. Intelligently Applied.



1 SIMULTANEOUS UPWARD AND DOWNWARD MOVEMENT.

Bi-helical movement creates simultaneous upward and downward conveyance around the rotational axis.

2 CONTINUOUS INTRODUCTION OF ORGANIC MATTER.

Organic material is continuously introduced at the axis and gently distributed throughout the working volume.

3 GENTLE RADIAL REDISTRIBUTION.

Material is gently moved radially outward and redistributed, avoiding compaction and preserving soil structure.

4 AIR AND MOISTURE PATHWAYS.

The helical geometry creates continuous pathways for air and moisture to move through the substrate, supporting life and enhancing processes.

5 PROGRESSIVE SOIL FORMATION.

The working volume supports biological activity, carbon integration, aggregation and the progressive formation of living soil.

6 TOROIDAL GEOMETRY INSPIRED BY NATURAL SYSTEMS.

The closed-loop toroidal form is inspired by natural energy flows and promotes continuous, balanced regenerative processes.

ROTATIONAL AXIS

Air & Moisture Pathways

Material Flow

UK PATENT GB2605246

The Question



Engineering has become extraordinarily good at excavation.

Gentle Force asks a different question.

Can machinery participate in soil formation?

Can damaged ground become increasingly capable of restoring itself?

The Bioturbonator is not designed to manufacture finished soil.

It seeks to begin a trajectory.

One in which biology, water, minerals and organic matter progressively reorganise themselves into living ground.

That hypothesis now deserves rigorous scientific investigation.

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Scientific Reflection



"Some of the most important innovations begin with a question that has not yet been answered. Gentle Force asks whether we can design machinery that participates more intelligently in soil formation not overpowering the ground, but creating conditions in which natural processes can resume their work... We already know how to excavate, invert and move soil. The far more interesting challenge is learning how to help mineral ground become living ground, and how to help damaged soils recover the capacity to keep forming."

Dr Dan Evans, Soil Scientist

Why Gentle Force Matters to Me as a Soil Scientist

By Dr Dan Evans PhD SFHEA. Senior Lecturer in Soil Formation at Cranfield University

My scientific career has been shaped by one deceptively simple question **how does a material become soil?** That question has taken me into landscapes where soils are only just beginning to form, from newly exposed sediments and weathered bedrock to disturbed and degraded ground where the normal processes of soil formation have been interrupted. I have spent much of my career studying the point at which geological material begins to behave as something more than substrate when roots enter, organisms colonise, organic matter accumulates, pores form, water begins to be regulated, and mineral particles become organised into a living system.

Although soil formation is often presented as an exceptionally slow process, it is not governed by a single clock. Roots can create new pores within months. Microorganisms rapidly colonise exposed surfaces. Organic matter alters aggregation, moisture retention and nutrient cycling over relatively short periods. Some aspects of soil formation take centuries, but others begin almost immediately once the right conditions are present. This has led me to become increasingly interested not only in how soils formed in the past, but in how we might help initiate soil-forming processes in the future.

Across the world, many soils have become compacted, eroded, depleted of organic matter or stripped of their biological complexity. The deeper problem is not simply that they contain less carbon or support fewer organisms, but that they have lost some of their capacity to recover. Their pores are disconnected, their organic resources depleted, their biology constrained and their future possibilities narrowed. I think of this as a loss of **soil formation capacity** a loss of the ability to develop, reorganise and become more functional through time.

My meeting with Tom was exciting because Gentle Force speaks directly to that interest. Rather than asking how soil can be cut, turned or mixed more efficiently, it asks whether damaged ground can be interacted with in a way that helps restore the conditions from which soil formation can continue. Soil is not simply a collection of ingredients. It is the organisation of mineral material, organic matter, water, air and biology into a functioning system that is capable of participating in its own further development.

This is why the idea of **weaving** within Gentle Force resonates with me. Healthy soil is not static. It is organised movement. Roots grow and decay, water threads through pores, organisms transport particles, minerals dissolve and reform, and aggregates continually assemble and break apart. The Bioturbinator proposes a geometry that seeks not simply to move soil, but to support the progressive restoration of these soil-forming processes.

What interests me scientifically is the possibility that this geometry could interact with soil-forming material in a fundamentally different way from conventional cultivation tools, distributing its interaction through a greater volume of substrate while introducing organic matter, opening pathways for water and air, and reducing destructive fragmentation.

