

**How to Grow, Learn and Radically
Engage with the Natural World**

First published in Great Britain in 2022 by

Profile Books Ltd

29 Cloth Fair

London

EC1A 7JQ

www.profilebooks.com

Published in association with Wellcome Collection

**wellcome
collection**

183 Euston Road

London NW1 2BE

www.wellcomecollection.org

Copyrights in the individual works retained by the contributors

Text design by Crow Books

1 3 5 7 9 10 8 6 4 2

Printed and bound in Great Britain by

Clays Ltd, Elcograf S.p.A.

The moral right of the author has been asserted.

All rights reserved. Without limiting the rights under copyright reserved above, no part of this publication may be reproduced, stored or introduced into a retrieval system, or transmitted, in any form or by any means (electronic, mechanical, photocopying, recording or otherwise), without the prior written permission of both the copyright owner and the publisher of this book.

A CIP catalogue record for this book is available from the British Library.

ISBN 978 1 78816 6911

eISBN 978 1 78283 7992

CONTENTS

Note on Illustrations

1 Vegetal Transmutation

Eduardo Navarro & Michael Marder

2 Before Roots

Merlin Sheldrake

3 Self-Portrait as a Mushroom in the Damp and Leafy Forest

Abi Palmer

4 Strange Soil

Rebecca Tamás

5 Plants Know

Emanuele Coccia

6 Wilder Flowers

Rowan Hisayo Buchanan

7 Bitter Barks: Legacies and futures of the famous fever tree

Kim Walker & Nataly Allasi Canales

8 How to Study the Mosses

Jessica J. Lee

9 A Planet Without Flowers

Sumana Roy

10 Eco Revenge

Susie Orbach

11 Nature as Health

Araceli Camargo

12 What the Wind Can Bring

Amanda Thomson

13 *Upirngasaq* (Arctic Spring)

Sheila Watt-Cloutier

14 Braiding Sweetgrass

Robin Wall Kimmerer

Acknowledgements

About the Authors

Rooted Beings

NOTE ON ILLUSTRATIONS

The chapter-opening illustrations, *Photosynthetics* (*Fotosintéticos*), are a new body of work by the Argentinian artist Eduardo Navarro. These expansive and contemplative drawings of part-human, part-plant beings were commissioned by Wellcome Collection and La Casa Encendida, in partnership with Delfina Foundation, for exhibition in London and Madrid.