The opportunity is not to manufacture a finished soil in a single intervention. The more compelling objective is to begin a trajectory helping compacted or depleted substrates become increasingly capable of developing structure, supporting biological colonisation, regulating moisture and integrating organic matter through time. This idea connects strongly with my wider interest in what I call tomorrow's soils—the soils that may one day emerge on mine wastes, construction substrates, degraded agricultural land, urban rubble and semi-arid landscapes if the right conditions can first be established. Restoration should not simply recreate what once existed it should reopen the possibility of future development.

At present, the Bioturbinator remains an engineering and scientific hypothesis rather than a validated technology, and its performance must be tested rigorously across a range of substrates and conditions. We need to understand not only its immediate effects, but whether those changes persist and whether treated materials become more capable of continuing their own development. Some of the most important innovations begin with questions that have not yet been answered. Gentle Force asks whether engineering can participate more intelligently in soil formation not overpowering the ground, but creating conditions in which natural processes can resume their work. That question is deeply aligned with my own research interests, and it is why I believe Gentle Force deserves serious scientific investigation.

"The more compelling objective for me is to begin a trajectory to help a compacted, depleted or largely mineral substrate become more capable of developing structure, supporting biological colonisation, regulating moisture and integrating organic matter through time. In other words, can the intervention create a soil that continues to form after the Gentle Force has moved on?“

“A visionary and creative interpretation of energy flows in natural systems, applied to sustainable soil tillage and processes such as earthworm bioturbation.”

“The inventor may wish to investigate whether this tool could be better suited to very poor soils where organic matter could be woven into the soil, like deserts, to keep it from being blown away or burnt off by the sun.”

Professor Jennifer Dungait

Editor-in-Chief of the European Journal of Soil Science

Digging for Innovation, June 2020

“Tom Lawton's endlessly flowing toroidal work stirs up wonder and invites us to ask: Is this what regenerative and distributive design looks like in motion?”

Kate Raworth, author of *Doughnut Economics*

大師

蚯蚓之道

THE MASTER

The Wonder of the Earthworm

道法自然

PIONEER OF THE GREATEST UNDERGROUND MOVEMENT ON EARTH.

Resilient. Social creature. Doesn't care what he looks like.
A team player. Unyielding force. Flows in pathways that create unique rotational architecture – improving aeration and drainage.
The king of the underworld. Modest.
Nature's overlooked genius.

Simultaneous Hermaphrodite.



THE TAO 道

THE WAY OR COURSE OF NATURE



The flow of life is basic to Chinese thinking.
The universe is an energy system.
By the operation of force and energy upon stuff or matter.
Informed by spirit or energy.
A form of constant change.

WU WEI 無為

The earthworm is the master of wu wei—effortless action—action in accordance with the nature of things.

ALAN WATTS 艾倫・沃茨

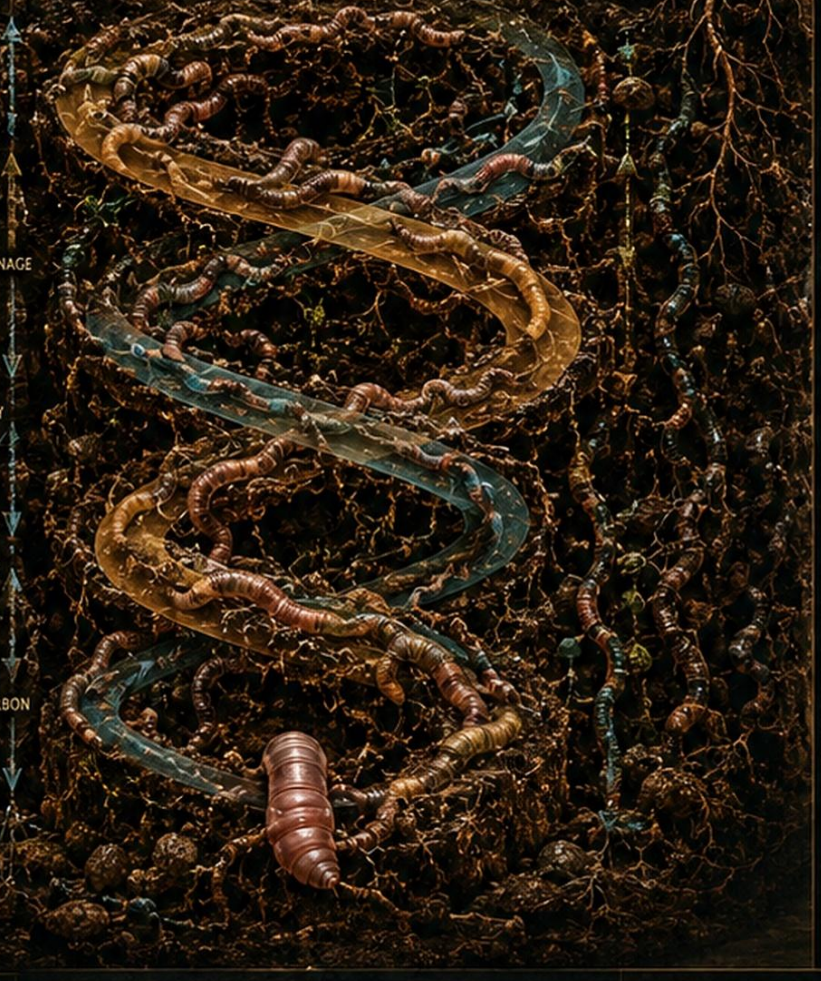


"If you ask me to show you God, I will point to the sun, or a tree, or a worm. But if you say, 'You mean then that God is the sun, the tree, the worm...?' you have missed the point entirely."

"We do not come into this world; we come out of it, as leaves from a tree."

TOGETHER, WE FLOW. TOGETHER, WE TRANSFORM.

BIHELICAL MOVEMENT – NATURE'S HIDDEN ARCHITECTURE



AERATES SOIL 增加通氣
Tunnels create pathways for air to penetrate deeply.

ENHANCES DRAINAGE 改善排水
Channels allow water to infiltrate and move efficiently.

BUILDS FERTILITY 提升肥力
Blends organic matter and minerals, enriching soil.

STIMULATES LIFE 促進生命
Supports microbes, fungi and tiny creatures.

SEQUESTERS CARBON 固碳儲存
Buries organic carbon deep in the soil.

THE BIHELICAL PATHWAY 雙螺旋之道



Individual worms follow simple instincts. Together, their paths interweave into a bihelical architecture—nature's own rotational engineering.

Like WONDER.
Born from countless gentle acts.
Emergent. Efficient. Beautiful.



From countless tiny tunnels emerges a hidden geometry that transforms landscapes.

This is GENTLE FORCE in action.

THE LIFE OF A MASTER 大師的一生



COCOON 卵囊	HATCHING 孵化	YOUNG 幼體	MATURE 成體	REPRODUCES 繁殖	LONG LIFE 長壽
2–3 weeks	3–4 weeks	4–8 weeks	8+ weeks	Every 7–10 days (hundreds of cocoons)	3–10 years

MANY BODIES. ONE PURPOSE.
QUIETLY. CONTINUOUSLY. ENDLESSLY.
THE GREATEST ENGINEERS ARE OFTEN THE SMALLEST.



NATURE'S SERVICES 自然的服務

- SOIL STRUCTURE BUILDERS 土壤結構建造者
- NUTRIENT CYCLERS 養分循環者
- CARBON SEQUESTRATORS 固碳儲存者
- MICROBIAL GARDENERS 微生物園丁
- ECOSYSTEM FOUNDATIONS 生態系統基石



KING OF THE UNDERWORLD
地下世界之王

Look closely. Beneath our feet, the earthworm writes the future.
細心觀察。在我們腳下，蚯蚓正在書寫未來。


"Wonder taught me that gentle, continuous movement can produce extraordinary effects. The Bioturbonator is an attempt to ask whether the same philosophy might help restore the ground beneath our feet."
Tom Lawton
Friday 31 July 2026
7.00pm
Vivaldi
Four Seasons
Trafalgar Sinfonia
MOTOWN
Nights

Wonder began as a sculpture.

A study of movement without destination.

Years later, the same geometry found another purpose.

Not in galleries...

...but beneath our feet.

One invention asks us to become still.

The other asks whether the ground itself might one day recover.

Different objects.

One philosophy.

Gentle Force.



BIOTURBONICS

WOW

WORM OF WONDER®

THE WORLD'S FIRST PRECISION UNDERGROUND BIOLOGICAL DELIVERY SYSTEM



GENTLE FORCE.
INTELLIGENTLY APPLIED.

RESTORES
SOIL ARCHITECTURE

DELIVERS
LIQUID LIFE™
& CO_2

RECONNECTS
DEEP & SURFACE
HORIZONS

ACTIVATES
LIFE WHERE IT
BELONGS

NOT A PLOUGH.
NOT A DRILL.
NOT AN INJECTOR.

A LIVING SYSTEM FOR LIVING SOILS.

- WATER
- AIR
- BIOLOGY
- ROOTS
- MINERALS
- REGENERATION

INSPIRED BY NATURE

ENGINEERED WITH PURPOSE

DELIVERED WITH PRECISION

SOILS RECOVER. NATURE LEADS.

THE GREATEST SUCCESS IS TO BECOME UNNECESSARY.

GENTLE FORCE. INTELLIGENTLY APPLIED.

bioturbonics.com