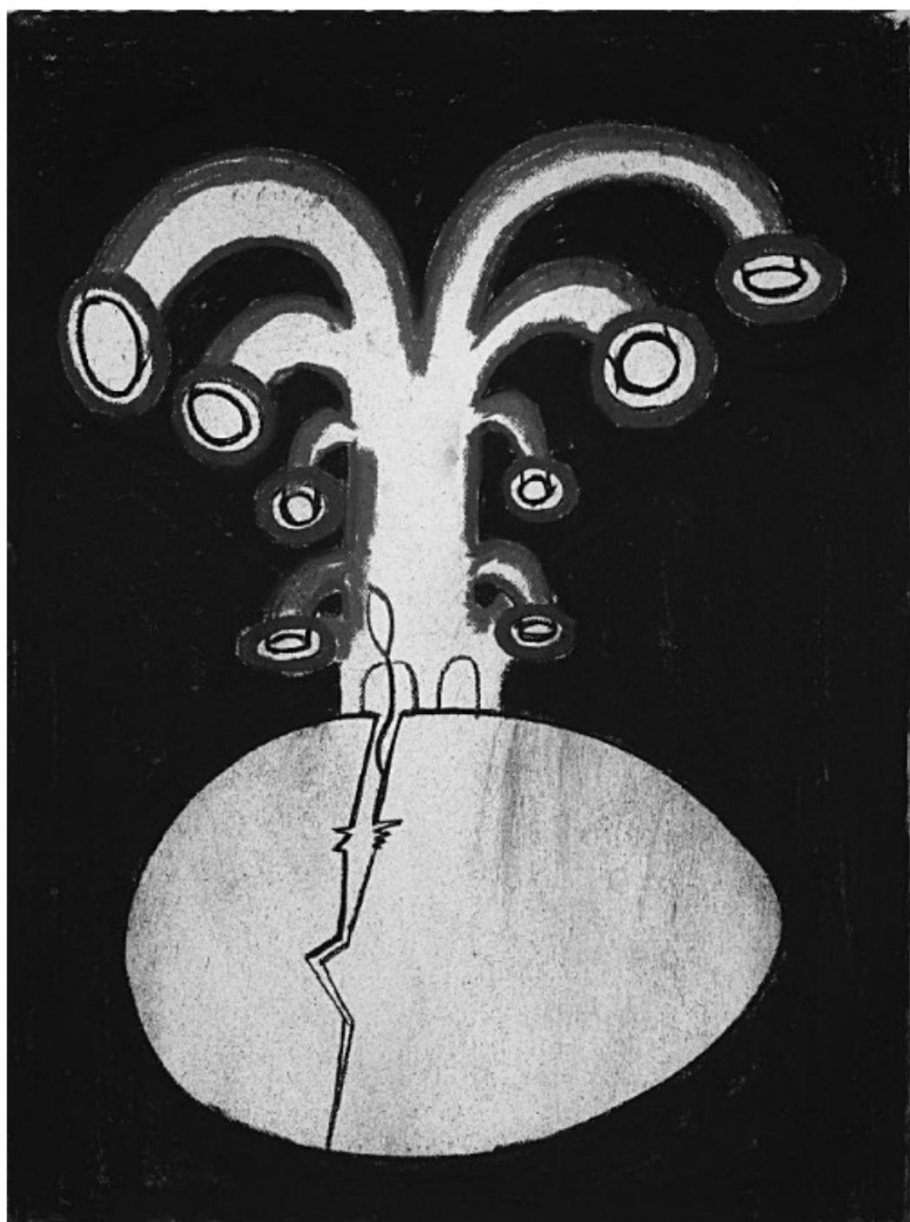
Navarro describes his work as emotional technology, a tool that allows us to develop trust, empathy and contemplation with non-human entities. The drawings were made with charcoal on handmade, biodegradable paper envelopes. Inside, seven seeds of an Ombu tree remain dormant. After being exhibited, the drawings will be placed in an open landscape, allowing nature to take over and activate the seeds within. While the seeds wait for the right humidity and light to begin their journey in time, the drawings act as a degradable womb, hosting their uncertain future.

THIS BOOK IS A PLANT

1

VEGETAL TRANSMUTATION

Eduardo Navarro & Michael Marder



Please use these performative instructions to explore the world around you as you hold this book in your hands.

TAKE A MOMENT TO DRAW a cosmic breath with your whole body, slower than any breath you have ever taken in your life.

Close your eyes. See and hear with your skin as you embody the density that emanates from within the seed of your thoughts. Register the vibrations rippling throughout the space around you and the radiant waves enveloping you. Caress the air with your hands, petting its flows with each fingertip. Feel how grounded, yet free, you are. Stable, but supple.

Your skin is more than skin. It is at the same time an enormous leaf, in which your whole body is wrapped, as well as a respiratory system and a number of sense organs, photosensitive and acoustically engaged.

Break out into light, while staying connected to the dark and the obscure. Your fingers are roots and branches. There are more fingers branching out from the fingers in order for you to hug the earth and the sky better, more thoroughly.

One arm stretches tall; the other seeks deep in the soil. Span these extremes with your midsection: your chest, your trunk. Pay equal attention to both arms, orientations, worlds. Receive the kisses of the sun on your eyelids, ears, mouth, cheeks, fingers . . . Imbibe the cool moistness of the earth with the other arm and a part of your trunk. Become the crossing between the warmth that gently touches you and the coolness you soak up.

Your limbs rotate in every direction, weightlessly reaching out to light and to darkness. Grow little by little, both intensively in time and extensively in space. Contract, minimise yourself, decay. Grow from contracting; contract from growing.

Focus on the soles of your feet as they absorb energy from planet Earth with every breath. Concentrate on the crown of your head, receiving the energy of the atmosphere. More like a tree crown, it is no longer a head. Think as you are breathing and perceiving – with your whole body, skin, limbs, lips, tips and edges. Do not hoard thoughts in your brain. Instead, let them circulate, like sap, in every part of yourself.

You are in an endless state of communion and infinite contemplation with other natural elements and beings. Can you see with your skin and hear with your arms? Can you think together with the air and the sun and the soil? Can you dream with your feet? Imagine with your fingertips?

Perhaps there are other plants sharing the space with you. Acknowledge these vegetal beings as you gradually move around in a wordless communicative practice. Experiment with the language of gestures, of physical expressions and forms. A choreography of touching without touching: the language of plants.

Move in the place where you are and sense the place moving along with you, growing and contracting rhythmically. Care for your place and for your attachment to it. You do not have your place; the place embraces you in itself. Render it equally welcoming, open to others. Experience your place as always the same *and* radically different, ramified and attuned otherwise in each instant. What does it mean for you to be at home there?

Your breathing is in a constant dialogue with your surroundings. Breathe in your depths, with the lungs, and on the surface, with the skin. Re-establish the ties between inner and outer breathing to sustain a respiratory conversation with the world. Root in your body through this double breath.

Inhale the space, exhale the sky.

You are tending to your impulses, decisions, and actions on a horizontal plane, letting them become a holistic garden. Nurture them with your breath and the humid density of the obscure ground, from which they spring.

As you are very slowly dying, while also staying alive, your body becomes the soil you are living in. You are perpetually feeding yourself and others in a delicate equilibrium.

Feel the slow rotations of the cycle of life. In tandem with it, let fresh sprouts, bulbs and seeds in the space gradually take over. Nourish and support them from below. Allow the subtle movements of air and visible or invisible winged creatures to carry your seeds and pollen like messages across time. Disseminate yourself, holding nothing back.

*Repeat once the book is closed, weightlessly reaching out
to light and to darkness.*

time, they evolved coarse fleshy organs to house their fungal associates, which scavenged the soil for nutrients and water. By the time the first roots evolved, the mycorrhizal association was already some 50 million years old. Mycorrhizal fungi are the roots of all subsequent life on land. The word 'mycorrhiza' has it right. Roots (rhiza) followed fungi (mykes) into being.

Today, hundreds of millions of years later, plants have evolved thinner, faster-growing, opportunistic roots that behave more like fungi. But even these roots can't outmanoeuvre fungi when it comes to exploring the soil. Mycorrhizal hyphae are fifty times finer than the finest roots and can exceed the length of a plant's roots by as much as a hundred times. Their mycelium makes up between a third and a half of the living mass of soils. The numbers are astronomical. Globally, the total length of mycorrhizal hyphae in the top ten centimetres of soil is around half the width of our galaxy (4.5×10^{17} kilometres versus 9.5×10^{17} kilometres). If these hyphae were ironed into a flat sheet, their combined surface area would cover every inch of dry land on Earth two and a half times over. However, fungi don't stay still. Mycorrhizal hyphae die back and regrow so rapidly – between ten and sixty times per year – that over a million years their cumulative length would exceed the diameter of the known universe (4.8×10^{10} light years of hyphae, versus 9.1×10^9 light years in the known universe). Given that mycorrhizal fungi have been around for some 500 million years and aren't restricted to the top ten centimetres of soil, these figures are certainly underestimates.

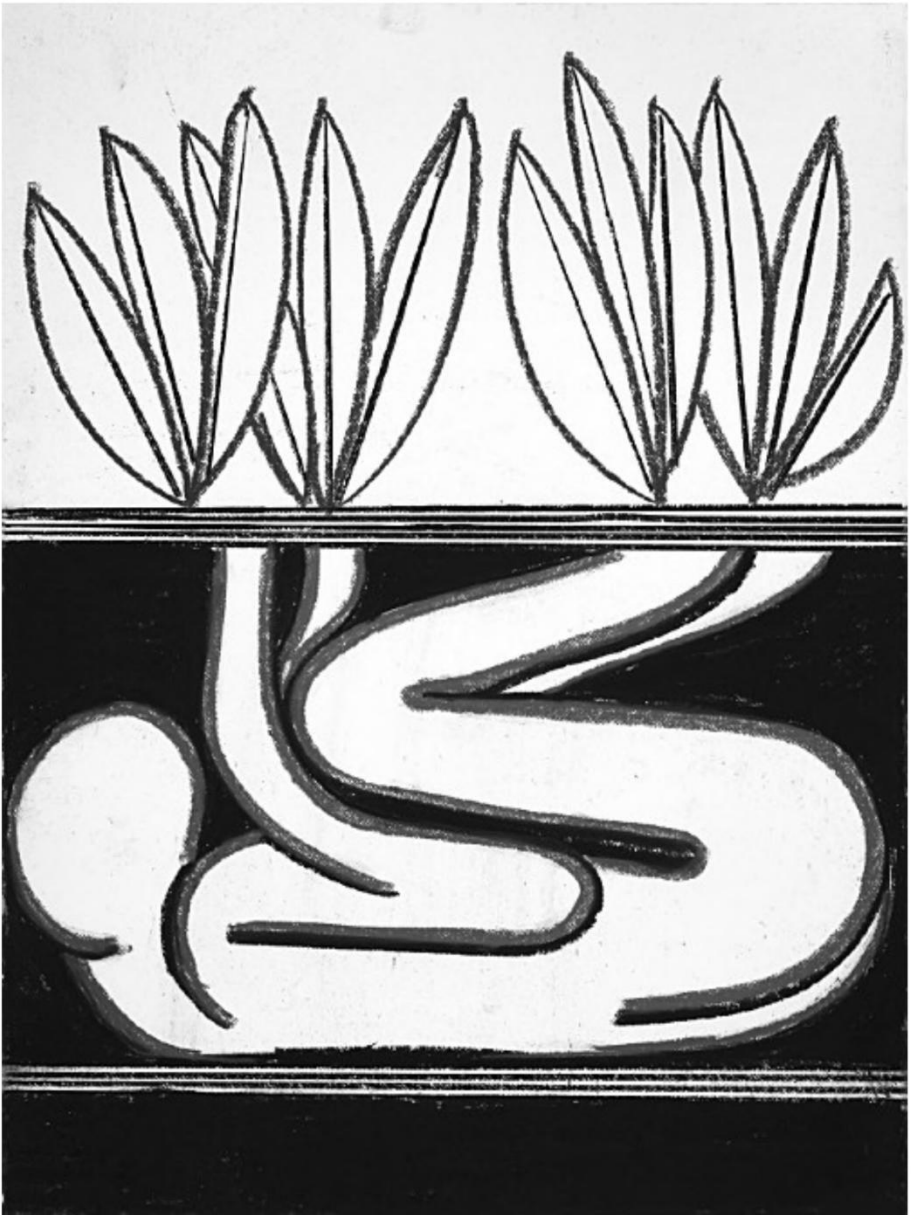
In their relationship, plants and mycorrhizal fungi enact a polarity: plant shoots engage with the light and air, while the fungi and plant roots engage with the solid ground. Plants pack up light and carbon dioxide into sugars and lipids. Mycorrhizal fungi unpack nutrients bound up in rock and decomposing material. These are fungi with a dual niche: part of their life

*image
not
available*

11

NATURE AS HEALTH

Araceli Camargo



HEALING IS SACRED. Healing is the lifelong process of approaching wholeness. We heal with, and for, Nature. Nature, with a capital N: a being, our kin, a spirit, an energy. We, too, are Nature.

As our hands work through soil, when mending a plant, we inhale millions of microbes that provide vital support to our gut

ecosystem, ensuring the healthy function of our various bodily systems. As we take the time to heal the plant, the plant heals us. When we find our way through the knotted and uneven ground of a lush forest it helps us create supple, resilient and flexible minds, muscles and skeletons, keeping us in a healthy active state. The more we do this, the more we create the capacity to keep doing it. We heal *for* Nature. We heal to sustain our ability to interact with Nature, to know this plural being, to care for them, creating a lifelong healing relationship.

We are kin. All living beings which inhabit this earth are contained within nature, from rivers to plankton to people. Nature holds multiple energies and lives. There is no divide or hierarchy between us: every living being has a contribution to give, has worth, and the right to exist with dignity and health.

Oxygen binds our kinship. Time and space created an opportunity for Oxygen to enter our Planet, survive and thrive through humble, single-celled organisms called cyanobacteria. This miraculous phenomenon gave the foundation for all life. Every single being needs and contains Oxygen, making it one of the most omnipresent elements on earth. Oxygen is in our Waters, Land, Air, and in our blood, creating an unbreakable bond between us all – an eternal kinship with all living things. Oxygen promises continual, abundant and healthy life.

Health is a process. It provides our biological systems the opportunity to create a stable state after experiencing trauma or stress in our lifetime.

When our habitats are healthy, we are healthy. Health does not happen in a vacuum, or within the confines of our bodies. We heal with Nature. In a richly biodiverse environment, such as a forest, our respiratory tract allows us to ingest microbes from vegetation, fungi and soil. These microbes are essential to the health and function of our internal microbiome found in our gut,

and are known as *supportive capacities*. As biological sciences evolve, there is an increasing body of work linking the function of our gut's microbiome to complex diseases such as depression, anxiety, obesity, dementia and diabetes. Exposure to biodiversity supports our health in preventing disease, but also helps lessen the burden of disease. From Nature we can receive vital nutrients and medicine that help us heal.

Nature can also provide *restorative capacities*: outdoor habitats like forests, rivers and mountains can rehabilitate us from the burdens of the lived experience. From a cognitive perspective, these habitats can create the experience of fascination, which is linked to effortless attention, reducing the demand on our cognitive resources, allowing our mind to restore. This is in contrast to the sustained attention required to successfully navigate a busy street, where there is a high demand on our cognitive capacities, owing to the varied and unexpected events, stimuli and activities our minds have to make decisions on and decipher. And from a physiological perspective, when we are in richly biodiverse environments our body's stress response is better regulated. This biologically adaptive response allows us to adapt to acute and unexpected changes to our environment. In our modern world, where stressors can be constant and our stress response is in high demand, this can cause wear and tear on many of our biological systems. Nature's restoring qualities can be important for a lifetime of health and healing.

And thirdly, Nature enables us to connect. *Connectedness* to Nature is our ability to mentally, spiritually and intellectually bond with the natural world. The feeling of belonging is very important to all beings. Our sense of belonging is not limited to human contact, we also need contact with the wider natural world. All beings on this Earth need to be connected and bonded in a kinship as it secures our collective survival. Loneliness, which can come from a lack of connectedness, is part of the

disease pathology for depression, anxiety, obesity and PTSD. Nature, and in particular a richly biodiverse environment, helps us heal, helps us connect, helps us feel whole.

Sadly, the biodiversity of our Planet is becoming more and more depleted and sick. Robust, healthy trees are becoming diseased from air, soil and water pollution. Precious ecosystems like coral reefs are dying, and all our life-giving kin – Water, Land and Air – have become polluted. There is no place on earth free from plastic; even the snow in the Arctic contains microplastics.

This is driven by extractive economies – economies dependent on the commodification and industrialisation of natural resources, including human labour. They are taking away our time and space to build kinship with Nature, taking away opportunities for healing. In such an economy, society has one concern: profit, by any means necessary. Profit drives decisions. People are paid non-living wages in order to increase profits. But this can have a knock-on effect on health. Non-living wages force people into dangerous housing. Social housing is often built next to industrial waste sites or busy highways, because it is cheaper – but it exposes people to environmental pollutants. Non-living wages force people to live with psychosocial stressors such as food, housing and job insecurity, and various types and scales of trauma that are part of the poverty landscape.

This is *biological inequity*: the systemically driven, uneven distribution of biological stress in a population. Those experiencing poverty and environmental pollutants are constantly forced to engage their stress response, leading to the dysregulations of our cardiovascular, metabolic, endocrine, immune and digestive systems. Research is now beginning to show us how these dysregulations play a key role in disease pathology.